Bridge No. C-07-001

November 2012

ENVIRONMENTAL ASSESSMENT

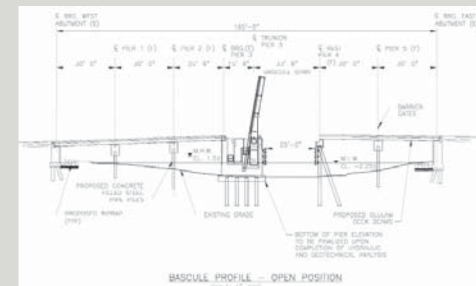
Mitchell River Bridge Replacement Project

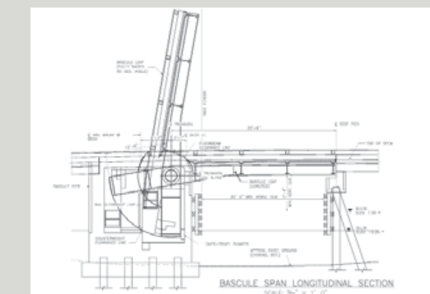
Bridge Street over Mitchell River, Chatham, Massachusetts

U.S. Department of Transportation
Federal Highway Administration

massDOT
Massachusetts Department of Transportation
Highway Division

ACCELERATED BRIDGE PROGRAM





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Chatham, Massachusetts

Environmental Assessment

Submitted pursuant to 42 USC 4332 (2)(c)

US Department of Transportation
Federal Highway Administration

Massachusetts Department of Transportation
Highway Division

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Chapter 1 Project Summary

The Massachusetts Department of Transportation – Highway Division (MassDOT) and the Town of Chatham are proposing to replace the existing Mitchell River Bridge (MassDOT Bridge Department Number C-07-001), which carries Bridge Street over the Mitchell River, in Chatham, Massachusetts. The Town of Chatham owns the bridge and is responsible for its maintenance. Bridge Street is a municipal roadway carrying one lane of traffic in each direction; it is functionally classified as an Urban Collector.

This project will be supported in part with Federal funding through the Federal Highway Administration (FHWA). This Environmental Assessment (EA), therefore, is being prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, the policies and procedures in 23 CFR 771 (Environmental Impact and Related Procedures, Federal Highway Administration), and FHWA Technical Advisory T 6640.8A.

1.1 Overview

The Mitchell River Bridge is an electrically powered, cable-lift, simple trunnion, single-leaf timber bascule drawbridge with eleven timber stringer approach spans supported on timber pile bents. The entire existing bridge superstructure, including the bascule and all eleven approach spans, was constructed of new timber elements in 1980. This 1980 superstructure was erected on a reconstructed substructure that combined reused timber piles from a previous bridge on this crossing intermixed with new (1980) timber piles, all new timber pier caps, all new wooden cross-bracing, and two new reinforced concrete abutments. The earlier bridge from which the reused timber piles were retained was a timber drawbridge that had been constructed in 1925 and then widened and modernized in 1949. This 1925/1949 structure was itself a complete replacement of a much longer timber drawbridge reportedly erected in either 1858 or 1871. That mid-19^{th} century bridge is presumed to have been the original bridge on this crossing. No part of that original bridge is known to exist today.

The Mitchell River is a tidal waterway that links Mill Pond to the Stage Harbor embayment system along Chatham's southwest coastline. The Stage Harbor System consists of six embayments: Stage Harbor, Oyster Pond River, Oyster Pond, Mitchell River, Mill Pond, and Little Mill Pond. It is also one of the Town of Chatham's most important marine resources. The Stage Harbor embayments support both salt marsh and eelgrass communities. Eelgrass beds are critical components of shallow coastal ecosystems that provide food and cover for a great variety of commercially and recreationally important fauna and their prey.

Figure 1 Site Location Map

The bridge is a popular location for recreational fishing; its railings include numerous fishing pole stabilizing notches carved out by local anglers. A town-owned, at-grade path is located at the southeast quadrant of the bridge and is utilized for public access to the Mitchell River. Pease Boat Works (a commercial business focusing on preserving the traditional skills of wooden boat building, repair, and restoration) is located upstream of the bridge and is a primary user of the channel for navigating vessels to and from their place of business. Other users of the channel consist of commercial and recreational fishing boats as well as vessels seeking anchorage and refuge during storm events.

Figure 2 Existing Bridge

The bridge currently has a National Bridge Inventory (NBI) Sufficiency Rating of 45.9 out of 100 and is currently classified as "Structurally Deficient", primarily due to the poor condition of the substructure. The current condition of the timber throughout the bridge varies and environmental conditions are conducive to continued deterioration. Bridge inspection reports are included in Appendix D.

Although the bridge is currently considered safe and is inspected on a regular basis (the last routine inspection occurred on October 5, 2010, and the last underwater inspection occurred March 18, 2012), anticipated deterioration in the near future may reasonably be expected to reduce the load carrying capacity below a threshold necessitating the implementation of load restrictions. Currently, two of the timber elements have load carrying capacities that are less than the required load capacity, and many other timber elements have load carrying capacities only slightly above the required capacity. The town has posted two signs at the bridge to caution users: "Passenger vehicles and light trucks only," and "No tour buses beyond this point."

In addition to the current deficiencies in the structural integrity of the bridge, there are functional and safety concerns that need to be addressed. These concerns include substandard curbs and bridge railings, substandard guardrails and associated end treatments and transitions, substandard sidewalk widths that do not meet accessibility requirements and substandard pedestrian railings.

The bascule portion of the bridge does not operate reliably and the operating equipment does not meet standards for safety and maintainability. Due to a design flaw in the 1980s reconstruction, the current navigation opening fails to satisfy US Coast Guard (USCG) permit requirements. The narrow clearance and alignment of the opening with respect to the existing channel hamper navigation.

1.1.1 Bridge Characteristics

The Mitchell River Bridge currently has a clear roadway width of 24 feet and carries one lane of traffic in each direction. The bridge includes sidewalks on each side of the roadway behind timber curbs, with timber bridge railings at the back of sidewalk. The sidewalks range in width from over 2 feet to over 5 feet wide.

The superstructure includes a 3 x 8-inch sawn lumber plank timber wearing surface with the planks oriented at 60 degrees to the roadway centerline extending the width of the roadway. The timber wearing surface is supported on and nailed to 4 x 8-inch sawn lumber plank timber structural deck, with the planks oriented perpendicular to the roadway centerline extending the full width of the bridge. The timber deck is supported on 6 x 16-inch sawn lumber stringers at 15.5 inches on center. The timber curbs consist of 8 x 8-inch sawn lumber members elevated on top of 6 x 8-inch spacers at 6 feet on center. The timber bridge railing consists of 8 x 8-inch posts, 6 x 6-inch top rails, 10 x 5-inch intermediate rails and 6 x 4-inch bottom rails and curbs.

The substructure at the ends of the bridge consists of concrete abutments supported on timber piles. The abutments include integral concrete wing walls (retaining walls) that extend along the approach roadway at the back of sidewalk that retain the roadway embankment. The substructure over the waterway consists of pile bents with timber piles and 16 x 14-inch sawn lumber caps and 6 x 12-inch sawn lumber lateral and longitudinal timber bracing members.

The bascule span provides approximately 19 feet of horizontal clearance between fenders and approximately 7 feet of vertical clearance above mean high water with the bascule leaf in the lowered position. The pivot for the bascule leaf is on the west side of the navigation channel. The bascule leaf is approximately 23 feet from pivot to tip. It rotates to a maximum angle of approximately 75 degrees from the horizontal position in the fully raised position. With the bascule leaf in the fully raised position, the bascule leaf overhangs the west fender and provides unlimited vertical clearance for a width of approximately 15 feet between leaf tip and east fender. The timber stringers for the bascule leaf are located between the timber stringers of the approach spans.

In order to reduce the loads on the operating machinery, the bascule leaf is balanced with a counterweight hung from the underside of an extension of bascule leaf timber stringers that extends under the approach span deck a length of approximately 9 feet from the pivot. The counterweight consists of a galvanized steel box filled with concrete and steel ballast. The bascule span is operated by a pair of electric winches, one in each sidewalk on the approach spans, west of the bascule span. Each winch draws in and pays out a five-eighths inch wire operating rope attached to a pulley system for additional mechanical advantage. An electrical control cabinet is located on the north sidewalk behind the winch. Traffic is controlled during bridge operations using electrically operated, horizontally pivoting warning gates and post mounted traffic signals along the roadway approaching the bridge.

1.2 Mitchell River Crossing History

There have been three drawbridges constructed at this location since the mid-19th century. While the configuration of the crossing has changed (length, width, and draw section) through the various reconstructions, each version was constructed using primarily timber materials.

The known history of the bridge is as follows:

- The original bridge was constructed in 1858 or 1871 (historical records are unclear) and included a timber double-leaf bascule span and timber approach spans that were significantly longer than the present bridge. Many of these approach spans were filled in on both ends of the bridge behind new concrete retaining walls in 1907.

- The bridge was completely replaced in 1925 with a shorter twelve-span timber bridge with a single-leaf timber bascule span. The overall width of the 1925 bridge was approximately 15 feet. The bridge included an all timber superstructure with steel pipe railings on both sides and all timber substructure and foundations except for concrete abutments.
- In 1949, the bridge was widened to the north to provide 24 feet of clear roadway width and 3-foot raised sidewalks on both sides with an overall width of 30 feet. During the widening, one pile bent was removed and steel beams were installed in two of the spans to support the timber superstructure including an intermediate steel hanger beam where the removed bent was previously located. The steel beams were supported on two new pile bents. The steel pipe railings were relocated to the back of the new raised sidewalks. Additional piles were added to supplement the existing piles for the widened configuration. The widened bridge included an all timber superstructure except for the steel framing installed in two of the spans and all timber substructure and foundations except for concrete abutments.
- In 1980, the bridge superstructure was completely replaced to its current configuration retaining only some of the timber piles and both concrete abutments. In the new configuration, wider sidewalks were provided in all but the first, last, and bascule spans and the sidewalks were placed at deck level behind timber curbs. The pivot for the bascule span was relocated to the opposite side of the channel and a new pile bent was constructed to support the bascule, while the existing pile bent that had supported the previous bascule was removed. Additional piles were added to supplement the existing piles and all the timber pile caps and timber bracing were replaced. The steel framing added in 1949 was removed and another pile bent was reconstructed.
- Periodic minor repairs to the bridge have been performed since the bridge was reconstructed in 1980 including replacement of portions of the timber wearing surface, replacement of the lifting beam, installation of plastic wrap on some of the timber piles, and other miscellaneous minor repairs. Ongoing maintenance is required on the bascule span as a result of the poor alignment caused by the expansion and contraction of the wood and the outdated operating systems.
- The timber piles throughout the bridge are of different ages including some piles from the original 1925 construction, some from the 1949 widening, and some from the 1980 reconstruction. The intermediate pile bents include a total of 128 timber piles still being used to support the bridge of which an estimated 30 piles were added in 1949 and 31 piles added in 1980. The other 67 piles appear to be from the original 1925 construction. The piles supporting the abutments are completely buried within the approach embankment rip rap and thus are not accessible for visual inspection.

1.3 Project Development & National Register Eligibility Overview

The Mitchell River Bridge Replacement Project will be funded in part through the Federal Aid Highway Program. The project, therefore, is a federal undertaking that is subject to review under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended. The regulations governing Section 106 [36 CFR 800] require Federal agencies, in this case the FHWA, to identify historic properties that may be affected by an undertaking, assess the effects that the undertaking may cause, and "seek ways to avoid, minimize, or mitigate any adverse effects on historic properties." The regulations also require the federal agency to consult with other parties that may have an interest in the effects of the undertaking on historic properties, including the federal Advisory Council on Historic Preservation (ACHP), the State Historic Preservation Officer (SHPO), federally recognized Indian tribes, local governments, and the public. The regulations [36 CFR 800.16(l)(1)] define a historic property as any "district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP)."

Project development began in the summer of 2009, starting with early coordination with the Massachusetts State Historic Preservation Officer (SHPO), the Chatham Board of Selectmen (BOS), and the Chatham Historical Commission (CHC) in compliance with MassDOT's (formerly MassHighway) 2006 Project Development and Design Guide. MassDOT began the design process under a determination from the SHPO that the existing 30-year old bridge was not eligible for listing on the NRHP. The SHPO had made this determination in a letter dated February 6, 1981 (in response to a Massachusetts Department of Public Works–MA DPW, now MassDOT–investigation of potentially National Register (NR) eligible bridges, statewide) and again in a letter dated July 16, 1985 (in response to MA DPW investigation into potentially NR eligible movable bridges, statewide). All correspondence is included in Appendix I.

Following MassDOT's announcement of its intention to replace the bridge, the CHC and an *ad hoc* historic preservation advocacy group known as the Friends of the Mitchell River Wooden Drawbridge (Friends) requested the SHPO to reconsider the earlier decision regarding the bridge's ineligibility for the NRHP. The SHPO reaffirmed the earlier position that the bridge is not eligible for listing in the NRHP in two letters dated January 12, 2010 and February 26, 2010 in response to requests from the CHC and the Friends.

The ACHP, the agency that advises other federal agencies on national historic preservation policy, subsequently suggested in a letter dated May 24, 2010, that FHWA submit a formal request for a National Register determination of eligibility to the Keeper of the NRHP (the Keeper) to resolve the dispute regarding the bridge's NR eligibility. The SHPO once again reaffirmed its determination that the Mitchell River Bridge is not eligible for listing in the NRHP in a letter to FHWA dated July 7, 2010.

FHWA submitted documentation supporting its finding that the bridge is not eligible for listing in the National Register to the Keeper in a letter dated August 31, 2010. The Keeper, however, formally determined that the Mitchell River Bridge is eligible for individual listing in the National Register in a notification dated October 1, 2010, overturning both FHWA's and the SHPO's earlier determinations that the bridge was not eligible for listing. The Keeper determined that the bridge was eligible for the NRHP under Criterion A for its association with local transportation history and under Criterion C as a rare surviving example of a structure embodying the distinctive characteristics of a once-common method of construction.

Subsequently, FHWA and MassDOT determined that demolishing the bridge will result in an Adverse Effect under Section 106, as defined by the Code of Federal Regulations, 36 CFR 800.5(a)(1). MassDOT paused its project development process while nine (9) conceptual alternatives were developed for consideration as part of the Section 106 consultation process. Seven (7) were build alternatives, one (1) was the rehabilitation alternative, and one (1) was the no-build alternative. A *Bridge Repair/Rehabilitation Feasibility Study,* which evaluated the rehabilitation and no-build alternatives, was completed in February 2011 and a *Bridge Alternatives Evaluation and Life Cycle Cost Comparison*, which included an analysis of the additional seven build alternatives, was completed in April 2011. Lastly, an independent review of the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* was completed in May 2011. All completed reports are provided in the appendices, and a detailed description of the conceptual alternatives is provided in Chapter 3.

FHWA identified interested consulting parties and held the first Section 106 consulting parties meeting on January 25, 2011. The *Final Repair/Rehabilitation Report* and *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* were submitted to the consulting parties in advance of the second Section 106 consulting parties meeting held on May 17, 2011. A third consulting parties meeting was held by conference call on January 4, 2012.

FHWA prepared a Section 106 Memorandum of Agreement (MOA) to stipulate measures that it would take to mitigate the adverse effect that would be caused by removal of the NR-eligible Mitchell River Bridge. Those measures include FHWA's commitment to ensure that MassDOT will design and construct a context sensitive new bridge to replace the existing bridge, photo-documentation of the existing bridge before its removal, and further consultation regarding aesthetic details of the replacement bridge (Appendix J). The SHPO signed the MOA on April 17, 2012, and the ACHP signed on May 14, 2012. A fully executed MOA is now in effect for this undertaking and the Section 106 process is complete, pending completion of previously noted mitigation measures.

1.4 Accelerated Bridge Program

The Accelerated Bridge Program (ABP) was implemented in 2008 to repair, replace or rehabilitate structurally deficient bridges throughout the Commonwealth of Massachusetts. The goal of the Accelerated Bridge Program is to reduce the number of structurally deficient bridges in the Commonwealth over an 8-year time frame ending in Federal Fiscal Year 2016. Under this program, progress is tracked by the Accelerated Bridge Program Oversight Council, which is charged with monitoring the progress of the implementing agencies and keeping the public informed about the results. The replacement of the Mitchell River Bridge is programmed for funding under the ABP.

1.5 Project Cost, Programming, and Funding Sources

Chapter 233 of the Acts of 2008 established the financing for the ABP. Sections 2 and 2A of this legislation provides nearly $3 billion in funding to be used to improve the condition of bridges in the Commonwealth of Massachusetts. As noted in Sections 7 and 8 of the legislation, $1.1 billion is funded through Federal Grant Anticipation Notes (GANs) and almost $1.9 billion is funded through Commonwealth of Massachusetts Special Obligation Bonds (SOBs). All funding for the Mitchell River Bridge project would come from these two sources.

The Mitchell River Bridge is currently programmed for approximately $12 million under the ABP. FHWA is participating by funding approximately 80 percent of the construction cost with the Commonwealth funding the remaining amount. Upon completion of the project, the Town of Chatham, as owners of the bridge, will be responsible for all future maintenance of the bridge.

Chapter 2 Purpose and Need

2.1 Project Purpose

The purpose of the project is to remedy the bridge's structural deficiencies and functional obsolescence, while keeping with the context of the surrounding area and accommodating all existing and future uses of the bridge.

2.2 Project Need

The project is needed to address both structural deficiencies and functionally obsolete features of the current bridge. Factors which contribute to the project need include:

- The current Sufficiency Rating of the bridge is 45.9; bridges with ratings less than 50 and classified as "structurally deficient" are eligible for federal replacement funds.
- The National Bridge Inspection Standard (NBIS) Condition Rating in 2010 rated the substructure at a 4 (or Poor), which classifies the bridge as "structurally deficient". The rated condition of the other critical bridge elements was as follows: deck was rated 5; superstructure was rated 6; and channel was rated 4.The design live load for the existing bridge is below current American Association of State Highway Transportation Officials (AASHTO) live load criteria. Further, two elements of the bridge have load carrying capacities less than the inventory level capacity, but load restriction and weight posting have not been implemented.
- The existing bridge geometry is considered substandard with a Deck Geometry Rating of 2, which is considered "intolerable with a high priority of replacement".
- The sidewalks do not meet current safety and accessibility requirements under the Americans with Disabilities Act (ADA).
- The original design restricts the navigational opening from a potential 19-feet 4-inches width (fender to fender) to 15-feet 2-inches (between lead tip and east fender). Navigation is hampered by both the narrow clearance and the alignment of the opening with respect to the navigational channel of the river.
- Repair and/or rehabilitation of the current structure has been determined to be insufficient to correct either structural or functional deficiencies as concluded by the *Bridge Repair/Rehabilitation Feasibility Study* presented in Appendix D.

2.3 Project Goals

MassDOT has established the following design goals for the Mitchell River Bridge Project:

- Meet current bridge design criteria and standards.
- Provide a context sensitive design that is appropriate for the site and character of the Town of Chatham.
- Improve navigation safety and reliability by providing a wider navigation opening than the existing 19-feet 4-inches width between fenders and 15-feet 2-inches clear width (as limited by the lead tip of the bascule span) with unlimited vertical clearance between east fender and tip of raised bascule leaf.
- Provide a cost effective design with service life of at least 75 years (or similar overall life cycle costs) while minimizing maintenance costs.
- Improve operational safety and reliability, and reduce opening duration, to minimize disruptions to all users.
- Minimize environmental impacts both during construction and throughout the bridge service life.

Figure 3 Existing Wooden Bascule Span over Mitchell River

Chapter 3 Alternatives Evaluation

3.1 Introduction

In October 2010, the Keeper of the National Register determined that the 30-year old Mitchell River Bridge is eligible for individual listing in the NRHP. Following the Keeper's determination, FHWA and MassDOT undertook an extensive alternatives analysis as part of the project development process and the Section 106 process to determine how best to avoid, minimize, or mitigate the adverse effect that would be caused by the removal of the NR-eligible bridge. MassDOT prepared the *Bridge Repair/Rehabilitation Feasibility Study*, dated March 2011, and the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison and Addendum*, dated April 2011 (see Appendix D-F).

The *Bridge Repair/Rehabilitation Feasibility Study* (Appendix D) concluded that maintenance and repair is not a prudent or cost effective alternative when compared to a rehabilitation alternative based on the consequences of maintaining, repairing, or rehabilitating the existing bridge and the scope, cost and life expectancy for each alternative. Furthermore, the same report also determined that a rehabilitation alternative, which would require replacement of the majority of the bridge elements, would still result in functional and safety deficiencies (i.e., narrow roadway and navigation width), would still have a short service life, and would require greater maintenance than a replacement alternative. Therefore, the only prudent alternative is complete replacement of the Mitchell River Bridge. A context sensitive replacement structure will provide a cost effective long term solution that minimizes future maintenance, and adequately meets the project's purpose and need.

The *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* and its addendum presented seven replacement alternatives, described in the next section that met design criteria, provided structures that were sensitive to the surrounding area and resembled the existing structure to varying degrees (Table 1). The replacement alternatives presented in the study and described in this chapter were vetted through the Section 106 process, and five of the original seven alternatives were dismissed due to unsatisfactory ratings in comparison with the design criteria. The two alternatives that were carried forward for evaluation in this EA include the All Timber Replacement with Concrete Bascule Pier Alternative (Alternative 1B) and the Timber Superstructure on Concrete and Steel Substructure Alternative (Alternative 3). Additionally, the No-Build Alternative is presented in this EA for comparison with the Build Alternatives. The following sections and associated appendices provide detailed descriptions of the alternatives analysis prepared for the Mitchell River Bridge.

3.2 Seven Build Alternatives

The *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* evaluated the bridge replacement alternatives that range from all timber to all steel and concrete. In keeping with the design of the existing bridge, all alternatives evaluated are single-leaf bascule moveable bridges, with the same roadway geometry and typical section for each. The major differences between the alternatives evaluated in the report were the choice of materials, the manner of raising and lowering the movable span, the length of each bridge span, and the combination of materials for each element of the bridge. Except for Alternative 1, all alternatives provide a navigable opening of 25 feet. The *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* originally considered only five alternatives for the replacement structure including:

- Alternative 1: A 12-span timber superstructure on a timber substructure with a timber bascule span and a 19-foot clear horizontal channel opening (i.e., all timber replacement);
- Alternative 2: A 10-span timber superstructure on a timber substructure with a steel bascule leaf on concrete bascule pier and a 25-foot clear horizontal channel opening;
- Alternative 3: A 6-span timber superstructure on a concrete and steel substructure with a steel bascule leaf on a concrete bascule pier and a 25-foot clear horizontal channel opening;
- Alternative 4: A 6-span timber deck and steel stringer superstructure on a concrete and steel substructure with a steel bascule leaf on a concrete bascule pier with 25-foot clear horizontal channel opening; and,
- Alternative 5: A 6-span concrete deck and beam superstructure on a concrete and steel substructure with a steel bascule leaf on a concrete bascule pier with 25-foot clear horizontal channel opening (i.e., all steel and concrete replacement).

Alternative 1 was further refined into two sub-alternatives based on conversations between FHWA, MassDOT, and other interested parties:

- Alternative 1A: A 12-span all timber replacement with 25-foot clear horizontal channel opening with overhead cable lift and;
- Alternative 1B: A 12-span all timber replacement with 25-foot clear horizontal channel opening and concrete bascule pier with overhead cable lift.

All of these alternatives, except Alternative 1, satisfy the Purpose and Need of the project. All alternatives equally accommodate improvements in roadway safety function and safety, including additional roadway and sidewalk width and safety features.

MassDOT evaluated the alternatives by considering design criteria and other factors established by FHWA and MassDOT including roadway function and safety; context sensitivity; navigation function and safety; initial construction and life cycle costs; maintenance and reliability; property impacts; disruptions to users; and environmental impacts. The results of the evaluation are summarized in Table 1.

<u>Roadway Function and Safety</u>: Alternative meets current design criteria and standards for functionality and safety for all users; traffic railings that separate the sidewalks from the roadway for protection of pedestrians from vehicular traffic; sidewalks meet accessibility and safety standards; loading capacity is adequate.

<u>Context Sensitivity</u>: Alternative is context sensitive to the site and character of the surrounding area.

<u>Navigational Function and Safety</u>: Alternative improves navigation safety and reliability by promoting optimum navigable clearances for regular commercial and recreational users of Mitchell River and Stage Harbor and as a safe-haven during storm events.

<u>Life Cycle Costs</u>: Alternative provides a cost effective design striving to meet a service life of at least 75 years with low maintenance costs.

<u>Maintenance and Reliability</u>: Alternative minimizes future maintenance, improves operational safety and reliability, and reduces operation duration while minimizing disruption to all users.

<u>Environmental Resources</u>: Alternative considers initial and future impacts to environmental resources.

3.2.1 Alternative 1: Timber Superstructure on Timber Substructure with Timber Bascule Span (i.e. All Timber Replacement) with a 19 foot-4 inch Wide Navigational Channel

Alternative 1 is an all timber bridge structure replacement most similar to the existing bridge with modifications to improve safety and reliability of the bascule span. An all timber replacement would include timber superstructure (wearing surface structural deck, beams, and traffic and pedestrian railings) and timber substructure (piles, and bent caps, bracing, sheave poles and fender system). While this “in-kind-replacement” alternative provides a context sensitive design, it is deficient in navigational function and safety, environmental resource impacts, and long term maintenance costs.

Concerning navigational function and safety, the approximately 19-foot navigational opening provided by this alternative (the same as the existing opening) is insufficient to allow boats to safely pass through without the risk of boat damage or personal injury. This position was strongly supported at a Section 106 Consultation Meeting by the owner of Pease Boat Works and by the U.S. Coast Guard (USCG). Further, a timber bascule span is more likely to become unreliable due to misalignment and decay. Timber is a natural product that is subject to expansion and contraction due to the moisture content of the wood. The inherent flexibility and moisture content of timber structures increases the likelihood of the bridge component connections becoming loose over time.

The use of timber piles in a marine tidal environment is also a serious concern to MassDOT. Experience with timber in marine environments throughout the United States has consistently demonstrated that timber, subject to decay and damage from marine borers, has a relatively short service life (20 to 30 years) compared to other materials such as concrete and steel. Section 3.3.3 further outlines the details of the deficiencies posed by construction materials associated with Alternative 1.

MassDOT has a 75 year goal for the expected lifespan for bridges constructed under their ABP. With an expected 20 to 30 year service life, an all-timber bridge would fall far short of that goal. By comparison, a concrete and steel substructure has an expected life span of over 75 years. As a result, a timber substructure may need to be replaced three times over the same life span as a concrete and steel substructure. This repeated replacement of the substructure and superstructure (the substructure cannot be replaced without the removal and replacement of the superstructure) would be costly to the Town of Chatham who would be responsible for all future maintenance of the bridge, disruptive to the traveling public, and result in repeated disruptions to the marine environment. Repeated disruptions to the marine environment is particularly critical because of the sensitive marine resources within the project area, such as salt marsh, anadromous fish species habitat (Winter Flounder), and designated shellfish growing areas. For the reasons stated above, Alternative 1 has been dismissed.

3.2.2 Alternative 1A: Timber Superstructure on Timber Substructure with Timber Bascule Span (i.e. All Timber Replacement) with 25-foot Wide Navigation Channel

Alternative 1A is similar to Alternative 1 with the exception that the width of the bascule span opening is increased from 19 feet-4 inches to 25 feet. An all-timber structure would provide a context sensitive design and the increase in the width of the span opening would be safer for boaters, alleviating the safety concerns of boaters and the USCG. However, the all timber design would retain all the reliability, longevity, and environmental impact disadvantages of Alternative 1. Therefore, for the reasons described in Alternative 1 (long term costs to the Town of Chatham, disruptions in traffic during bridge reconstruction periods, and environmental impacts during repeated bridge reconstructions), Alternative 1A has been dismissed.

3.2.3 Alternative 1B: Timber Superstructure on Timber Substructure with Timber Bascule Span (i.e. All Timber Replacement) with 25-foot Wide Navigation Channel and Concrete Bascule Pier

Alternative 1B is similar to Alternative 1A with the exception that it includes a concrete bascule pier to enclose the pivoting counterweight. In this alternative, the pivoting counterweight is fully enclosed within a concrete bascule pier that prevents the counterweight from becoming submerged during span lift operation. The submergence in salt water of the counterweight has led to corrosion of the existing steel counterweight box. The design of Alternatives 1 and 1A would also require submergence of the counterweight box.

The (nearly) all-timber bridge structure with a concrete bascule pier enclosing the pivoting counterweight would provide a context sensitive design and result in a longer lasting and more reliable counterweight for the lift span. At 25 feet, Alternative 1B also provides the benefit of a substantially improved span opening width, and the timber substructure mimics the existing bridge materials. In addition, this alternative is strongly supported by a number of consulting parties. For these reasons, Alternative 1B has been carried forward for further analysis.

3.2.4 Alternative 2: Timber Superstructure on Timber Substructure with Steel Bascule Leaf on Concrete Bascule Pier

Alternative 2 is similar to Alternative 1B with the exception that it includes a steel bascule leaf on concrete bascule pier. In this alternative, the timber wearing surface of the bascule leaf is supported on and bolted to steel open-grid flooring panels. See Appendix E for a detailed description of Alternative 2.

Use of steel flooring panels within the bascule leaf (rather than timber planks) would result in more reliable operation of the leaf span because the use of steel panels reduces the possibility of flexing and misalignment of the bascule leaf.

While a (nearly) all timber bridge structure with steel bascule leaf and concrete bascule pier would provide a context sensitive design and result in more long lasting and reliable operation of the leaf span, the timber substructure design would retain all the reliability, longevity, and environmental impact disadvantages of Alternative 1, 1A, and 1B. Therefore, for the same reasons as in Alternative 1 (long term costs to the Town of Chatham, disruption to traffic during bridge reconstruction periods, and environmental impacts during repeated bridge reconstructions), Alternative 2 has been dismissed.

3.2.5 Alternative 3: Timber Superstructure on Concrete and Steel Substructure with Steel Bascule Leaf on Concrete Bascule Pier

Alternative 3 is similar to Alternative 2 with the exception that it includes a concrete and steel substructure with a steel-framed bascule leaf on a concrete bascule pier. This alternative generally consists of an all timber superstructure (including the wearing surface, structural deck, beams, diaphragms, sidewalks, and traffic and pedestrian railings) with the exception of the bascule leaf frame.

As in Alternative 2, the bascule leaf is supported on and bolted to steel open-grid flooring panels. The substructure of Alternative 3 consists of pile bent units constructed with steel piles and concrete caps. Steel piles with concrete caps are a more appropriate substructure type for use in a marine environment. As noted in Alternative 1, experience with timber in marine environments throughout the United States has consistently demonstrated that timber has a relatively short service life (20 to 30 years) compared to other materials such as concrete and steel. Further, the limited foundation capacity of timber piles reduces span lengths, resulting in shorter span lengths and greater number of pile bents. Specifically, the concrete and steel substructure of Alternatives 3, 4, and 5 are six-span bridges whereas Alternatives 1, 1A, 1B, and 2, having a timber substructure, require 10- to 12-spans. Having a bridge with fewer spans has several benefits such as less disruption to the marine environment during construction and fewer obstructions in the river for fish, wildlife and recreational boaters.

Figure 4 Rendering of Alt 2, 3, & 4 - Street View Looking East

Figure 5 Rendering of Alt 2, 3, & 4 - Sidewalk View Looking West

Alternative 3 provides a fair balance of a context-sensitive timber superstructure with a long lasting concrete and steel substructure. The overall bridge design would fit in well with the existing rural coastal community in Chatham. At 25 feet, Alternative 3 also provides the benefit of a substantially improved span opening width with reliable operating machinery that will benefit the boating community in Chatham. Further, the concrete and steel substructure of Alternative 3 will provide an expected service life of over 75 years. This is a substantial benefit to the Town of Chatham, who is responsible for all future maintenance and repair of the bridge after the replacement bridge is constructed. Additional environmental benefits are achieved through the reduced need to work in the marine environment for future substructure repair or replacement. For these reasons Alternative 3 has been selected to be the preferred alternative.

3.2.6 Alternative 4: Timber Deck and Steel Stringer Superstructure on Concrete and Steel Substructure with Steel Bascule Leaf on Concrete Bascule Pier

Alternative 4 is similar to Alternative 3 with the exception that it includes additional steel elements in the superstructure. In this alternative, the approach span timber deck is supported on steel stringers and diaphragms instead of timber beams and diaphragms. These additional steel elements are hidden under the timber decking and sidewalk and not visible from ground level (Figures 4 & 5).

Alternative 4 provides the same benefits as Alternative 3 over Alternatives 1, 1A, 1B, and 2 related to the use of a concrete and steel substructure (longevity, reduced maintenance costs, and reduced long term environmental impacts). Alternative 4 provides more steel elements in the superstructure than Alternative 3, further reducing future maintenance costs to the Town of Chatham.

Similar to Alternative 3, Alternative 4 provides a fair balance of a context-sensitive, mostly-timber superstructure with a long lasting concrete and steel substructure (perhaps slightly less context-sensitive than Alternative 3 due to the additional steel elements in the superstructure). The overall bridge design would fit in well with the existing rural coastal community in Chatham. At 25 feet, Alternative 4 also provides the benefit of a substantially improved span opening width with reliable operating machinery that will benefit the boating community in Chatham. Further, the concrete and steel substructure of Alternative 4 will provide an expected service life of over 75 years. This is a substantial benefit to the Town of Chatham, who is responsible for all future maintenance and repair of the bridge after the replacement bridge is constructed. Additional environmental benefits are achieved through the reduced need to work in the marine environment for future substructure repair or replacement. Alternative 4 was dismissed because the additional steel elements in the superstructure make it less context sensitive than Alternative 3.

3.2.7 Alternative 5: Concrete Deck and Beam Superstructure on Concrete and Steel Substructure with Steel Bascule Leaf on Concrete Bascule Pier

Alternative 5 is similar to Alternative 4 with the exception that it includes additional concrete elements in the superstructure. In this alternative, the approach span contains a concrete roadway deck supported on concrete deck beams. The concrete roadway deck would include a stamped concrete pattern and color admixtures that simulate the look of timber (Figures 6 & 7).

Of the alternatives evaluated, Alternative 5 provides the least amount of timber elements, being limited to sidewalk, traffic and pedestrian railings, and fascia boards.

Alternative 5 provides the same benefits as Alternative 3 and 4 over Alternatives 1, 1A, 1B, and 2 related to the use of a concrete and steel substructure (longevity, reduced maintenance costs, and reduced long term environmental impacts). With the inclusion of a concrete roadway deck and support beams, Alternative 5 would be the longest lasting alternative, requiring the least future maintenance costs to the Town of Chatham.

Having the least amount of timber elements, Alternative 5 is considered poor for context-sensitivity. Of the alternatives with a concrete and steel substructure (Alternative 3, 4, and 5), Alternative 5 is the least context-sensitive to the existing rural coastal community in Chatham.

At 25 feet, Alternative 5 provides the benefit of a substantially improved span opening width and reliable operating machinery that will benefit the boating community in Chatham. Further, the concrete and steel substructure of Alternative 5 will provide an expected service life of over

Figure 6 Rendering of Alt 5 - Street View Looking East

Figure 7 Rendering of Alt 5 - Sidewalk View Looking West

75 years. This is a substantial benefit to the Town of Chatham who is responsible for all future maintenance and repair of the bridge after the replacement bridge is constructed. Additional environmental benefits are achieved through the reduced need to work in the marine environment for future substructure repair or replacement. Alternative 5 was dismissed because of the concrete elements throughout the structure, making it poor in context sensitivity.

3.2.8 Conclusion

As shown in Table 1, each alternative was rated on how well it met the design criteria. An alternative could be rated as good, satisfactory, fair, or poor in each design criteria category.

A context sensitive solution is highly desired by the FHWA, MassDOT, and the Section 106 consulting parties. Alternatives 1 and 1A are all timber solutions that would resemble the existing bridge. Alternative 1B is an all timber solution that would resemble the existing bridge with the exception of the introduction of a concrete bascule pier to enclose the pivoting counterweight. The other alternatives contain timber in different bridge elements and other features. A review of how well the alternatives meet the need to provide a context sensitive solution is provided in Table 2.

Based on the alternatives evaluation presented in the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* and addendum report, Alternative 5 would provide the best engineering solution for the proposed replacement for the Mitchell River Bridge, but rated poorly for a context sensitive design. Although Alternative 5 is the best alternative in strictly engineering terms, FHWA and MassDOT recognize that this alternative would not provide a context sensitive replacement of the NR-eligible bridge and was therefore dismissed. In contrast, some of the Section 106 consulting parties expressed strong support for Alternative 1B – all timber alternative with the exception of a concrete bascule pier. As a compromise between the all-timber design of Alternative 1B and the steel-and-concrete design of Alternative 5, MassDOT has identified Alternative 3 as its Preferred Alternative, which consists of a timber superstructure supported on concrete-filled steel pilings, with a steel-framed bascule leaf on a concrete bascule pier. The Chatham Board of Selectmen also expressed support for Alternative 3 as it provides what they believe to be the most prudent balance of aesthetics, functional and financial benefits for the Town of Chatham (Appendix I). Therefore, Alternative 1B and Alternative 3 were advanced for consideration in this EA.

Table 1: RESULTS OF DESIGN CRITERIA EVALUATION[1]

Alt.	Primary Project Design Criteria Categories						
	Roadway Function & Safety	Context Sensitive	Navigation Function & Safety	Initial Construction Cost	Life Cycle Costs	Maintenance & Service Life	Environment
1	Good	Good	Poor	Good	Fair	Poor	Poor
1A	Good	Good	Fair	Good	Fair	Poor	Poor
1B	Good	Satisfactory	Satisfactory	Good	Fair	Fair	Fair
2	Good	Satisfactory	Good	Fair	Poor	Fair	Fair
3	Good	Fair	Good	Fair	Satisfactory	Satisfactory	Satisfactory
4	Good	Fair	Good	Fair	Satisfactory	Satisfactory	Satisfactory
5	Good	Poor	Good	Satisfactory	Good	Good	Satisfactory

Notes:

1. Good – Best meets the intent of the criterion compared among all alternatives considered.
   Satisfactory – Generally meets the intent of the criterion, with some exception, relative to all alternatives considered.
   Fair – Meets some of the intent of the criterion, but not as well as the more highly rated alternatives.
   Poor – Essentially does not meet the intent of the criterion or meets the criterion at a low threshold as compared to the more highly rated alternatives.
   For more detailed explanation of the design criteria, as well as the full evaluation, see the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* in the Appendix E.

Table 2: CONTEXT SENSITIVE SOLUTIONS - SUMMARY OF BRIDGE ELEMENTS with TIMBER

Alt.	Approach Substructure	Approach Beams	Deck	Sidewalks	Pedestrian Railings	Traffic Railings	Bascule Span
1	✓	✓	✓	✓	✓	✓ (5)	✓
1A	✓	✓	✓	✓	✓	✓ (5)	✓
1B	✓	✓	✓	✓	✓	✓ (5)	✓ (6)
2	✓	✓	✓	✓	✓	✓ (5)	× (4)
3	×	✓ (5)	✓	✓	✓	✓ (5)	× (4)
4	×	× (1)	✓	✓	✓	✓ (5)	× (4)
5	×	× (2)	× (3)	✓	✓	✓ (5)	× (4)

Notes:

1. Steel stringers are obscured by the timber sidewalks.
2. Concrete deck beams are obscured by the timber sidewalks.
3. Concrete deck includes a stamped concrete pattern and color admixtures to simulate a timber deck.
4. Concrete bascule pier contains stone facing and steel bascule leaf is obscured by the timber sidewalk.
5. Denoted timber members are glue laminated (i.e. glulam) timber in lieu of sawn lumber.
6. Timber bascule leaf is supported concrete bascule pier which contains stone facing.

3.3 EA Alternatives

As described in the previous section, as a result of the full alternatives evaluation during the Section 106 process, two of the proposed alternatives best fit the stated design criteria and are being evaluated in the EA: Alternative 1B and Alternative 3. Alternative 1B, an all-wood replacement structure, was found to satisfy the minimum design criteria. Alternative 3 was also found to satisfy the minimum design criteria; however, Alternative 3 would provide a bridge with greater reliability and would require less frequent maintenance, as well as have a lower overall life cycle cost. The following describes the alternatives under evaluation in more detail. In addition, the alternatives under consideration include the No-Build Alternative for comparison.

3.3.1 No-Build Alternative

The No-Build Alternative is required to be evaluated under NEPA as a baseline for comparing the impacts of the build alternatives. Under the No-Build Alternative, the existing bridge would remain in the current location and the configuration of the bridge would remain unchanged. The current bridge is a two-lane local road with two-way traffic. It is classified as an Urban Collector with an average daily traffic (ADT) of 866 vehicles (based on a 2010 count made available by Andrew Koziol of the Cape Cod Commission). The bridge is approximately 192 feet long and consists of a twelve-span timber trestle structure including a single-leaf timber bascule type lift span.

Under the No-Build Alternative, maintenance of the bridge would continue until it could no longer safely support live load traffic or until the bascule span could no longer function. At that time, the bridge would be permanently closed with the bascule span in the full open position to allow the unconstrained flow of boat traffic through the channel. No longer able to cross the Mitchell River Bridge, vehicular traffic would be detoured onto Stage Harbor Road and then to Main Street, a distance of approximately 3 miles. Given the traffic count numbers and that the detour would be along routes of similar classification, it is anticipated that the detour route would have the capacity to handle the added traffic volumes. Pedestrian and bike traffic would also be required to use the detour route. Permanent closure of the bridge would limit access to recreational users of the bridge and areas adjacent to the bridge due to concerns over the safety of the structure. Over time as the bridge continued to deteriorate, the Town of Chatham would be responsible for the removal of the bridge if it became a hazard.

Furthermore, due to a design error in the 1980 bridge replacement, the bascule span of the existing bridge does not extend into a full upright position. The operating machinery is also unreliable. In the event of a bridge closure, the bascule span of the existing bridge would need to be removed to ensure safe passage of boats. In order to satisfy maritime safety concerns, the USGC might ultimately request that the entire bridge be removed.

The No-Build Alternative does not satisfy the purpose and need of the project as it would neither address the structural deficiencies of the bridge nor the functional obsolescence of the bridge nor accommodate all existing and future users of the bridge. Closure of the bridge would be disruptive to the local community, and residents would lose access to an important community resource.

3.3.2 Build Alternatives

The Build Alternatives evaluated in this EA are bridge replacement alternatives with a bascule-type movable span. Although there are other movable bridge span types (i.e., swing spans, lift spans, and retractable spans), the Keeper's determination has led MassDOT to only evaluate context sensitive designs for the replacement alternatives that satisfy the project's purpose and need while incorporating as much timber into the design as practicable.

3.3.2.1 Common Features of the Build Alternatives

The following section describes the features that the two Build Alternatives share in common.

Noted Historic Features: The Keeper noted that the bridge is "a rare surviving example of a structure embodying the distinctive characteristics of a once-common method of construction," and is "of exceptional significance" as "the last remaining single-leaf wooden drawbridge in Massachusetts (and perhaps the United States)" (Refer to the Keeper's determination of eligibility in Appendix H). Both Build Alternatives incorporate similar elements of the historic structure.

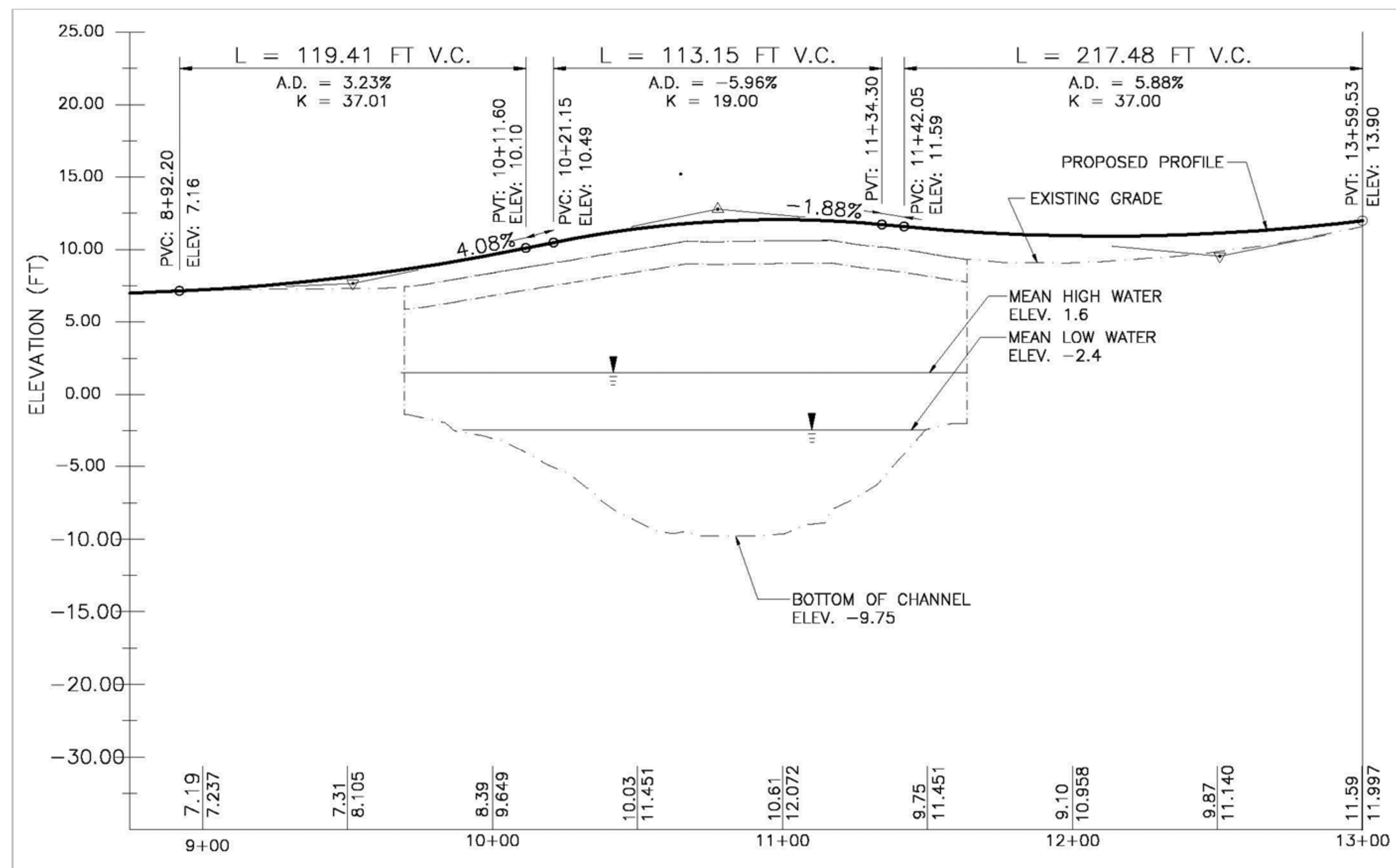

Figure 8 Roadway Profile for Build Alternatives

Typical Section: The proposed bridge typical section for all replacement alternatives is based on a 30 mph design speed. The proposed typical section includes a 26-foot clear roadway width; raised timber sidewalks at least 5 feet in width located on each side of the roadway; crash tested timber traffic railings meeting the requirements of AASHTO and National Cooperative Highway Research Program (NCHRP) 350; and 3.5-foot high timber post and beam pedestrian railings at the back of sidewalk. The bridge would have an overall width of approximately 40 feet (Figure 8). The bridge deck would have a level cross slope for both timber deck alternatives. The 26-foot roadway would accommodate two 11-foot lanes with 2-foot shoulders on each side. Although the shoulder width does not satisfy current MassDOT policies, which require a minimum shoulder width of 4 feet, the 2-foot shoulders were supported by the Chatham Bikeways Committee and other stakeholders as currently there are no bike lanes along the bridge or along the approach to the bridge. The bridge sidewalks would meet ADA accessibility requirements.

The roadway approaches would have the same typical section as the bridge typical section for a distance of 120 feet beyond each end of the bridge to the point where the approach roadway would meet the existing roadway section.

Roadway Geometry: The proposed roadway horizontal alignment and vertical profile would avoid or minimize impacts to adjacent environmental resources (specifically, salt marsh and shellfish growing areas), adjacent structures (fish storage shed on the southwest quadrant), and adjacent right-of-way. The replacement bridge would be on an alignment approximately matching the alignment of the existing bridge (possible because the bridge will be closed during construction and traffic detoured). The roadway vertical profile would be raised in order to maintain the existing clearance between the water surface and the bottom of the bridge over the channel (Figure 9). Because the bascule span length would be increased by 30 percent, the bridge structure depth would also increase, resulting in the need to raise the roadway profile. However, the goal to minimize adjacent impacts restricts the amount that the roadway profile can be raised. The vertical curve lengths would be as recommended by AASHTO for minimum stopping sight distances for the design speed.

Bridge Length and Span Arrangement: The existing bridge is approximately 192 feet long between abutments. The replacement bridge would be approximately the same length, but may vary slightly to accommodate uniformity in the span lengths. The replacement bridge would consist of a multi-span trestle structure with the number of spans varying depending on the material components of the alternative. The Build Alternatives include a single-leaf bascule span over the navigation channel in approximately the same location as the existing navigation channel. Based on discussions with users of the navigational channel, MassDOT has agreed to shift the bascule span 5 feet to the west of its present location to improve navigation.

Traffic Control: Vehicular traffic would be controlled during bridge operations using electrically operated, horizontally pivoting warning gates and post-mounted traffic signals located along the roadway approaches. These traffic controls would be located in approximately the same location as the existing signals and warning gates. A crash-tested, horizontally pivoting barrier gate would be installed on the bridge, east of the navigation channel, to protect users from the drop-off hazard created when the bascule leaf is raised. The 30 mph design speed is the lowest allowed under state guidelines for this type of roadway. To address concerns relative to speeding, the design includes 11 foot travel lanes (instead of 12), and 2 foot shoulders (instead of 4).

Horizontal Clearance: The existing bascule span currently provides just over 19 feet of horizontal clearance between fenders. The bascule leaf is approximately 23 feet from pivot to tip. When it rotates to a maximum angle of approximately 75 degrees from the horizontal position in the fully raised position, the bascule leaf overhangs the west fender and provides unlimited vertical clearance for a width of about 15 feet between leaf tip and the east fender. As such, navigation through the bridge continues to be a challenge and a safety concern for the boating community. Navigation is hampered by both the narrow clearance and the alignment of the opening with respect to the navigational channel of the river. The Build Alternatives would provide approximately 25 feet of horizontal width between fenders, approximately 7 feet of vertical clearance above mean high water with the bascule leaf in the lowered position, and unlimited vertical clearance with the bascule leaf fully raised. The USCG has communicated to MassDOT that they will seek to promote the optimum navigational opening for any replacement structure (Appendix A).

3.3.2.2 All Timber Replacement with Concrete Bascule Pier (Alternative 1B)

Alternative 1B consists of an all timber superstructure (i.e., timber wearing surface, structural deck, beams, diaphragms, traffic railings, pedestrian railings, and lifting beam). The superstructure would be supported on an all timber substructure (i.e., timber piles, bent caps, bracing, sheave poles, and fender system) that closely resembles the existing bridge, but is

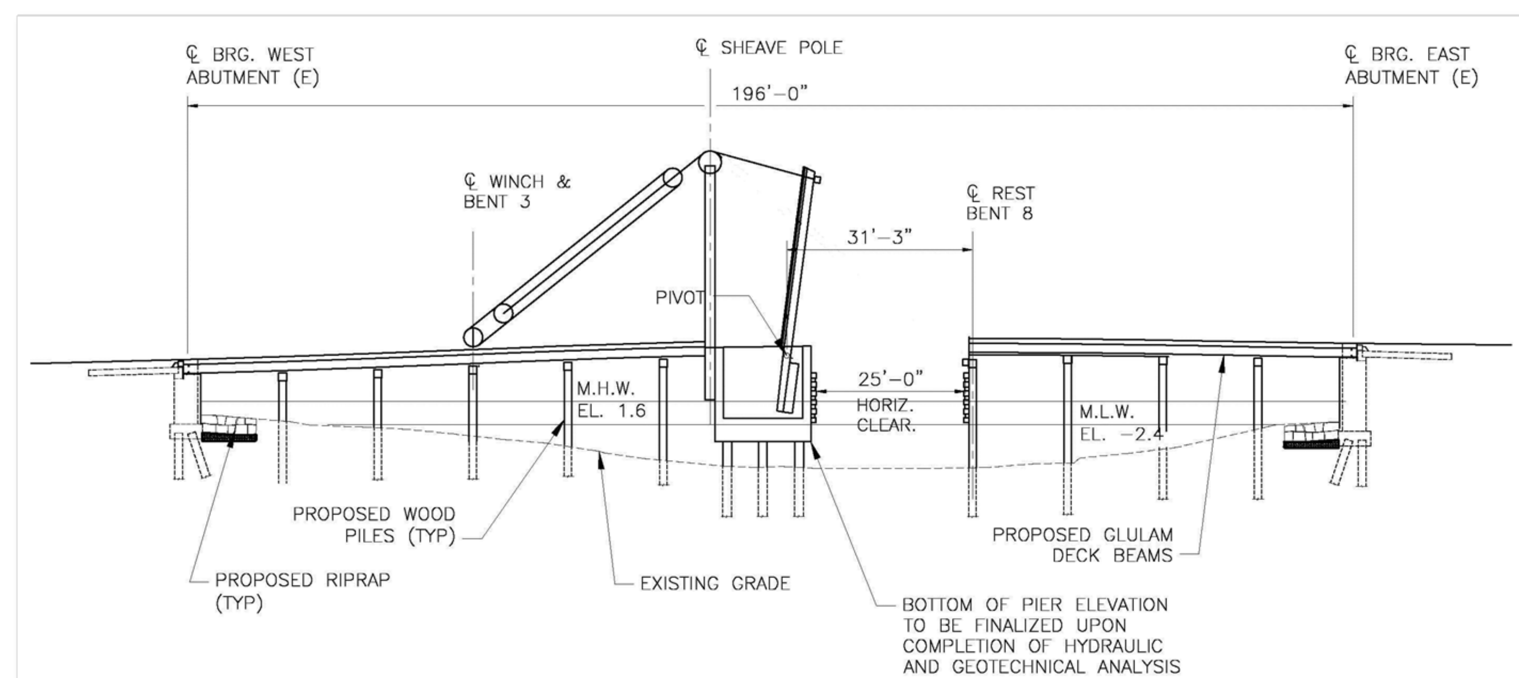

Figure 9 Bascule Profile Alternative 1B (Open Position)

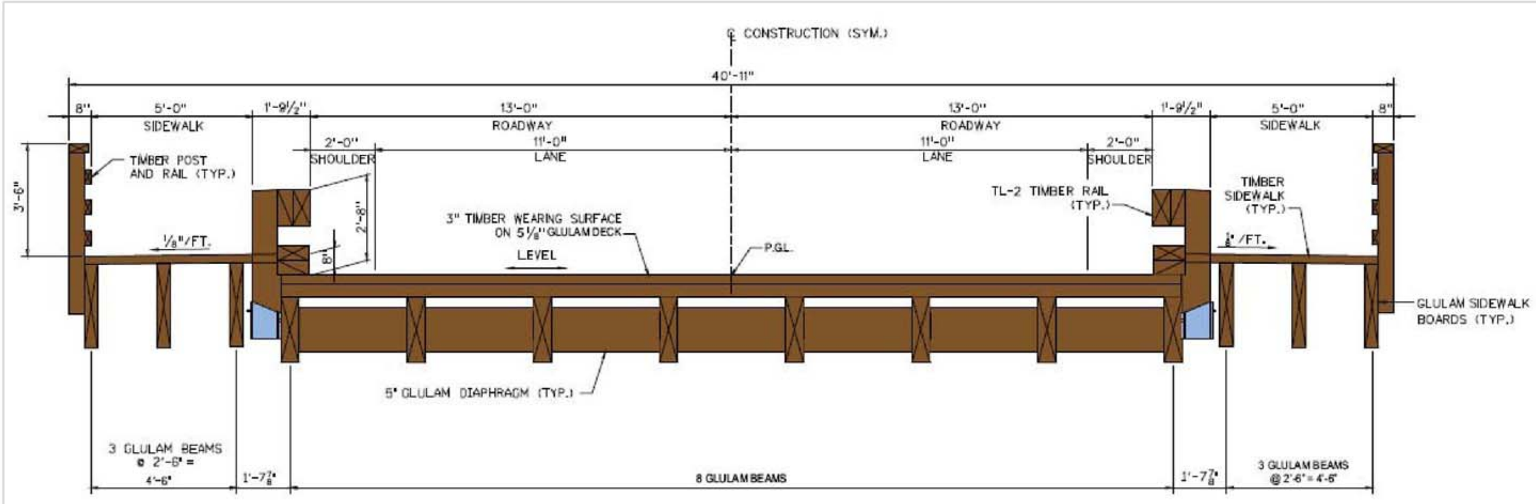

Figure 10 All Timber Approach Span Alternative 1B

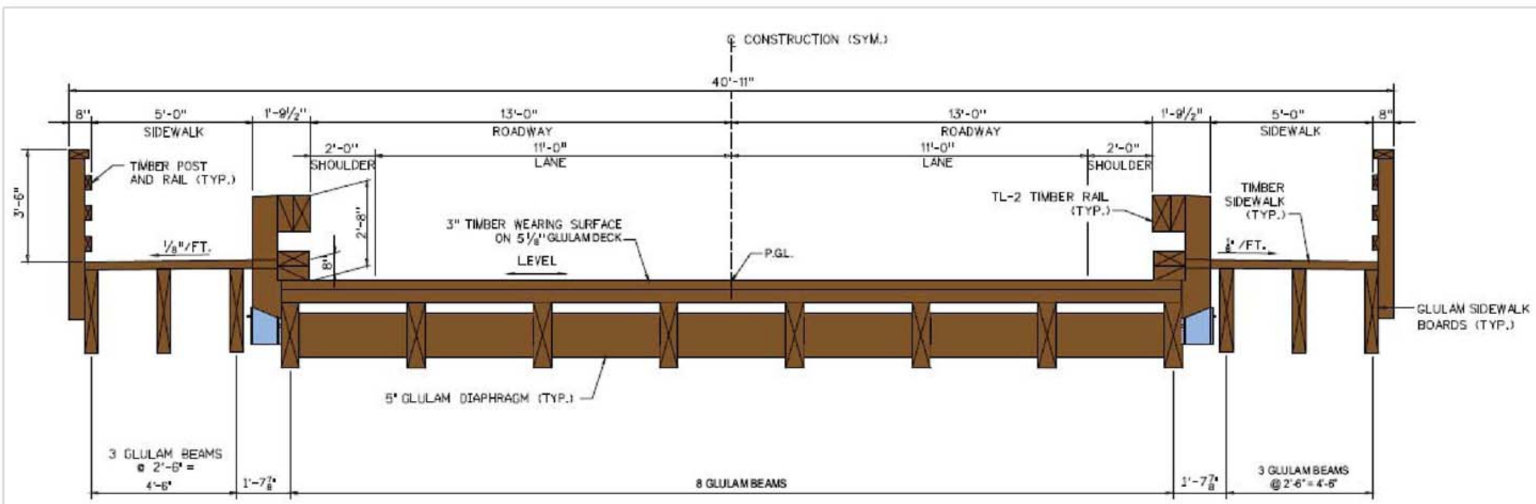

Figure 11 All Timber Bascule Span Alternative 1B

Figure 12 Rendering Alternative 1B

modified to include improvements. More information on the alternative can be found in the *Addendum to the Bridge Alternatives Evaluation and Life Cycle Cost Comparison* (Appendix E).

This alternative consists of an approximately 194-foot long, twelve-span bridge with a single-leaf bascule span over a 25-foot clear horizontal navigation channel. The span arrangement is similar to the existing bridge. Unlike the existing wooden bridge, Alternative 1B would include a concrete bascule pier and rest pier, which would allow the bridge counterweight to rotate while completely in the dry.

The superstructure under this alternative includes a timber wearing surface with the timber planks oriented parallel to the roadway centerline. The timber wearing surface would be supported on and attached to a timber structural deck. The structural deck would be supported on glue-laminated (Glulam) lumber stringers. Crash-tested timber traffic railings, meeting AASHTO and NCHRP 350 requirements, would separate the roadway from the sidewalk. The timber bridge railing may incorporate components from the existing wood railing.

The substructure over the waterway would consist of pile bents with timber piles, caps, and lateral and longitudinal bracing members. The substructure at the ends of the bridge consists of pile-supported concrete abutments. The abutments include integral concrete wing walls (retaining walls) that extend along the approach roadway at the back of sidewalk to retain the roadway embankment. The embankments adjacent to the abutments and retaining walls along the waterway have rubble rip rap slope protection to protect the retaining walls from being undermined by scour forces.

The bascule span channel would provide 25 feet of horizontal width between fenders, approximately 7 feet of vertical clearance above mean high water with the bascule leaf in the lowered position, and unlimited vertical clearance with the bascule leaf fully raised. The pivot for the bascule leaf would be on the west side of the navigation channel. The bascule leaf would be approximately 31 feet from pivot to tip and rotate to completely clear the fender with the bascule leaf fully raised. In order to reduce the loads on the operating machinery, the bascule leaf would be balanced by a 9.5-foot long counterweight that fully clears the water at high tide with the bascule leaf fully raised.

The reinforced concrete bascule pier would be supported on concrete filled driven steel pipe piles. The exterior faces of the bascule pier would include stone facing using materials and details consistent with the local landscape. The fender system would consist of a combination of horizontal and vertical timber members attached to the timber pile bents each side of the navigation channel.

The bascule span would be operated by a pair of electric winches, located outboard of each sidewalk, so as to not impair accessibility, on the approach spans west of the bascule span. Each winch would draw in and pay out wire operating rope attached to a pulley system. The pulley system uses wire rope attached to the ends of a lifting beam under the bascule leaf deck. The wire rope, pulleys, and deflector sheaves would be designed to meet AASHTO requirements and would be significantly larger than the same elements of the existing bridge (i.e., the deflector sheave would be 45 inches in diameter compared to the existing 15 inches). The electrical control cabinet would be located within a timber shed located outboard of the sidewalk, with an architectural style to match adjacent buildings. A more detailed description of the various elements of Alternative 1B is provided in the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison and Addendum* (Appendix E).

3.3.2.3 Timber Superstructure on Concrete and Steel Substructure (Alternative 3)

As described in the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison and Addendum* (Appendix E), the proposed approach spans for Alternative 3 consist of an all timber superstructure with the exception of the bascule span frame. The superstructure would be supported on pile bent substructure units constructed with concrete-filled steel piles and concrete caps. The bascule span superstructure consists of a timber roadway deck and sidewalks on steel framing supported on the concrete bascule pier substructure.

This alternative consists of a 195-foot long, six-span bridge with a single-leaf bascule span over a 25-foot clear horizontal navigation channel. The approach superstructure would include a timber wearing surface with the planks oriented parallel to the roadway centerline. The timber wearing surface is attached to a timber structural deck, which is supported by Glulam lumber stringers. Crash-tested timber traffic railings, meeting AASHTO and NCHRP 350 requirements, separate the roadway from the sidewalk. The timber bridge railing may incorporate components from the existing wood railing.

The proposed substructure over the waterway consists of pile bents with concrete-filled, driven steel pipe piles, and proposed reinforced concrete

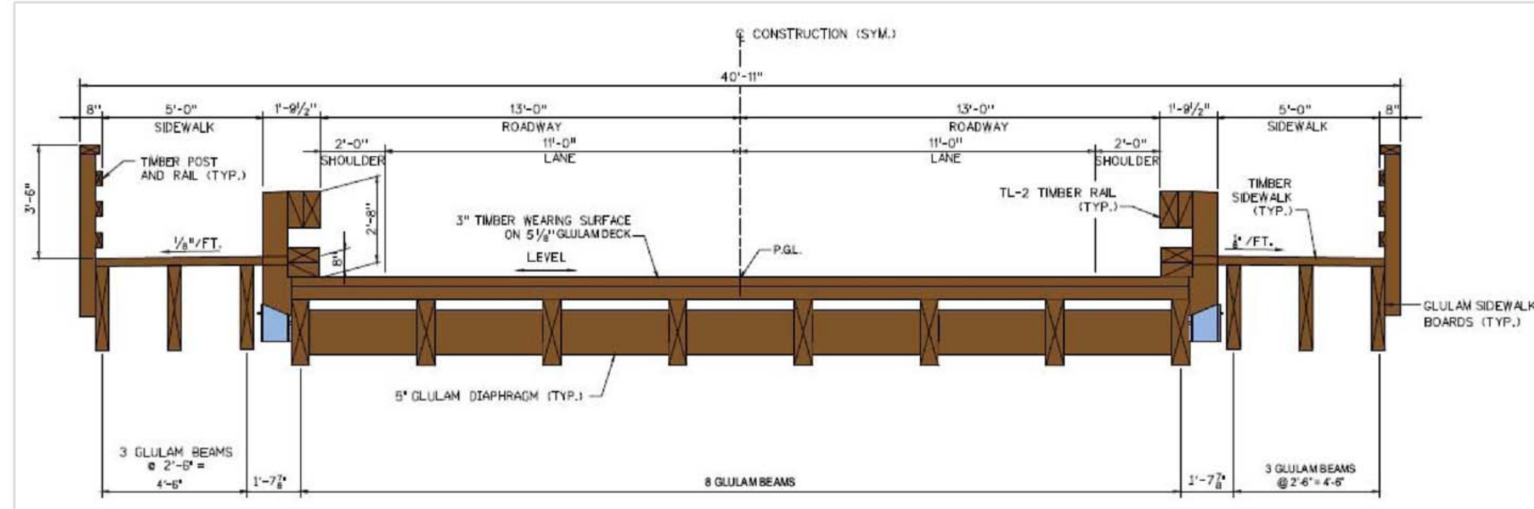

Figure 13 All Timber Approach Span Alternative 3

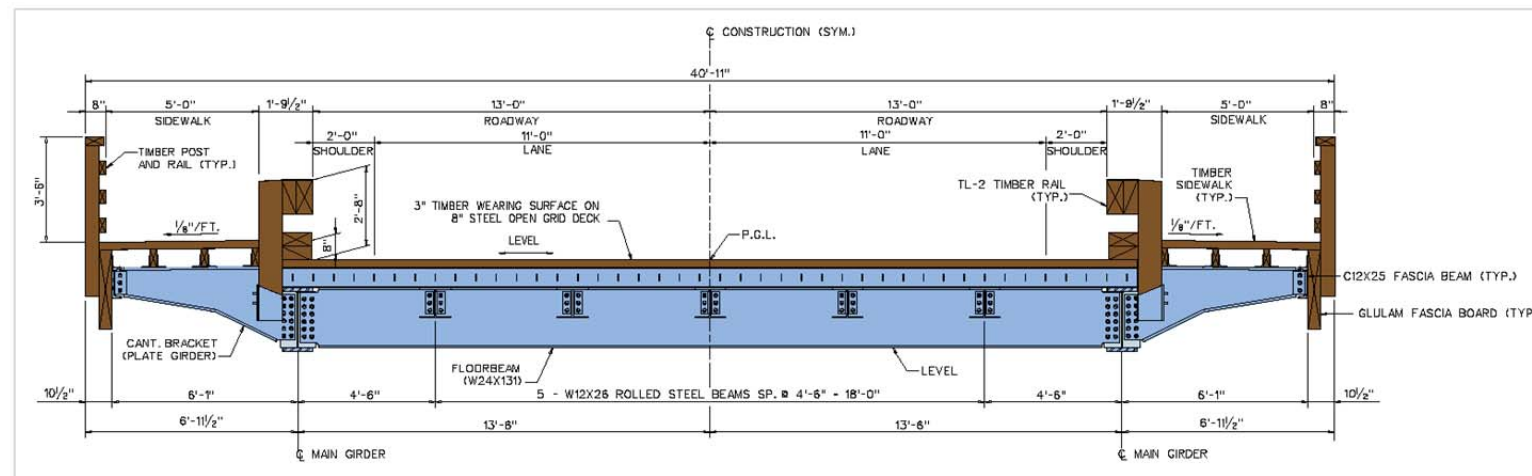

Figure 14 Steel Bascule Leaf Span Alternative 3

caps; however, the Section 106 MOA stipulates further consultation regarding materials to be used for pier cap construction. The substructure at the ends of the bridge consists of pile-supported concrete abutments. The abutments include integral concrete wing walls (retaining walls) that extend along the approach roadway at the back of sidewalk to retain the roadway embankment. The embankments adjacent to the abutments and retaining walls along the waterway have rip rap slope protection, similar to Alternative 1B.

The proposed bascule span channel provides 25 feet of horizontal width between fenders, approximately 7 feet of vertical clearance above mean high water when the bascule leaf is in the lowered position and unlimited vertical clearance with the bascule leaf fully raised. The pivot for the bascule leaf will be located on the west side of the navigation channel. The bascule leaf is approximately 33 feet from pivot to tip and rotates to completely clear the fender with the bascule leaf fully raised. In order to reduce the loads on the operating machinery, the bascule leaf is balanced by a 12.6-foot long counterweight consisting of a steel counterweight box filled with concrete and steel ballast.

The bascule leaf superstructure consists of a timber wearing surface with the planks oriented parallel to the roadway centerline. The timber wearing surface is supported on and attached to steel open grid flooring panels. The proposed bascule leaf is supported on a concrete bascule pier and concrete rest pier. The bascule pier and rest pier are supported on concrete-filled driven steel pipe piles. The exterior faces of the bascule pier and rest pier would include stone facing using materials and details consistent with the local landscape.

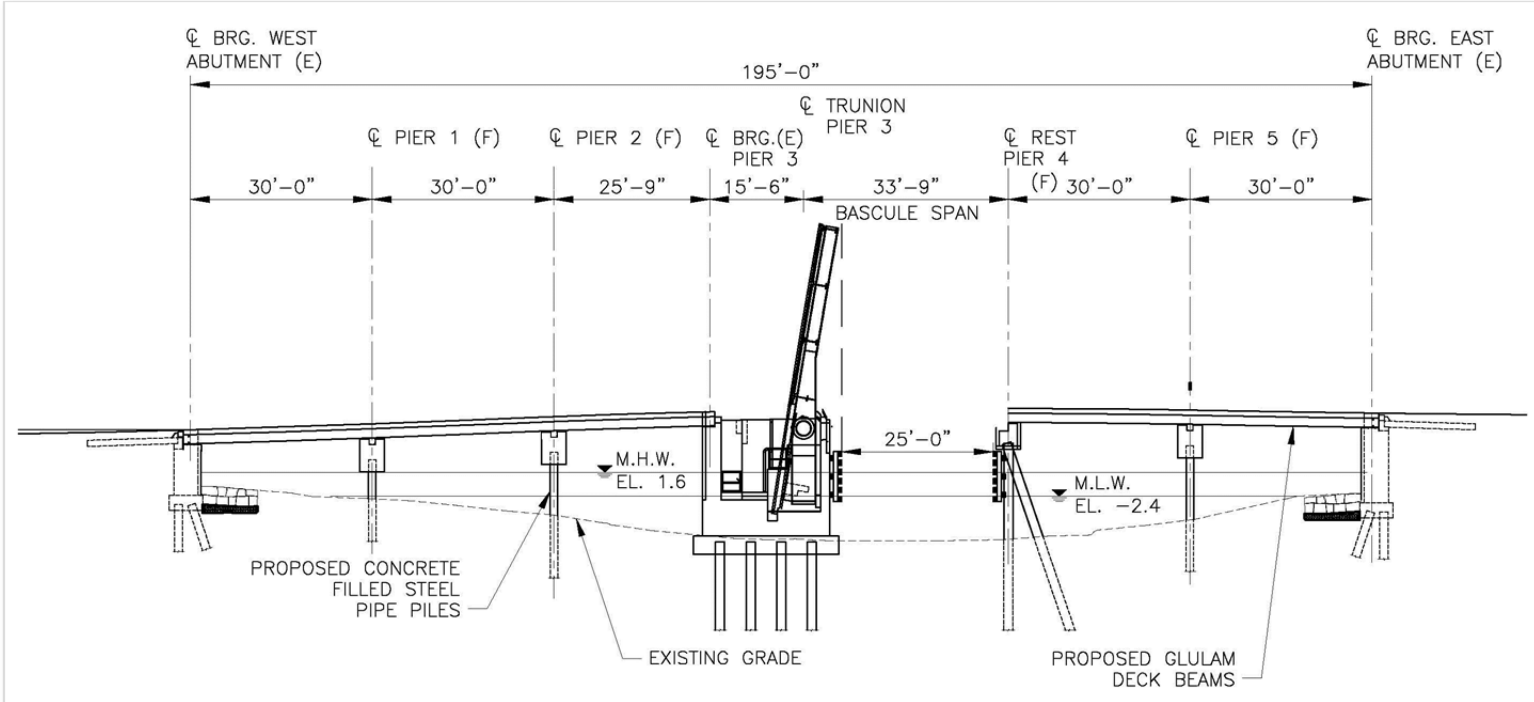

Figure 15 Bascule Profile Alternative 3

Figure 16 Rendering Alternative 3

The fender system on each side of the navigation channel would consist of a combination of horizontal and vertical timber members attached to the face of the concrete bascule pier and the rest bent.

The drive machinery consists of two independent drive trains each directly coupled to the outboard end of the trunnion shafts. A means to manually operate the bridge is integrated into the drive train in the event of a complete loss of power to the motors. A more detailed description of the various elements of Alternative 3 is provided in the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison and Addendum* (Appendix E).

3.3.3 Comparison of the Build Alternatives

The two Build Alternatives share a number of common characteristics, including roadway geometry, typical section, horizontal clearance, bascule pier design, and approach roadway elements. The major difference between them is in the materials used for the construction of the substructure and in the operation of the bascule pier. The choice of materials leads to other differences, including the number of spans, the choice of machinery, and life cycle costs. The All Timber Replacement with Timber Substructure (Alternative 1B) has 12 spans, and utilizes materials (wood) with uncertain reliability in the existing estuarine environment. This contributes to a greater life cycle cost for the bridge, translating into a greater share of costs borne by the Town of Chatham in the future. Of the two Build Alternatives, Alternative 1B offers the greater resemblance to the existing structure. The Timber Replacement with Steel and Concrete Substructure (Alternative 3) has higher initial construction costs, but fewer spans (6 instead of 12), and substantially less future cost borne by the Town of Chatham for bridge repair and/or replacement. For either alternative, initial costs are supported 100 percent by federal and state funding, while any future maintenance, repair or replacement would be owned 100 percent by the Town of Chatham.

Table 3: Comparison of Build Alternatives

Characteristics	All Timber Replacement with Timber Substructure	Timber Replacement with Steel and Concrete Substructure
Travel Lanes	One in each direction	One in each direction
Horizontal Navigational Clearance	25 feet	25 feet
Number of Spans	12 spans	6 spans
Piers	Timber Piles	Concrete filled steel piles
Bascule Pier	Stone faced concrete	Stone faced concrete
Bascule Leaf	Timber frame	Steel frame
Wearing Surface	Timber planks	Timber planks
Machinery	Two electric winches	Two drive trains
Overall Life Cycle Cost	$30.7m/$24.8m[1]	$26.8m/$26.2m[1]
Chatham Responsibility[2]	$21.4m/$15.5m[1]	$15.8m/$15.2m[1]

Note:
1. Worst case scenario/best case scenario
2. Town of Chatham is responsible for all future costs of the bridge, minus the initial construction cost, which would come from State and Federal funds

<u>Operating Machinery</u>

The electric winch operating machinery for Alternative 1B, which is the only practical operating system for the all timber bascule leaf superstructure, has a substantial number of maintenance, durability, reliability, and safety concerns compared with the operating machinery for Alternative 3.

The lift system for Alternative 1B consists of wire rope, pulleys, and deflector sheaves (as seen in Figure 10) in addition to the electrical winches. This system mimics the existing operating lift system. The operating components would be located above the deck where they would be directly exposed to harsh environmental conditions. This exposure would be expected to result in increased maintenance and reduced service life of the equipment. The operating equipment would be located on the sidewalks, in an unprotected location, and where the general public would be exposed to potential hazards of the operating machinery. There is no full time operator now and the replacement bridge will not have one either.

A wire rope operating system lacks redundancy. Due to limitations in the strength and stiffness of the bascule leaf timber framing, the bascule leaf cannot be supported from and operated using a single wire rope (i.e., lifting from one side). If the bascule span is inoperable, the bascule leaf may need to be secured in the raised position to permit navigation traffic to pass, as federal law preserves the right of navigation over vehicular traffic to prevent interference with interstate and foreign commerce (see Section 9 of the Rivers and Harbors Act of 1899 and the General Bridge Act of 1946 as referenced in the USCG Bridge Permit Application Guide).

A wire rope operating system for this span would require large deflector sheaves, pulleys, and operating drums, which would be visually out of scale and out of character for a small bridge. The larger operating system elements, compared to the existing condition or the No Build Alternative, would be required to meet AASHTO requirements. A more detailed analysis of the operating machinery and components can be found in the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison and Addendum* (Appendix E).

In contrast, the machinery for Alternative 3, which consists of two independent gear operated drive trains, would be located below deck and fully contained within a concrete bascule pier (including all operating components i.e., motors, gears, bearings, and shaft couplings) where it would be protected from environmental conditions and would be inaccessible to the general public. It would be more substantial and durable, due to its location in the bascule pier, requiring less maintenance.

The operating machinery for Alternative 3 would be fully redundant and would permit continued operation of the bascule span, in the event half of the operating machinery was removed from service for maintenance or was otherwise inoperable. The steel bascule leaf structure would provide adequate strength and stiffness to permit the bascule leaf to be raised using half of the operating machinery. The more substantial design and construction of the operating machinery would reduce the risk of failure of a component.

<u>Construction Materials</u>

The All Timber Replacement with Concrete Bascule Pier Alternative (Alternative 1B) utilizes timber piles in the design, which are less expensive than the concrete-filled, driven steel pipe piles proposed for the Timber Superstructure on Concrete and Steel Substructure Alternative (Alternative 3).

Timber piles have lower strength and less stiffness than other types of piles (i.e., concrete-filled steel pipe piles), and as such, a greater number of piles are required to support the same loads. They also require additional bracing between piles due to the flexible nature of timber. The greater number of piles would account for greater impacts to environmental resources during construction (land under water and essential fish habitat).

Timber piles in marine environments are susceptible to fungal and bacterial decay and damage from marine borers that feed on the wood. The aggressiveness of the decay and marine borer attack can vary significantly from environment to environment and depend on the type and quality of timber preservatives. The shorter service life of timber piles would require greater construction impact over the life of the bridge, along with associated environmental impact and traffic disruption. A number of technologies have been developed to mitigate decay, however, these technologies have consequences which offset the benefits (for more detailed discussion see Appendix E).

Although not banned from use, the timber preservatives that protect the timber piles from decay and marine borers are toxic. Timber preservatives are known to leach from the piles and accumulate in sediments adjacent to the piles. These sediments are disturbed each time the piles are replaced. Timber preservatives differ in their effectiveness in resisting decay and marine borer attack as well as in their levels of toxicity. The more effective timber preservatives have a higher level of toxicity. Although research is ongoing, there are currently no non-toxic timber preservatives that are highly effective in preventing decay and marine borer attack in marine environments.

In addition to the timber piles, the timber bascule superstructure would be subject to permanent deformations related to timber splitting, checking, and expansion and contraction based on moisture penetration. As seen with the current structure, this would lead to misalignment of the structure at both the bascule pier and the rest pier, as well as a degradation of the operating system itself.

The Timber Superstructure on Concrete and Steel Substructure (Alternative 3) would be supported on concrete filled steel pipe piles, and while the approach spans would utilize timber superstructure elements, the bascule superstructure would be a steel frame overlaid with timber planks.

Steel piles are stronger and stiffer than timber piles, requiring appreciably fewer piles when compared to timber piles. To support the Mitchell River Bridge, only twenty-eight 16-inch diameter steel piles are required for Alternative 3, while ninety-nine 12-inch diameter timber piles are required for Alternative 1B. As such a fewer number of piles will have less construction impact and associated environmental impact, expand small vessel navigation, and increase accessibility to shellfishing areas under the bridge.

Steel piles are more durable and not susceptible to fungal and bacterial decay or marine borer attack like timber piles. Although steel piles are susceptible to corrosion, steel coatings in combination with the design of larger diameter piles typically yield a minimum service life of 75 years. A longer service life would result in less construction and environmental impact over the life of the bridge.

3.3.4 Selection of the Preferred Alternative

The Timber Superstructure on Concrete and Steel Substructure (Alternative 3) is the Preferred Alternative for the Mitchell River Bridge Replacement Project. The All Timber Replacement with Concrete Bascule Pier (Alternative 1B) would have a lower initial cost and is more like the present structure. The Preferred Alternative, however, would meet the project purpose and need, have a lower overall lifecycle cost, result in fewer construction and environmental impacts (both in the near and long term), while still maintaining a context sensitive solution with the use of a timber superstructure and incorporating other timber elements into the design. Alternative 1B would require greater maintenance and have a corresponding disruption to users over its life span. The use of timber piles in the existing environment would also introduce additional environmental impacts, restrict small vessel navigation, and reduce accessibility to shellfishing areas under the bridge. The No-Build Alternative has been eliminated as it does not meet the purpose and need for the project, nor does it meet the projects goals. In addition, the No-Build Alternative would allow for the continuation of the negative environmental effects generated by the unrelenting deterioration of the existing bridge. Ultimately the existing bridge would be closed under the No-Build Alternative which would be disruptive to the local community, and residents would lose access to an important community resource.

Since the two alternatives have the same length and alignment, as the replacement bridge is being located in the same location as the existing bridge, the environmental consequences of the two build-alternatives are essentially the same. The one area that would have some difference in environmental consequences from construction in the near term (Alternative 1B will have greater long term environmental consequences due to the shorter service life of the bridge) is the number of piles needed for each replacement. Alternative 3 would restore a greater area of river bottom because it requires fewer piers and fewer piles per pier. However, it is a smaller portion of the total overall impact, as the greater impact to the river bottom would be related to the concreted bascule pier and rest pier, which is a characteristic of both alternatives. Chapter 5 focuses on the environmental consequences of the Preferred Alternative.

Chapter 4 Affected Environment

4.1 Introduction

This chapter describes the affected environment for the following resources that may be impacted by the proposed build alternatives. The project study area includes the area around the existing Mitchell River Bridge, specifically the Mitchell River and the adjacent land. The affected environment described in this chapter (see Figure 16) forms the basis against which benefits and impacts of the project are evaluated. The permitting requirements for this project are listed in Chapter 8. This chapter summarizes the existing or baseline conditions for:

- Physical Geography, Soils, and Geology;
- Water and Wetland Resources;
- Wildlife and Fisheries;
- Air Quality;
- Noise;
- Land Use;
- Environmental Justice Communities;
- Cultural Resources;
- Public Parks and Recreation; and
- Hazardous Waste.

Several resource categories were not further evaluated due either to their absence within the study area or because the proposed project would not impact the resource category. Those resource categories that were determined to be insignificant relative to the alternatives and dismissed from further analysis include:

- Traffic: The currently proposed detour route has been used in the past and has proven to be able to accommodate the minimal added traffic volumes associated with Bridge Street's Average Daily Traffic (ADT).
- Farmland: There are no farmlands located within, or adjacent to, the study area.
- Wild and Scenic Rivers: There are no Wild and Scenic Rivers located within, or adjacent to, the study area.
- Drinking Water Resources: The Town of Chatham is located within an EPA Designated Sole Source Aquifer; however, the scope of the project would have no impact on drinking water resources.
- Scenic Byways: There are no Scenic Byways located within, or adjacent to, the study area.

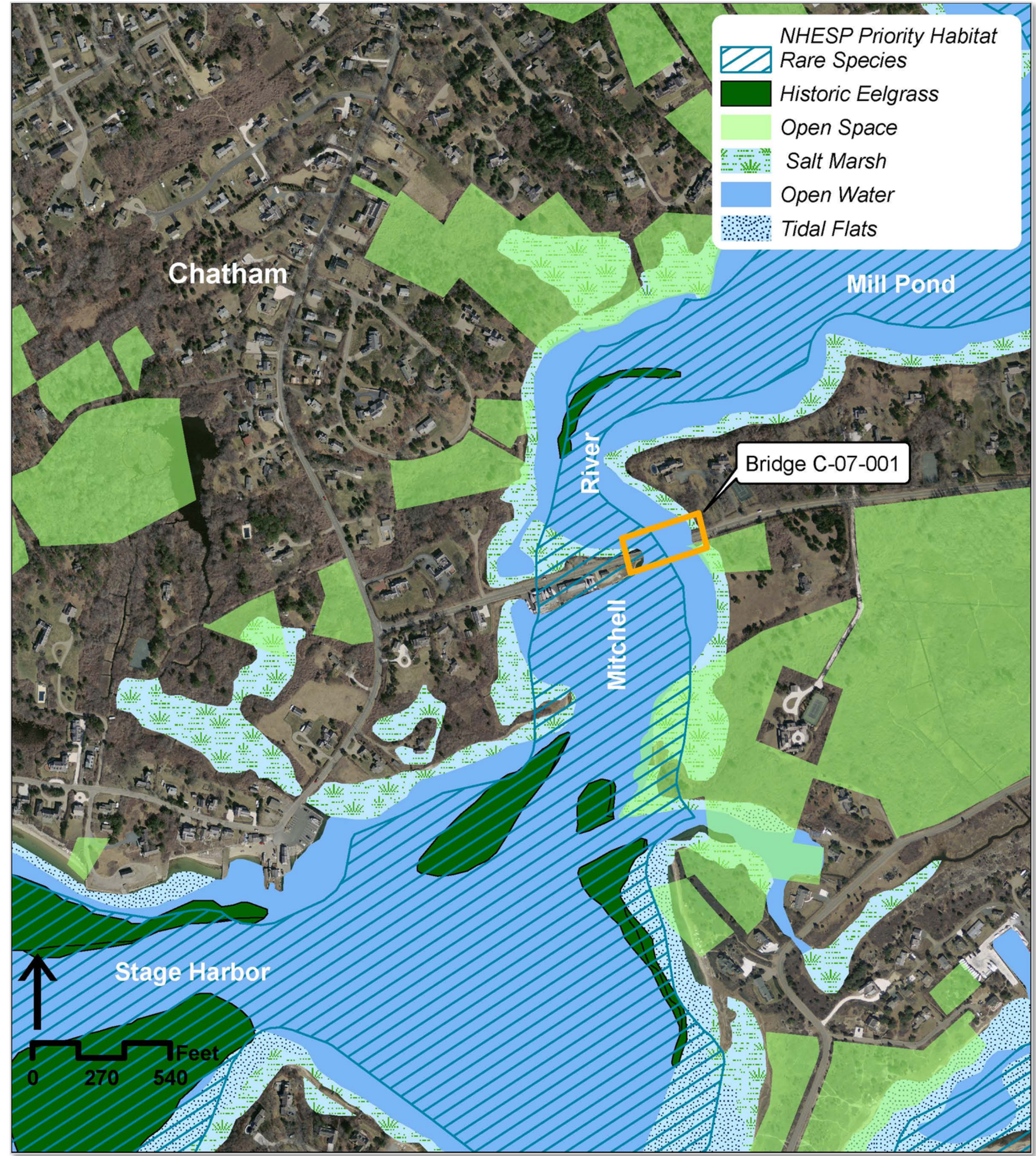

Figure 17 Affected Environment Map

- Socioeconomic Environment: The proposed alternatives would have no impact of the demographics of Chatham or the number of jobs created.

4.2 Physical Geography, Soils, and Geology

The geologic history of Cape Cod where the Town of Chatham is located primarily involves the advance and retreat of the last continental ice sheet and the rise in sea level that followed within the last 25,000 years. During their retreat, the glaciers deposited soil and rock debris called glacial deposits or drift, which filled the bedrock basin in the area. On Cape Cod, the bedrock is buried by glacial deposits ranging from more than 200 feet to more than 600 feet thick. The surficial geology at the bridge location generally consists of thick outwash deposits from melting glaciers. These deposits formed stratified drifts of various soil particle sizes. Sand and gravel were further sorted and stratified by meltwater, which drained from the ancient glaciers and flowed in new streams. The clay and silt-sized particles were carried by the meltwater streams into the glacio-lacustrine (glacial lakes) or glacio-marine (the sea) environment where the particles settled out according to size. Over the course of several advancements and retreats of these ice fronts, the remaining deposits formed the subsurface profile encountered at the bridge site. Finally, more recent saltwater organic sediments and alluvial soils were deposited on top of the glacial outwash, in tidal marshes or estuaries and within the modern day floodplains of major river and streams.

According to the Soil Survey of Barnstable County (1983), soils east of the bridge are mapped as Belgrade Silt Loam. Land to the west of the bridge is mapped as Carver Coarse Sand. The soil evaluations conducted at the project site confirmed the general accuracy of the soil survey mapping; however, the broad salt marsh located west of the bridge is not depicted on the soil survey. Also, it is assumed that fill material was imported to the area to accommodate the original construction of the bridge, the marina, and the town landing, which was a common construction practice.

4.3 Water and Wetland Resources

The following section describes the affected environment for water and wetland resources including surface water, wetlands, coastal zone, and floodplains.

4.3.1 Surface Water

The Mitchell River, a 1.1-mile long tidal waterway, links Mill Pond to the Stage Harbor embayment system along Chatham's southwest coastline. The river has a mean tidal range of approximately 3.9 feet and a mean spring tide range of approximately 4.5 feet. The Stage Harbor System consists of six embayments: Stage Harbor, Oyster Pond River, Oyster Pond, Mitchell River, Mill Pond, and Little Mill Pond. This system not only provides safe anchorage for local recreational and commercial fishing boat uses, but it is also one of the Town of Chatham's most important marine resources. The Stage Harbor embayment supports both salt marsh and eelgrass communities, which provide habitat for commercially harvested quahogs, soft-shell clams, oysters, scallops, and mussels as well as for winter flounder (*Pleuronectes americanus*), a commercially important finfish species.

The Massachusetts Department of Environmental Protection (MassDEP) conducted an assessment of water quality in the Stage Harbor system (including Mitchell River) as part of the Massachusetts Estuary Project (2003). The MassDEP project focused on the sources and fate of nitrogen with respect to ecosystem thresholds associated with nutrient over-enrichment. Field observations of water quality, hydrodynamics, and ecological attributes were made to support numerical modeling of nitrogen dynamics. These field observations establish a baseline of the Mitchell River water quality.

The mean depth of the Mitchell River is approximately 5.25 feet. Mean salinity is 30 parts per thousand (ppt). The tide within Stage Harbor is semidiurnal and at the Mitchell River Bridge, the amplitude ranges from between 2.2 and 6.0 feet (neap and spring, respectively). Water remains in the area of the Mitchell River Bridge for approximately 1 day, after which the tidal flow of the river flushes water through the system. The mean total nitrogen concentration measured in the vicinity of the bridge is 0.43 milligrams per liter (mg/L) which is, as would be expected, higher than the mean Nantucket Sound concentration of 0.29 mg/L.

Within the Stage Harbor System, only Mill Pond showed very low oxygen levels (<3 mg/L). Oyster Pond and lower Mitchell River consistently had oxygen levels >5 mg/L and chlorophyll A levels < 15 ug/L (generally <10 ug/L). None of these systems showed very high algal bloom conditions. Both parameters, however, would generally indicate nutrient enrichment in Mill Pond and to a lesser extent in Oyster Pond and lower Mitchell River.

The Mitchell River and its surrounding embayments are listed as impaired waterbodies per section 303(d) of the Federal Clean Water Act. Two Total Maximum Daily Loads (TMDLs) have been developed for the Mitchell River and its surrounding embayments in order to address the pollutants contributing to the impairment. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. The first is the *Final Pathogen TMDL for the Cape Cod Watershed (August 2009)*. This TMDL characterizes the segment of water nearest the bridge (MA96-11) as having "continuing excellent water quality." However, it also lists this location as a high priority for monitoring due to its proximity to sensitive shellfish areas. Three main potential sources were identified as sanitary waste (sewers and septic), wildlife and pet waste, and stormwater. The second TMDL for this location is the *Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evaluations for Total Nitrogen (December 2008).* This TMDL characterizes the Stage Harbor System (which includes the Mitchell River) as having elevated nitrogen levels and historic losses of eelgrass beds as a consequence.

The existing stormwater system in the vicinity of the bridge consists of two catch basins on the east side of the bridge that discharges into the northeast quadrant.

4.3.2 Wetlands

The areas located adjacent to the northeast and southeast of the bridge are similar in that they contain a narrow strip of salt marsh, which abruptly transitions into forested upland and/or scrub shrub upland habitat. Single family residences exist a few hundred feet from the salt marsh in these areas. Northwest of the bridge, the landscape is dominated by a broad salt marsh area extending westerly for approximately 500 feet. The Stage Harbor Marina is located in the southwest quadrant and the shoreline has been engineered with riprap shoreline protection extending approximately 200 feet from the edge of the existing wingwall (no vegetated wetlands are present).

<u>Federal Designation</u>

According to National Wetland Inventory (NWI) Maps, three dominant classifications are located within the project limits:

- Within the channel: E1UBL – Estuarine, subtidal, unconsolidated bottom, subtidal. This category characterizes the channel flowing underneath the bridge.
- Southwest quadrant: E1AB3L – Estuarine, subtidal, aquatic bed, rooted vascular, subtidal. This category covers submerged aquatic vegetation such as eelgrass beds. While the NWI map locates this as submerged aquatic vegetation, field surveys of the area have shown no presence of eelgrass within the project limits.

- Remaining quadrants: E2EM1P – Estuarine, subtidal, emergent wetland, persistent, irregularly flooded. This category characterizes the salt marsh wetland (described in the next section) that is common in the project limits.

Salt Marsh

Salt marsh exists in a relatively narrow band along the eastern shoreline of the Mitchell River in the vicinity of the Mitchell River Bridge. To the northwest, a broad, ditched salt marsh extends along the edge of the Town Landing and Bridge Street. Vegetation is dominated by salt meadow cordgrass (*Spartina patens*) and salt marsh cordgrass (*Spartina alterniflora*). Scattered and interspersed within the salt marsh are marsh elder (*Iva frutescens*), glasswort (*Salicornia* spp.), seaside goldenrod (*Solidago sempervirens*), halberd-leaved orach (*Atriplex patula var. hastata*), coast blite (*Chenopodium rubrum*), sea-blite (*Suaeda maritima*), and common reed (*Phragmites* spp.).

Isolated Vegetated Wetlands (IVW)

An IVW is located southwest of the Mitchell River Bridge within a densely vegetated thicket approximately 100 feet up gradient from the Mitchell River. Its circular shape and position in the landscape suggests that it may have been a farm pond in the past. Vegetation within the interior is dominated by a few mature willow (*Salix* spp.) trees and mats of sensitive fern (*Onoclea sensibilis*). The willows' root systems have produced numerous clone saplings, which creates a moderately dense understory within the IVW. Pockets of standing water up to 4 inches in depth were observed within the wetland.

Land Under Water (LUW)

As defined by the Massachusetts Wetlands Protection Act (310 CMR 10.00), LUW at this location extends seaward from the mean low water (MLW) Line of -2.4 feet NAVD. The High Tide Line (HTL), which delineates federal jurisdiction, extends seaward from approximately 2.2 feet NAVD.

4.3.3 Coastal Zone

The project area is located within the coastal zone and is consistent with the federal Coastal Zone Management Act, which is regulated by individual states. As the design progresses and regulatory permitting processes are initiated, MassDOT will request a concurrence from the Massachusetts Office of Coastal Zone Management (CZM) for consistency with the MA Coastal Zone Management Plan.

4.3.4 Floodplains

According to the July 20, 1998 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM, Community Panel No. 250004 0009 E), areas to the north of the Mitchell River bridge are located within Zone A8 (El. 9) and areas to the south are located within Zone A9 (El.10). Areas within Zone A are subject to inundation by the 1 percent annual chance flood event. Therefore, the study area is within the 100-year floodplain.

4.4 Wildlife and Fisheries

The following section describes the affected environment for wildlife and fisheries resources including wildlife, federal and state-regulated wildlife habitats, fisheries, and benthic communities.

4.4.1 Wildlife

Salt marsh habitat is the most common within the project limits of the bridge. Salt marsh is an important and dynamic ecosystem that, among other things, provides important nursery grounds and wildlife habitat. The salt marsh ecosystem consists of plants (described in a previous section), fish (described in the next section), invertebrates and birds. While bird surveys have not been completed in the direct vicinity of the bridge, it is assumed that typical birds found in the nearby Monomoy National Wildlife Refuge, which also contains areas of salt marsh habitat, may also be found in the estuary near the bridge. Monomoy is located less than two miles directly south of the existing Mitchell River Bridge. The refuge is a 7,604-acre, 8-mile long barrier island stretching south of the elbow of Cape Cod in Chatham. According to information from the United States Fish and Wildlife Service (USFWS), the refuge is a Western Hemisphere Shorebird Reserve Network (WHSRN) regional site, which is designated for the protection of migratory bird habitat. In addition to the state and federally listed species described in the next section, the refuge harbors a myriad of other bird species, including: turnstones (*Arenaria interpres*), sanderlings (*Calidris alba*), least and semi-palmated sandpipers (*Calidris minutilla* and *Calidris pusilla*), black-bellied and semi-palmated plovers (*Pluvialis squatarola* and *Charadrius semipalmatus*), dowitchers (*Limnodromus* spp.), red knots (*Calidris canutus*), dunlins (*Calidris alpina*), American oystercatchers (*Haematopus palliatus*), and whimbrels (*Numenius phaeopus)*.

4.4.2 Federal and State-Regulated Wildlife Habitats

According to the thirteenth edition of the Massachusetts Natural Heritage Atlas (effective October 1, 2008) published by the Massachusetts Natural Heritage and Endangered Species Program (NHESP), the Mitchell River Bridge is located within Estimated Habitat of Rare Wildlife or Priority Habitat of Rare Species. The NHESP database identified four state-listed rare species in the vicinity of the Project site: roseate tern (*Sterna dougallii*), common tern (*Sterna hirundo*), arctic tern (*Sterna paradisaea*), and least tern (*Sterna antillarum*). It should be noted that the Roseate Tern is also a federally listed endangered species. In response to early coordination with the USFWS (Appendix A), the agency concluded that, "due to the limited size of the project and the abundance of feeding areas available to terns in the vicinity, the project is not likely to adversely affect the roseate tern." Further consultation and the preparation of a Biological Assessment under Section 7 of the Endangered Species Act are not required by the agency.

4.4.3 Fisheries

According to the National Marine Fisheries Service (NMFS), Essential Fish Habitat (EFH) has been designated for seventeen federally managed species within the Mitchell River and Stage Harbor system. EFH is defined as *those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity [16 U.S.C. 1802(10)]. To clarify, the term "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate (50 CFR 600.10); "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities (50 CFR 600.10); and "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem (50 CFR 600.10).* In addition, the Massachusetts Division of Marine Fisheries (MADMF) has identified the project site to be within winter flounder (*Pleuronectes americanus*) spawning habitat and has submitted comments on the sensitivity of this habitat to potential bridge reconstruction activities (Appendix A).

An EFH assessment has been completed for the following species in the analysis (for an expanded discussion, see the full EFH assessment in Appendix B):

- Little Skate (*Leucoraja erinacea*): For little skate, EFH requires bottom habitats with a sandy substrate from Georges Bank through to Southern New England to the Middle Atlantic Bight.
- Winter Skate (*Leucoraja ocellata)*: Juveniles and adults prefer bottom habitats with a substrate of sand and gravel or mud in Cape Cod Bay, on Georges Bank, the southern New England shelf, and through the Mid-Atlantic Bight to North Carolina.

- Atlantic Bluefin Tuna (*Thunnus thynnus*): Although the EFH mapper indicates that the Mitchell River is within EFH for "all" life stages (eggs, juvenile, adult) of bluefin tuna, the prevailing assumption is that spawning and larval recruitment occurs primarily in the Gulf of Mexico, Bahamas, and in the Florida Straits.
- Smooth Dogfish (*Mustelus canis*): Smooth dogfish is a common coastal shark species found in the Atlantic Ocean from Massachusetts to northern Argentina. Marsh creeks may be particularly important to newborn smooth dogfish during June and July. Estuaries are critically important nursery habitats for smooth dogfish.
- Winter Flounder (*Pleuronectes americana*): Winter flounder eggs require bottom habitats with a substrate of sand, muddy sand, and mud. Juveniles and adults occur in bottom habitats with mud or fine-grained sediments, including estuaries with mud, sand, or muddy sand. Spawning is most commonly observed during the months of February through June.
- Atlantic Cod *(Gadus morhua)*
  According to the EFH description for Atlantic cod, adults prefer "bottom habitats with a substrate of rocks, pebble and gravel in the Gulf of Maine, Georges Bank, southern New England and the middle Atlantic south to Delaware Bay."
- Haddock *(MelangogranJnJus aeglefinus)*
  According to the EFH description for adult haddock, the fish prefer "bottom habitats with a substrate of broken ground, pebbles, smooth hard sand and smooth areas between rocky patches on Georges Bank and the eastern side of Nantucket Shoals, and throughout the Gulf of Maine, plus additional area of Nantucket Shoals and the Great South Channel."
- Atlantic Halibut (*Hippoglossus hippoglossus*)
  According to the EFH description for haddock, eggs are found in pelagic waters to the sea floor, larvae are found in surface waters, and juveniles and adults prefer bottom habitat with a substrate of sand, gravel or clay of the Gulf of Maine and Georges Bank.
- Long Finned Squid *(Loligo pealii)*
  According to the EFH description, habitat for the pre-recruits is the pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras, North Carolina.
- Short Finned Squid *(Illex ilecebrosus)*
  According to the EFH description, habitat for pre-recruits is the pelagic waters over the continental shelf from the Gulf of Maine to Cape Hatteras, North Carolina.
- Atlantic Butterfish *(Peprilus triacanthus)*
  Larvae, juveniles and adults are found in offshore waters over the Continental Shelf from the Gulf of Maine through Cape Hatteras, North Carolina areas, and inshore EFH includes estuaries on the Atlantic coast from Passamaquoddy Bay, Maine to James River, Virginia.
- Atlantic Mackerel *(Scomber scombrus)*
  Mackerel eggs, larvae, juveniles and adults are found offshore in the pelagic waters found over the Continental Shelf from Maine through Cape Hatteras, North Carolina, and inshore EFH includes estuaries on the Atlantic coast from Passamaquoddy Bay, Maine to James River, Virginia.
- Summer Flounder *(Paralichthys dentatus)*
  EFH for adult summer flounder is the demersal waters over the Continental Shelffrom the Gulf of Maine to Cape Hatteras, North Carolina. Generally summer flounder inhabit shallow coastal and estuarine waters during warmer months and move offshore on the outer Continental Shelf at depths of 500 feet in colder months.
- Scup *(Stenotomus chrysops)*
  Juvenile and adult scup, in general during the summer and spring are found in estuaries and bays between Virginia and Massachusetts, in association with various sand, mud, mussel and eelgrass bed type substrates.
- Black Sea Bass *(Centropristis striata)*
  Juveniles are found in the estuaries in the summer and spring. Generally, juvenile black sea bass are found in coastal areas between Virginia and Massachusetts, but winter offshore from New Jersey and south. Juvenile black sea bass are usually found in association with rough bottom, shellfish and eelgrass beds, man-made structures in sandy / shelly areas; offshore clam beds and shell patches may also be used during the wintering. Black sea bass are generally found in estuaries from May through October.
- Surf Clam *(Spisula solidissima)*
  Surf clam habitat exists throughout the substrate, to a depth of three feet below the water/sediment interface, within federal waters from the eastern edge of Georges Bank and the Gulf of Maine.
- Blue Shark *(Thunnus thynnus)*
  The blue shark is oceanic and pelagic. In temperate seas, it occasionally approaches shore. It is found worldwide in tropical and temperate waters.

4.4.4 Benthic Communities

The Stage Harbor embayment, including Mitchell River, is known to provide suitable habitat and established populations for commercially harvested quahog (*Mercenaria mercenaria*), various mussels (Family Mytilidae), soft-shelled clams (*Mya arenaria*), eastern oyster (*Crassostrea virginica*), and bay scallop (*Argopecten irradians*). The area is listed as an "approved" designated shellfish growing area (DSGA) by the MADMF. A DSGA is an area of potential shellfish habitat, and all DSGA's are within the territorial waters (tidal zone out to the territorial line) of Massachusetts. Growing areas are managed to allow shellfish harvest for human consumption.

Sediment conditions were observed on September 13, 2011. Sediment characteristics included firm silty sand mixed with shell hash and gravel along the eastern and western banks of the river. Similar conditions were observed in the central, deeper areas of the estuary. All sediments contained shell fragments at the surface, and in some areas, *Codium fragile* (an invasive seaweed species) was observed attached to large shells and rocks. Shell debris was comprised primarily of hardshell clams. The project's benthic infaunal analysis suggests that the area around the Mitchell River Bridge is relatively healthy and exhibits only moderate levels of stress and intermediate to high values of habitat quality and diversity.

The western side of the project site is within a zone of historical eelgrass. The 1951 eelgrass distribution maps for the Stage Harbor system suggest that eelgrass coverage was significantly greater in some of the sub-embayments compared to present conditions. It appears that the Stage Harbor system at that time was capable of supporting relatively dense eelgrass stands. The system still had coverage in 1994, but was near complete loss by 2000. Direct inspection of the marine bottom within the construction footprint confirmed that eelgrass is not present in these locations.

4.5 Air Quality

The Clean Air Act of 1963 (42 USC 7401 et seq.) was established to promote public health and welfare by protecting and enhancing the nation's air quality. The federal Clean Air Act, as amended, requires the United States Environmental Protection Agency (USEPA) to set National

Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Airsheds that cannot attain compliance with the NAAQS are designated as non-attainment areas, while those areas that meet the NAAQS are designated as attainment areas. Chatham is located in an attainment area for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen oxides (NOx), sulfur dioxide (SO2), and particulate matter (PM10 and PM2.5). However, Chatham is located in the Boston-Lawrence-Worcester, MA-NH non-attainment area for the 8-hour ozone standard. Massachusetts was designated as "moderate attainment" for the 8-hour standard by the USEPA in 2004 (DEP 2008).

To regulate the emission levels resulting from a project, federal actions located in non-attainment areas are required to demonstrate compliance with the general conformity guidelines established in 40 CFR Part 93, Determining Conformity of Federal Actions to State or Federal Implementation Plans (the Rule). Section 93.153 of the Rule sets the applicability requirements for projects subject to the Rule through the establishment of de minimis levels for annual criteria pollutant emissions. These de minimis levels are set according to criteria pollutant non-attainment area designations. Projects below the de minimis levels are not subject to the Rule. Those at or above the levels are required to perform a conformity analysis as established in the Rule. The de minimis levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the action. The de minimis value for moderate ozone non-attainment areas is 100 tons per year for nitrogen oxide and 50 tons per year for volatile organic compounds.

4.6 Noise

The noise environment in the area of the Mitchell River Bridge can be characterized as having low ambient noise levels consistent with a rural area with widely separated residential development.

Based on the recently released "Highway Traffic Noise: Analysis and Abatement Guidance" [FHWA-HEP-10-025, July 2010], FHWA defines roadway projects using three classifications:

- Type I projects include the construction of a major highway on new location or the physical alteration of an existing highway that substantially changes the horizontal or vertical alignment or increases the number of through traffic lanes.
- Type II projects are non-Type I projects where MassDOT has undertaken a voluntary effort to construct feasible and reasonable noise barriers along existing interstate highways under its jurisdiction, when funding priorities allow. Type II projects do not apply to state routes or local roads such as Bridge Street.
- Type III projects (such as repaving or bridge rehabilitation, replacement or reconstruction) do not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

Since the proposed replacement project does not substantially change the existing horizontal or vertical alignment or increase the number of lanes of the current bridge, all of the alternatives considered for the Mitchell River Bridge Replacement would be classified as Type III and would not require a noise analysis.

4.7 Land Use

The Mitchell River Bridge carries Bridge Street over the Mitchell River in the Town of Chatham, Barnstable County, Massachusetts. The bridge is approximately 1.5 miles from the mouth of the Mitchell River, and there are no other structures crossing the waterway. The properties and neighborhoods in the vicinity of the bridge are mostly residential properties, with a few exceptions. A parcel in the southeast quadrant of the bridge is owned by the Town of Chatham, with a path used by residents to access the river. The Stage Harbor Marina, located in the southwest quadrant of the bridge, provides dockage and moorings, as well as boat repair, storage and sales. Further upstream from the Mitchell River Bridge, the Pease Boat Work & Marine Railway is a boat restoration and repair company that focuses on wooden boats. In addition, a parcel in the northwest quadrant of the bridge is leased by the town and used as a public boat landing (described in Section 4.10).

The existing right of way (ROW) is based on the line of the 1890 County Layout. The ROW is 50 feet for the majority of the project limits; however, just east of the bridge the ROW changes to variable with that maximized at 65 feet. At the east end of the bridge, the centerline is not centered within the ROW such that roadway is within 5 feet of the layout line.

4.8 Environmental Justice Communities

DOT Order 5610.2(a), Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies to address environmental and human health conditions in minority and low-income communities. Environmental Justice Areas are defined as census block groups that represent neighborhoods of high minority, low-income, non-English speaking and foreign born populations. According to US Census data (2000), which defines low income populations as a person whose median household income is at or below the Department of Health and Human Services poverty guidelines, there are no Low Income or Minority Populations living in geometric proximity to the bridge, or in the Town of Chatham.

4.9 Cultural Resources

The following section provides a description of historic and archaeological resources.

4.9.1 Historic Resources

The Keeper of the NRHP has determined, in a notification letter dated October 1, 2010, that the existing 30-year-old Mitchell River Bridge is eligible for individual listing in the National Register. The Keeper determined that the bridge is eligible for the NRHP under Criterion A for its association with local transportation history and under Criterion C as "a rare surviving example of a structure embodying the distinctive characteristics of a once-common method of construction." The Keeper noted further that the bridge is "of exceptional significance" as "the last remaining single-leaf wooden drawbridge in Massachusetts (and perhaps the United States)". This determination requires FHWA to avoid, minimize, or mitigate any adverse effects to the National Register-eligible bridge that could be caused by the federal undertaking as required under the regulations implementing Section 106 of the National Historic Preservation Act of 1966 (NHPA).

The Mitchell River Bridge is not part of any historic district that is listed or may be eligible for listing in the National Register. There are no other properties within or adjacent to the project area that are listed or may be eligible for listing in the National Register.

4.9.2 Archeological Resources

A review of the MHC pre-contact archaeological base maps revealed no recorded sites in the immediate vicinity of the project area. The closest recorded pre-contact sites (19-BN-267 and -268) are located east of the Mitchell River roughly 0.25 to 0.5 mile from the project area. A review of the MHC historic archaeological base maps revealed one recorded historic site (CHA.HA.I) located approximately 500-feet southeast of the project area. MassDOT has solicited comments regarding this project from the Tribal Historic Preservation Officers (THPO) of the Wampanoag Tribe of Gay Head/Aquinnah and the Mashpee Tribe. Neither THPO has responded to MassDOT's solicitations. MassDOT also has solicited comments regarding this project from the Director of the Massachusetts Board of

Underwater Archaeological Resources (BUAR). The Director of the BUAR has stated that this project is unlikely to impact submerged cultural resources due to prior disturbance by earlier bridge construction and the limited nature of bottom lands disturbance by the proposed project (Appendix I).

4.10 Public Parks and Recreation

There are no public parks directly abutting the Mitchell River Bridge or within the vicinity of the bridge that would be impacted by replacement of the existing bridge. There is a boat launch that is in the northwest quadrant of the bridge on privately owned land. The town leases the use of the boat launch ramp from the owners, and has renewed the lease annually since the mid-1990's. This landing is not considered a Section 4(f) resource because the land is privately owned with only a short term lease and the lease agreement does not allow for full public access. The use is "solely for the purposes of launching, mooring, and landing of small boats." In addition, the bridge is a popular location for recreational fishing; its railings include numerous fishing pole stabilizing notches carved out by local anglers.

There is a public path situated on a town owned parcel (parcel 15A-1) in the southeast quadrant of the bridge and a public path crossing privately owned property (parcel 15B-1B-1B) in the northeast quadrant of the bridge. Bridge Street East (parcel 15A-1) is a small formal town landing laid out and accepted by the town in 1908 with an area of 4,252 square feet. The parcel contains a narrow natural pathway from Bridge Street that provides pedestrian access to the eastern shoreline of the Mitchell River. The north parcel, 157 Bridge Street (parcel 15B-1B-1B), is a privately owned parcel that contains a narrow natural pathway from Bridge Street that provides pedestrian access to the eastern shoreline of the Mitchell River. These paths are the only public ways to the Mitchell River in this vicinity; the next closest public access is 0.25 to 0.5 mile away.

Bridge Street East (parcel 15-A-1 publicly owned) is considered a significant recreational resource as it is the lone access point to the tidal flats on the southeast quadrant of the bridge and has been determined to be a Section 4(f) resource. The north parcel, 157 Bridge Street (parcel 15B-1B-1B), is not protected under Section 4(f) because it is privately owned. Both recreational and commercial shell fishermen utilize these access points year round. The intertidal and subtidal portions of Mitchell River contain shellfish resources with both natural and seeded sets of quahogs. Maintaining this public access is very important to the community and will be preserved as part of the reconstruction efforts of the Mitchell River.

Figure 18 Parcel 15A-1 Path

Figure 19 Parcel 15B-1B-1B Path

4.11 Hazardous Waste

A hazardous materials site screening performed for the Mitchell River Bridge (dated January 2010) project did not discover any hazardous material waste sites located within or adjacent to the project limits.

Sources consulted for the screening include: MassGIS, the USEPA National Priority List (NPL), the MassDEP Bureau of Waste Site Cleanup, and the Massachusetts Department of Fire Safety Underground Storage Tank (UST) List.

4.11.1 Materials On-Site

The existing bridge site contains a number of known hazardous materials, including creosote treated timber piles, bracing and other submerged timber treated with preservatives, oils and lubricants associated with the machinery for the movable span, and bituminous concrete wearing surface at the bridge approaches. Additionally, there may be limited amounts of lead paint on the structure. Although it is a primarily wood structure, steel elements were built in the 1980's, and MassDOT did not phase out the use of lead paint on bridges until approximately 1990.

To assess the current sediment quality, URS collected two sediment samples from 0-4' below the existing channel bottom in the vicinity of the bridge. Metal concentrations at both locations including arsenic, chromium, copper, lead and zinc were reported above detection limits. Nickel was also reported above detection limits for one sample. Arsenic slightly exceeded the Reportable Concentration (RCs-1) standard of 20 ppm, for one sample. The source of the arsenic is unknown, but could be related to old pressure treated lumber in the existing bridge.

4.11.2 Surrounding Sites

As noted above, the hazardous materials screening determined that no listed sites of prior oil or hazardous materials releases appear to be within a quarter-mile radius of the project site. The following list summarizes the results from the hazardous materials screening for Bridge Street in Chatham.

- USEPA: No NPL Superfund sites in the Town of Chatham
- MassDEP (UST): Two underground storage tanks at Stage Harbor Marine, 80 Bridge Street, Chatham, MA 02633.
- MassDEP (21E): Two non-21E reported releases at Stage Harbor Marine, 80 Bridge Street (immediate action taken); one reported release at Old Mill Boatyard, 613 Stage Harbor Road (approved Response Action Outcome 5/1/1996); and one reported release at 20 Gammy Lane (approved Response Action Outcome 1/19/1995). There are no identified sites with activity and use limitations (AUL).

Chapter 5 Environmental Consequences

5.1 Introduction

This chapter describes the potential impacts resulting from the Preferred Alternative (Alternative 3: Timber Superstructure on Concrete and Steel Substructure) for the following resources: physical geography, soils, and geology; water and wetland resources; wildlife and fisheries; air quality; noise; land use; environmental justice communities; cultural resources; public parks and recreation; and hazardous waste. Impacts were identified and assessed with regard to the anticipated level of intensity based on a review of scientific literature, previously prepared documentation, and the professional judgment of resource specialists.

Potential impacts are described in terms of the following:

- Type: either beneficial impact (a positive change in the condition of the resource) or adverse impact (a change that reduces or degrades the condition of the resource).
- Context: either local, regional, global or any combination.
- Duration: either short term or long term.

5.2 Physical Geography, Soils, and Geology

The Preferred Alternative would not adversely impact the physical geography, soils, and geology of the local area in either the short or long term. The scope and size of the project make it unlikely to impact the physical geography of the surrounding area, which has been defined primarily by glacial activity over the last 25,000 years. Soil excavation would be associated with the project, especially in the vicinity of the approach roadways. The soils in this area generally consist of construction fill, which was used in the previous construction of the bridge and approach roadway. Soil will be reused on-site to the extent possible, and any new soil brought to the site would be consistent with the existing soils on-site. Construction of the concrete bascule pier and rest pier may require minor excavation of material in the channel of the river; however, this work would be contained within a watertight cofferdam and any excess material would be disposed of in accordance with state and federal regulations. Lastly, there are no geologic resources of economic importance in the vicinity of the bridge.

5.3 Water and Wetland Resources

During construction of the new bridge, several work-in-water activities would occur in order to complete construction of the new bridge. These in-water activities are associated with the removal of substructure elements and the construction of new substructure elements. Work-in-water activities would introduce silt into the water column which has been identified by MADMF as having the potential to impact sensitive habitat. Work-in-water would be performed while following recommendations from MADMF that silt-producing activities be prohibited between January 15 and May 31, restrictions to winter flounder passage be minimized to the best extent practicable during construction, and structural elements not be placed in eelgrass beds. By following these recommendations, impacts to water and wetland resources are generally minor to negligible.

The proposed in-water activities, construction method, and proposed containment measure for each activity associated with the proposed project are listed in Table 4. In order to control the introduction of silt to the water column, in most cases a turbidity curtain is proposed around the work area. Water must be diverted for the construction of the bascule pier and rest pier and a control of water structure is proposed to divert the river away from the work area.

Table 4: Work in Water Activities

Activity	Proposed Method	Proposed Containment
Remove existing piles	Cut below mudline	Turbidity barrier
Install new piles	Vibratory/pneumatic hammer	Turbidity barrier
Install control of water structure	Vibratory/pneumatic hammer	Turbidity barrier
Construct bascule/rest pier	Vibratory/pneumatic hammer	Control of water structure
Install new riprap	Placement and leveling	Turbidity barrier
Construct abutments	Vibratory/pneumatic hammer	Control of water structure
Remove control of water structure	Cut at mudline	Turbidity barrier

5.3.1 Surface Water

The Preferred Alternative would not adversely impact water quality. The upgrade of the stormwater system in the vicinity of the bridge, which would be part of the civil engineering design portion of the project, would have a beneficial impact to water quality. The design includes the installation of four new deep sump catch basins to replace the two existing outdated catch basins in the vicinity of the bridge. The stormwater design will utilize the existing outfall on the east side of the bridge (with upgrades as necessary), and construct a new outfall on the west side of the bridge. Although there isn't the necessary ROW to provide additional stormwater best management practices (BMP's), the new design will meet state stormwater standards for a redevelopment project to the maximum extent practicable and improve existing conditions.

There will be, however, negligible to minor, short-term, localized impacts on levels of turbidity in the water column during the construction phase of the project. The relatively short and temporary duration of these activities, combined with the proposed sediment containment methods for the in-water construction activities, ensures that any impacts would be minor to negligible.

The proposed project would not cause further water quality impairment associated with the TMDLs (pathogens and nitrogen) for the Mitchell River and other nearby waterbodies during construction of the new bridge. Construction activities are not contributors of nitrogen loading or pathogen loading to the water body. In fact, the proposed project would have a beneficial impact to these impairments over the long term post-construction due to the upgrade of the existing stormwater system in the vicinity of the bridge.

5.3.2 Wetlands

The Preferred Alternative has minor temporary and permanent impacts to jurisdictional wetland resource areas in the vicinity of the bridge. The temporary and permanent impacts to salt marsh associated with the bridge are confined to the northwest quadrant of the bridge. Adverse impacts to sections of salt marsh in other quadrants due to the proposed project are not anticipated. The temporary and permanent impacts to LUW are associated with the removal of existing piles, installation of new piles, placement of riprap, and construction of the bascule pier and rest pier, which includes the installation and removal of a control of water structure.

Salt marsh impacts result from the widening of the approach roadway cross section to be consistent with the proposed bridge cross-sectional geometry. The increased bridge cross-sectional width is proposed to accommodate current design standards for multi-modal transportation facilities. Adverse salt marsh impacts have been avoided in other bridge quadrants, and minimized in the northwest quadrant, through the design of extended wing walls/retaining walls, and stabilizing the areas with riprap at a slope of 1.5 to 1, as opposed to a traditional 1 to 1 slope. Temporary salt marsh impacts (approximately 850 sq. ft.) associated with the bridge construction would be restored to their pre-construction state. All permanent adverse impacts to salt marsh (approximately 30 sq. ft.) would be replicated within close proximity to the impact area at ratios consistent with MassDEP, Army Corp of Engineers (ACOE) and USCG permitting requirements.

Impacts on LUW result from the removal of the existing substructure elements and construction of the new substructure elements. Construction of the new bascule pier and rest pier results in approximately 2,385 square feet of permanent impact to LUW, as they would be constructed from concrete. Replacement of the existing timber piles for the approach spans with concrete filled steel piles would have a beneficial long term impact in these locations, as the Preferred Alternative requires only four piers to support the approach spans, and each pier requires a fewer number of piles than a timber structure. The proposed replacement bridge would replace the existing 128 timber piles with 32 concrete filled steel piles, creating a net positive LUW impact and providing greater horizontal clearance between piers. There would be temporary adverse impacts to LUW in front of each abutment resulting from the installation of a steel cofferdam at each location in order to remove and replace the existing riprap and to demolish and reconstruct the abutments under dry conditions. Between removal of existing piles and removal/replacement of existing riprap, approximately 15,150 sq. ft. of temporary LUW impact will occur. Construction of the substructure elements will not occur in existing or historic eelgrass beds. Construction will not negatively affect the opportunity for resurgence of eelgrass at this location, as construction impacts will be limited to areas within the footprint of the bridge.

5.3.3 Coastal Zone

The Preferred Alternative would have little to no direct adverse impact on the coastal zone in the vicinity of the proposed bridge replacement. The proposed project is consistent with the goals of the Massachusetts CZM Program. A Federal Consistency Review will be requested from the Office of Coastal Zone Management once the project's permitting phase is initiated.

5.3.4 Floodplains

The Preferred Alternative would not adversely impact floodplains in the vicinity of the proposed bridge replacement. Major flooding events along the coastline result from wind driven storm surges which cause water to pile up along the Massachusetts Bay shoreline. Under these conditions, the presence or absence of structures within the coastal floodplain has no impact on either flood depths or flood velocities. Areas lower in elevation than the combined tidal and storm surge elevation become inundated, and areas higher in elevation are not flooded. Since storm surges represent the source of flood waters, available storage capacity afforded by the floodplain becomes inconsequential.

MassDOT's Hydraulic Section performed a Hydraulic Study Report, dated March 5, 2010 for the proposed 6-span structure. The study determined that while the project is located in a National Flood Insurance Program (NFIP) flood hazard zone A8, the proposed bridge replacement structure will have no impact on either the existing base (100-year) tidal flood elevation profile through the crossing site or the existing horizontal extent of the existing base (100-year) floodplain. Thus, the project complies with Executive Order 11988.

5.4 Wildlife and Fisheries

The following section describes the environmental consequences resulting from the proposed project to wildlife and fisheries resources including wildlife, federal and state-regulated wildlife habitats, fisheries, and benthic communities.

5.4.1 Wildlife

The Preferred Alternative would not adversely impact wildlife in the vicinity of the proposed bridge replacement. The proposed project is unlikely to have an adverse effect on wildlife due to the limited size and duration of the project, in conjunction with the abundance of feeding and nesting areas in the nearby Monomoy National Wildlife Refuge.

5.4.2 Federal and State-Regulated Wildlife Habitats

The Preferred Alternative would not adversely impact federally and state-regulated wildlife habitats. The Massachusetts NHESP has indicated that four state-listed bird species occur in the vicinity of the project site. However, it is unlikely that the project would result in an adverse effect on these regulated species due to the limited size of the project in comparison with the abundance of feeding and nesting areas in the nearby Monomoy National Wildlife Refuge. NHESP agreed that the proposed project would not constitute a prohibited "take" of Common or Roseate Tern, as construction activities will not be detrimental to foraging or reproductive success (see Appendix A). Similarly, the USFWS determined the proposed project would not result in an adverse effect for species under their jurisdiction, and determined no biological assessment is required under Section 7 of the Endangered Species Act (see Appendix A).

5.4.3 Fisheries

The Preferred Alternative has short-term minor adverse impacts on EFH. The proposed construction activities are relatively limited in scope; however, temporary and permanent impacts would occur, some of which have the potential to affect the life stages of select EFH managed species. The permanent impacts from the installation of the piles and concrete bascule and rest pier would result in the loss of marine habitat. Without mitigation measures including complying with the time of year restriction recommended by MDMF, and the use of cofferdams and turbidity curtains during construction of substructure elements potential direct short-term, adverse impacts to EFH from silt-producing activities during construction might have occurred, but will be avoided as a result of these mitigation measures.

The permanent loss of marine habitat is relatively minor in the context of the overall amount of similar marine habitat present in the vicinity of the bridge and within the Stage Harbor/Mitchell River system. The loss of habitat is expected to have a minimal impact on EFH due to the construction methodology and proposed mitigation. The concrete and steel alternative requires replacement every 75 years, so potential impacts during construction will be minimized over the long term.

Of the seventeen species analyzed as part of the EFH assessment, eight were found to be unlikely to frequent the Mitchell River in the vicinity of the project site (Atlantic cod, haddock, Atlantic halibut, long finned squid, short finned squid, Atlantic mackerel, surf clam, and blue shark). No adverse effect would occur for those species. The following provides an assessment on the temporary and permanent impacts on EFH for the remaining nine species found in the Mitchell River and Stage Harbor System (for an expanded impact assessment, see the full EFH assessment in Appendix B):

Little Skate (*Leucoraja erinacea*): Little skate eggs are found at depths less than 88 feet (27 meters) and temperatures greater than 44°F (7 °C); therefore, project activities may affect EFH during the non-winter months. However, juveniles and adults may occupy the Mitchell River area throughout the fall, winter, and spring seasons. Potential direct impacts to little skate eggs, juveniles, and adults may occur during construction if eggs or individuals are present in the work footprint; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to this species. The presence of the concrete bascule pier and rest pier will eliminate a small potentially suitable habitat area with no significant adverse impact to the species expected. This species is not considered to be overfished, so the relative sensitivity to adverse conditions on the overall population should be low with regard to the proposed bridge reconstruction.

Winter Skate (*Leucoraja ocellata*): NMFS has determined that winter skate is in an overfished condition and that overfishing of this stock is occurring, based on stock size assessment. Juveniles are found within temperatures that range from 29°F (-1.2°C) to around 69°F (21°C), with most found from 39 to 60°F (4 to 16 °C), depending on the season. Winter skate adults are generally found in depths that range from shoreline to 1,217 feet (371 meters), but most abundant at depths 364 feet (111 meters) and temperatures that range from 29°F (–1.2 °C) to around to around 68°F (20 °C), with most found from 41 to 59°F (5 to 15 °C), depending on the season. Therefore, adult and juvenile winter skates may be present in the Mitchell River system throughout most of the year, potentially spanning all seasons. Potential direct impacts to eggs, juveniles, and adults may occur during construction if present in the work footprint; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to this species. The presence of the concrete bascule pier and rest pier will eliminate a small potentially suitable habitat area with no significant adverse impact to the species expected.

Atlantic Bluefin Tuna (*Thunnus thynnus*): Atlantic bluefin tuna typically spawn in subtropical waters (i.e., Gulf of Mexico) during spring months, so the presence of eggs and larvae in the Mitchell River system is highly unlikely. Juveniles and young adults may utilize habitat in the Mitchell River, though this has not been documented. If so, juveniles and young adults would likely be present during warmer months (spring through fall) but not present during winter months. Adult bluefin tuna (larger than 7.5 feet or 230 cm) are typically found in deeper, pelagic areas east of Nauset Beach from May through December. It is unlikely that bluefin tuna will be impacted by the construction activities as eggs and larvae are not likely to be present. Juveniles and young adults would likely avoid barriers or other activity within the construction footprint, utilizing the hydraulic opening that will be maintained during construction.

Smooth Dogfish (*Mustelus canis*): Smooth dogfish tend to congregate between southern North Carolina and the Chesapeake Bay in the winter. In the spring, they move along the coast when bottom water warms up to at least 42 to 69°F (06 to 21°C). As temperatures drop, smooth dogfish move offshore to their wintering areas. Therefore, this species could be present in the Mitchell River system from spring to fall. This species does not release eggs, so reproductive use of the habitat is limited to copulation activities. Potential direct impacts to juveniles and adults may occur during construction if present in the work footprint; however, similar to the bluefin tuna, individuals are likely to avoid impacts by utilizing the remaining hydraulic opening.

Winter Flounder (*Pleuronectes americana*): According to MADMF, the project site contains suitable habitat for all life stages of winter flounder. The varied marine bottom types of this estuarine system (muds, sands and gravel), combined with water temperature, depth, and salinity, are ideal for juveniles and adults in warmer months and equally suitable for eggs and larvae in colder months. The project would result in the loss of habitat associated with the concrete bascule pier and rest pier, as described above. The project has the potential to directly impact this managed species if silt comes into contact with eggs or larvae during construction; however, this impact will be avoided as a result of the mitigation meaures discussed previously.

Atlantic Butterfish *(Peprilus triacanthus):* Atlantic Butterfish spawn from May through August which is outside of the winter flounder protective period (January through April). Eggs are found in a range of depths, including shallow, inshore areas. Thus, suitable egg habitat could be affected by the project; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to this species. Since the reproductive range of this species occurs from Cape Hatteras to Nova Scotia, and the majority of larvae have been observed in deep, offshore water, the scale of this project will not have a significant impact.

Summer Flounder *(Paralichthys dentatus)*: Juvenile and adult summer flounder may be found in the vicinity of the project site and therefore may be impacted. The project will affect suitable habitat through the loss of habitat associated with the concrete bascule pier and rest pier, as described above. The project may also result in direct impacts to this species if present in the work footprint during construction; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to this species.

Scup *(Stenotomus chrysops)*: EFH for scup eggs, larvae, juveniles, and adults include New England estuarine waters. Spawning occurs between May and August in salinities greater than 15 ppt. The project will affect suitable habitat through the loss of habitat associated with the concrete bascule pier and rest pier, as described above. The project may also result in direct impacts to this species if present in the work footprint during construction; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to this species.

Black Sea Bass *(Centropristis striata)*: All life stages of Black sea bass have been documented in New England estuarine waters. This species is attracted to structures, including bridge supports, especially during the larval stage. The project may affect suitable habitat through the loss or disruption of habitat associated with the concrete bascule pier and rest pier, as described above. The project may also result in direct impacts to this species if present in the work footprint during construction; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to this species.

Summary: Of the nine species analyzed in this section, the project is unlikely to result in any significant adverse impact to any of the species. Potential direct impacts to certain life stages of all nine species could occur during construction if present in the work footprint; however the relatively small work footprint and scope of work is unlikely to result in any significant adverse impact to any species. In addition, the permanent loss of marine habitat as a result of the bridge substructure is relatively minor in the context of the overall amount of similar marine habitat present in the vicinity of the bridge and within the Stage Harbor/Mitchell River system.

5.4.4 Benthic Communities

The Preferred Alternative would only have a short-term, minor adverse impact on benthic communities as the proposed construction activities are relatively limited in scope. The use of work barges would minimize impacts to benthic communities, while the installation of cofferdams in early summer would minimize impacts to managed fish and shellfish habitat outside of the construction footprint. Temporary impacts may result from construction if shellfish beds have developed in tidal flats adjacent to the existing abutments; however these areas would be restored at the conclusion of construction. The project has the potential to have beneficial long term impacts on benthic communities as stormwater structures would be upgraded, which would be beneficial to water quality.

5.5 Air Quality

The Preferred Alternative would have localized, minor to negligible adverse impacts on air quality in the vicinity of the bridge. This project involves temporary construction activities which would not permanently impact air quality levels. Dust from construction operation and construction equipment exhaust emissions may adversely affect local air quality during construction; however, these air quality impacts would be temporary and would cease upon completion of the project. Recognizing the limited size and duration of construction activities associated with the project, none of the equipment activities would exceed minimal thresholds for ozone. Control measures, documented by the contractor in a dust and air emissions control plan, for lowering fugitive dust and emissions and ensuring heavy equipment is maintained and operated correctly would mitigate the level of minor adverse impact.

5.6 Noise

The Preferred Alternative would have localized, minor to negligible temporary adverse impacts on noise near the project area. A noise analysis was not conducted for this project, as it is not considered a Type I Action. An increase in ambient noise within the project area could be reasonably expected and would be caused by construction equipment. However, this increase in noise levels would be temporary, and noise levels would return to normal upon the completion of the project. MassDOT intends to develop contract specifications that incorporate recommended noise limits and required submittal of a noise control plan by the contractor. The contractor will be required to employ construction noise mitigation measures that will be evaluated as the project progresses.

5.7 Land Use

The Preferred Alternative would not adversely impact the existing land use surrounding the existing bridge site. The proposed project includes the replacement of an existing structure in the same location with a new structure of similar capacity and within a similar horizontal and vertical alignment. As such, adverse impacts to adjacent land have been minimized.

The project will require both minor permanent easements and temporary easements outside of existing ROW. Permanent easements total approximately 4,200 square feet, and are associated with new limits of riprap and wingwalls. Temporary easements total approximately 5,000 square feet, and are associated with construction of the sidewalk, guardrail and slope.

5.8 Environmental Justice Communities

The Preferred Alternative would not adversely impact environmental justice communities because the analysis has indicated that there are no such communities in the vicinity of the project, or in the Town of Chatham.

5.9 Cultural Resources

The following section provides a description of the environmental consequences to historic and archaeological resources.

5.9.1 Historic Resources

The Keeper of the National Register of Historic Places has determined in a notification letter dated October 1, 2010, that the existing 30-year-old Mitchell River Bridge is eligible for individual listing in the National Register. The proposed demolition of the existing bridge is, therefore, by definition, an adverse effect under the regulations implementing Section 106 [36 CFR 800.5(a)(2)(i)]. FHWA, as the lead federal agency for the undertaking, has conducted extensive consultations with interested local, statewide, and national parties to "develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize or mitigate" the adverse effect to the National Register-eligible bridge, as required under the Section 106 regulations [36 CFR 800.6(a)]. MassDOT and other consulting parties have participated in those consultations.

MassDOT considered alternatives that would avoid or minimize impacts to the historic bridge, including repair and rehabilitation options (as described in Section 3.1). As reported to the Section 106 Consulting Parties at a meeting in Chatham Town Hall annex on May 17, 2011, the repair alternative would entail selective removal and replacement in-kind of failed or failing elements. The rehabilitation alterative included overhauling the existing structure but leaving historic elements, such as the pilings, in place. MassDOT found that the repair and rehabilitation options would not address the structural deficiencies of the existing bridge substructure, as documented in the *Bridge Repair/Rehabilitation Feasibility Study* (Appendix D). Although the repair and rehabilitation alternatives would avoid or minimize the adverse impact to the bridge, they are not prudent and feasible because they would not meet the need to upgrade the deficient substructure elements, they offer a relatively short service life, and would result in greater long term maintenance costs than replacement alternatives. As such, repair and rehabilitation options do not satisfy the purpose and need of the project. In addition, participants at the May 17, 2011 meeting agreed that demolition and replacement with a new structure would be the appropriate course of action. Accordingly, MassDOT dismissed repair and restoration options. Further consideration was limited to alternatives that would mitigate the adverse impact of bridge demolition.

Alternative 3 (the Preferred Alternative) will fully meet the project's purpose and need while providing a handsome, context-sensitive modern bridge that will complement its picturesque natural setting and echo the appearance of its historic predecessors on this crossing. The Preferred Alternative will sufficiently mitigate the adverse effect caused by the demolition of the existing NR-eligible bridge, meeting both the letter and the spirit of Section 106 of the NHPA. The Chatham Board of Selectmen (BOS), which is responsible for the care, custody, and control of the Mitchell River Bridge on behalf of the Town, notified MassDOT, in a letter dated May 31, 2011, that it voted to support the Preferred Alternative as the "most prudent balance of aesthetic, functional, and financial benefits for the Town."

MassDOT proposes to mitigate the adverse effect caused by the demolition of the existing NR-eligible Mitchell River Bridge by carrying out all of the stipulations in the MOA (Appendix J). Those stipulations include MassDOT's commitment to design and build a context-sensitive new bridge; afford the Section 106 consulting parties the opportunity to review and comment on the sketch plans for the replacement bridge, including its aesthetic details, as those plans are developed; support any future requests for eligibility determinations for the structure by private entities; and prepare archival photographic documentation of the existing bridge for distribution to the Town of Chatham/Chatham Historical Commission for local depository. The MOA includes FHWA, the Massachusetts State Historic Preservation Officer, and the Advisory Council on Historic Preservation as signatories and MassDOT and the Town of Chatham as invited signatories. The MOA also provided the opportunity for all other local, statewide, and national Section 106 consulting parties to sign as concurring parties.

5.9.2 Archeological Resources

A review of the MHC pre-contact archaeological base maps revealed no recorded sites in the immediate vicinity of the project area. The closest recorded pre-contact sites (19-BN-267 and -268) are located east of the Mitchell River roughly 0.25 to 0.5 mile from the project area. A review of the MHC historic archaeological base maps revealed one recorded historic site (CHA.HA.I) located approximately 500 feet southeast of the project area. Project impacts will be confined to the existing bridge and the existing paved roadway approaches. Little or no archaeological potential can be ascribed to the project area based on the nature of the proposed work; the effects of past roadway, causeway, and bridge construction; roadside development (i.e., boat landing, building construction); and the presence of unfavorable environmental conditions (i.e., embankment).

MassDOT, on behalf of FHWA, has notified the Wampanoag Tribe of Gay Head/Aquinnah and the Mashpee Wampanoag Indian Tribal Council regarding the proposed project and potential impacts to archaeological resources. Neither tribe has responded to date.

MassDOT also has solicited comments regarding this project from the Director of the BUAR. The Director of the BUAR has stated that due to, "prior disturbance by earlier bridge construction, and the limited nature of bottom lands disturbance by the proposed project, the Board expects that this project is unlikely to impact submerged cultural resources (Mastone 1/11/2012, Appendix I)."

5.10 Public Parks and Recreation

The Preferred Alternative would not adversely impact public parks in the vicinity of the bridge. There are no public parks adjacent to the bridge. There are no impacts to the nearby Monomy National Wildlife Refuge (2 miles south). The boat launch that is located on private property leased to the town does not meet the criteria for protection under Section 4(f).

There is a public path situated on a town owned parcel (parcel 15A-1) in the southeast quadrant of the bridge and a public path crossing privately owned property (parcel 15B-1B-1B) in the northeast quadrant of the bridge. Bridge Street East (parcel 15A-1) is a small formal town landing laid out and accepted by the town in 1908 with an area of 4,252 square feet. The parcel contains a narrow natural pathway from Bridge Street that provides pedestrian access to the eastern shoreline of the Mitchell River. The north parcel, 157 Bridge Street (parcel 15B-1B-1B), is a privately owned parcel that contains a narrow natural pathway from Bridge Street that provides pedestrian access to the eastern shoreline of the Mitchell River. These paths are the only public ways to the Mitchell River in this vicinity; the next closest public access is 0.25 to 0.5 mile away.

Publicly owned Bridge Street East (parcel 15A-1) is considered a significant recreational resource as it is the lone access point to the tidal flats on the southeast quadrant of the bridge and is protected under Section 4(f). The north parcel, 157 Bridge Street (parcel 15B-1B-1B), is not protected under Section 4(f) because it is private property. Both recreational and commercial shell fishermen utilize this access year round. The intertidal and subtidal portions of Mitchell River contain important shellfish resources with both natural and seeded sets of quahogs. Maintaining this public access is very important to the community and needs to be preserved as part of the reconstruction efforts of the Mitchell River. FHWA has received concurrence from the Chatham BOS, in a letter date September 6, 2012, that parcel 15A-1 is significant to the town, that the impact would be *de minimis* and the *de minimis* impact determination for parcel 15A-1 is the appropriate approach.

5.11 Hazardous Waste

The Preferred Alternative would not adversely impact hazardous waste in the vicinity of the bridge. The bridge site is not located in the vicinity of, or down gradient, from any known hazardous waste sites. All hazardous materials known to exist at the current bridge, including creosote treated timber piles, would be handled and disposed of in accordance with applicable state and federal laws, as specified in the contract documents.

Chapter 6 Indirect Effects and Cumulative Impacts

6.1 Indirect Effects

Indirect effects are defined in the Council on Environmental Quality (CEQ) regulations (40 CFR 1508.8) as those effects "which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." The indirect effects (long term impacts) associated with the Preferred Alternative have been identified in the environmental consequences chapter of this document.

Construction of the Preferred Alternative will provide a context sensitive bridge that improves the structural integrity and navigational clearances of the existing bridge. It will be built along the same alignment as the existing bridge with the same functional capacity, and as such, indirect effects are not anticipated as traffic would remain the same after construction, and environmental effects from the project are expected to be relatively minor in the context of the overall amount of similar marine habitat present in the vicinity of the bridge and within the Stage Harbor/Mitchell River system.

6.2 Cumulative Impacts

Cumulative impacts are defined in 40 CFR 1508.7 as the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." The existing bridge is in a predominately residential area, and as such, extensive development within the project area is unlikely. Existing undeveloped parcels are publicly owned, or are constrained by environmental conditions that would restrict future development.

The cumulative impact analysis assumes recent maintenance activity at the bridge as well as other construction/redevelopment projects occurring in vicinity of the Stage Harbor System. The Mitchell River is an impaired waterway in the Stage Harbor System that contains historic eelgrass beds and substantial wetland resources. The Stage Harbor area also contains publicly owned open space and conservation land that is valued by the local community.

Based on the Bridge Inspection Reports (Included in Appendix D), the most recent repairs were performed in 2007, including replacement of portions of the timber wearing surface, replacement of the lifting beam, installation of plastic wrap on some of the timber piles, and other miscellaneous minor repairs. Temporary traffic impacts occurred during this time; however, the bridge was reopened at the completion of the repairs. Previous repairs to the bridge do not impact the current project, as the bridge would be completely replaced.

The Town is in the planning stages for the Crowell Road and Route 28 Intersection Improvement Project, which would improve the Crowell Road/Route 28/Depot Road/Queen Anne Road intersection, approximately one mile from the bridge. The proposed intersection project would likely include improved bike and pedestrian facilities, compliance with ADA standards, and improving intersection geometry in order to improve access to downtown business and recreation areas. The project would not impact the current project, which would incur mostly localized impacts. The project is in the vicinity of Oyster Pond, which is part of the Stage Harbor System. Impacts from this project are not expected to have a cumulative effect with the current project, although that project has the potential to impact the water quality of Oyster Pond.

The West Chatham Intersections and Corridor Project is also in the planning stages. This project proposes upgrades to two intersections and a quarter mile of Route 28. Improvements include landscape plantings, roadway geometry, drainage, and vehicular safety. The project would not impact the current project, which would incur mostly localized impacts. The project is in the vicinity of Oyster Pond, which is part of the Stage Harbor System. Impacts from this project are not expected to have a cumulative effect with the current project, although that project has the potential to impact the water quality of Oyster Pond.

To complement the previous two roadway projects, the Town is developing land use planning recommendations as part of the West Chatham Visualization and Land Use Planning Project. The project would not impact the current project, as it mostly pertains to land use and zoning policies in a location outside of the direct vicinity of the Mitchell River Bridge project.

These projects in combination with the proposed project would not cause increased impacts. The three projects described above would not be under construction at the same time as the proposed Mitchell River Bridge replacement. Therefore, temporary construction-related impacts, such as air quality, noise, and surface transportation impacts, would not be significant or sustained. In addition, these projects are not anticipated to have impacts on EFH, salt marsh, shellfish growing areas, or eel grass beds.

Chapter 7 Mitigation Measures

Minor impacts to the natural and human environment would occur during construction of the proposed Mitchell River Bridge. Commonly employed best management practices and other measures would be applied to further reduce the impact on the environment. Additional mitigation commitments will be developed by MassDOT in conjunction with the applicable agencies during the permitting phase of the proposed project.

7.1 Construction of the Preferred Alternative

The duration to construct the Preferred Alternative is estimated to be twenty-four months including the time required for the demolition of the existing bridge. With environmental restrictions on silt-producing construction activities in the water during specific periods of the year, it is estimated that the construction would take place over a total duration of thirty-three months. Procurement of long lead time items such as the bascule leaf steel framing, operating machinery, and electrical controls would take place during demolition of the existing bridge and construction of the bascule piers, and thus are not anticipated to affect the overall construction schedule.

Because the Preferred Alternative would be constructed on the same horizontal alignment as the existing bridge and the configuration of the bascule span prevents sequencing of the work in a manner where traffic (vehicular, pedestrian, and bicycle) could be maintained, the bridge will be closed for the full duration of the work and traffic detoured to an alternative route. The existing bascule span would be removed as an early action to facilitate marine activity through the channel. The traffic detour would route traffic to Stage Harbor Road, Main Street, and Bridge Street, a maximum detour length of approximately three miles. In order to reduce the construction duration and the period of time that the bridge would be closed to traffic, accelerated bridge construction techniques may be implemented including use of precast concrete bent caps, prefabricated timber deck units, shop assembly of the bascule leaf, shop alignment and testing of the operating machinery, and shop assembly and testing of the electrical controls. Accelerated bridge construction techniques may reduce the overall construction duration by six months.

It is anticipated that there would be a number of short duration closures of the navigation channel while the existing bridge is demolished and the replacement bridge is constructed. The need to periodically work within or over the navigation channel and the size of the barges and cranes required to construct the bridge may periodically require that the navigation channel be closed. The public would be notified through a USCG Notice to Mariners issued well in advance of any restrictions. In order to avoid extended closures of the navigation channel, a temporary navigation channel located west of the bascule span would be provided. The temporary navigation channel would be implemented by delaying the installation of the superstructure for the approach span flanking the bascule span. The temporary navigation channel would provide unlimited vertical clearance, a minimum horizontal width of 25 feet, and would include temporary floating fenders and navigation lighting. After the construction of the bascule pier, rest pier, and bascule leaf span is complete, navigation traffic would return to the permanent navigation channel. The bascule leaf would be secured in the raised position until the bascule span is fully operational.

In order to minimize the risk of adverse effect to the marine environment, MassDOT will implement the following mitigation measures prior to and during construction. The MADMF recommended a time-of-year restriction on all in-water construction or silt-producing activities between January 15 and May 31 to protect winter flounder (a commercially important fin-fish species) habitat. The agency has also recommended to minimize restrictions to winter flounder passage to the best extent practicable and to avoid placement of new foundations and other structures within eelgrass beds (Appendices A &B). As currently designed, the project would not locate any structural features within eelgrass beds. Prior to the start of construction, MassDOT will coordinate directly with MADMF to define the construction activities that may be performed in-water during the time-of-year restriction as well as define the required types of mitigation measures that must be used during the time-of-year restriction to minimize the adverse effects of silt-producing activities.

Prior to construction, a combination of hay bales, silt fences, and other soil erosion and sedimentation control devices will be placed along the perimeter of the upland work areas to control erosion and sedimentation. Turbidity barriers will be placed around the existing pile bents during pile removal and around new pile bents during installation of new piles to contain sediments produced during construction activities. Steel sheet pile cofferdams will be used to create a dry environment for the demolition of the existing abutments and for construction of the new bascule pier, rest pier and abutments. Turbidity barriers will be placed around the steel sheet piling during installation and once the steel sheet piling has been installed, the turbidity barriers may be removed, as the sheet piling will adequately contain sediments produced by construction activities performed within the cofferdams. The cofferdams will be dewatered in order to permit demolition and construction operations in the dry. Water that is removed from the cofferdams during dewatering operations will be collected and filtered to remove sediments before discharge into the river.

7.2 Physical Geography, Soils, and Geology

Any soil excavated during construction of the bascule pier, rest pier or the abutments will be dewatered on-site and then transported off site by truck for upland disposal in accordance with state and local regulations. Any new fill material used during the full depth reconstruction of the roadway will be clean fill per MassDOT standard specifications. Riprap will be used to stabilize the banks of the approach roadways and to provide scour protection for the abutments and wingwalls.

7.3 Water, Wetland Resources, Wildlife, and Fisheries

All work in water activities will be conducted in accordance with requirements from the MADMF as well as MassDEP, ACOE, NMFS, and USCG permit conditions:

- MADMF recommends that all silt producing activities be contained to minimize impacts on spawning winter flounder. If the silt cannot be contained, MADMF recommends that impacts to spawning flounder should be avoided by prohibiting all silt producing activities between January 15 and May 31. As currently designed, the project will contain all silt producing activities.
- MADMF recommends minimizing the restriction to winter flounder passage to the best extent practicable. Blocking a large percent of the river with cofferdams or bottom anchored turbidity curtains could impede winter flounder passage between Stage Harbor and Mill Pond. MADMF has concurred that winter flounder should have room to pass under the bridge to get to Mill Pond to spawn.
- The western portion of the Mitchell River Bridge is within mapped eelgrass (*Zostera marina*) beds. Eelgrass beds provide one of the most productive marine habitats for numerous marine species and are designated “special aquatic sites” under the Federal Clean Water Act 404(b)(1) guidelines. The placement of new abutments, piles or any other structures should not be allowed in eelgrass beds. Currently, there are no eelgrass beds in the vicinity of the bridge.

All temporary impacts to jurisdictional wetland areas (salt marsh) will be restored on site. All permanent impacts to jurisdictional wetland areas (salt marsh) will be replicated at a nearby site at ratios consistent with MassDEP, ACOE and USCG permitting requirements (generally 2:1). In addition, the design will incorporate riprap to stabilize the slopes of the approach roadways at a slope of 1.5 to 1 (rather than the traditional 1 to 1) in order to minimize the extent of impact to jurisdictional wetlands areas.

Best management practices will be used to reduce the potential for siltation associated with construction activities. These would include the use of hay bales, silt fences, and turbidity curtains. If turbidity cannot be contained, in-water work will be conducted during allowable time periods specified by MADMF. A water tight cofferdam will be installed for the construction of the bascule pier and rest pier in order to minimize turbidity related impacts to winter flounder and eelgrass communities.

The Preferred Alternative will have less in-water piers than both the existing structure and the other build alternative (Alternative 1B). The piers will be constructed of materials that will require less frequent maintenance or replacement than timber materials. This results in reduced impact frequency to these resources over the desired 75 year service life.

7.4 Air Quality

A specification on air quality will be incorporated into contract documents to ensure compliance with the provisions of Massachusetts General Law (MGL) Chapter 111 Section 142A, "Pollution or Contamination of Atmosphere: Prevention; Regulations; Violations; Enforcement," and the Massachusetts DEP Code of Massachusetts Regulations (CMR) 310 CMR 7.09, "Dust, Odor, Construction and Demolition."

7.5 Noise

The contractor will be required to notify MassDOT and coordinate with the Town of Chatham for any exceptions to the standard work hours. The contractor will be required to submit a noise control plan and develop construction noise mitigation measures. An example of noise mitigation includes sonic or vibratory pile drivers that will minimize noise impacts during the driving of sheeting and pile, and work hour restrictions to avoid noise impacts in the sensitive overnight period.

7.6 Land Use, Public Property and Recreation

Safety concerns associate with the proximity of the existing path as the town landing parcel to the construction zone will necessitate the temporary restriction of public access to the existing path during construction. To mitigate the loss of the path during construction, the project will include a temporary path in the same quadrant of the bridge and on the same parcel allowing for equivalent access during construction. The project has been designed to limit the need for permanent and temporary easements for the new structure. Only minor land easements, temporary or permanent will be needed from the parcel on the SE quadrant (1,173 sq. ft. permanent, and 1,243 sq. ft. temporary). The design will allow for continued, unobstructed access to the Mitchell River.

The bridge is a popular location for recreational fishing; its railings include numerous fishing pole stabilizing notches carved out by local anglers. The loss of this during bridge closure for construction is an unavoidable short-term impact and no mitigation can be provided.

7.7 Cultural Resources

MassDOT proposes to mitigate the adverse effect caused by the demolition of the existing NR-eligible Mitchell River Bridge by carrying out all of the stipulations in the fully-executed Section 106 Memorandum of Agreement (Appendix J). Those stipulations include:

- MassDOT's commitment to design and build a context-sensitive new bridge based on the parameters established by Alternative 3;
- Afford the Section 106 consulting parties and the public the opportunity to review and comment on the sketch plans for the replacement bridge, including its aesthetic details, as those plans are developed; and
- Prepare archival photographic documentation of the existing bridge for distribution to the Town of Chatham.
- MassDOT and FHWA will support any future requests for NR eligibility determinations from private entities for the proposed structure, once constructed.

The MOA includes FHWA, the Massachusetts State Historic Preservation Officer, and the Advisory Council on Historic Preservation as signatories and MassDOT and the Town of Chatham as invited signatories. The MOA also provided the opportunity for all other local, statewide, and national Section 106 consulting parties to sign as concurring parties.

The use of the existing NR-eligible also necessitates the evaluation of all prudent and feasible avoidance alternatives through a Programmatic 4(f). Chapter 10 of this EA contains the Programmatic 4(f).

7.8 Hazardous Waste

All hazardous materials will be handled and disposed of in accordance with state and federal laws, including the Massachusetts Contingency Plan (310 CMR 40).

Chapter 8 Permits and Regulatory Requirements

8.1 Federal and State Decisions and Actions

This EA describes the need for the project, presents alternatives that were considered and eliminated from further consideration, and presents the environmental consequences of the Preferred Alternative on the natural and human environment. In conformance with FHWA guidance on preparing environmental documents, this EA focuses on those impact categories that have the potential for significant impact. If there are no significant impacts, a Finding of No Significant Impact (FONSI) would be issued by the FHWA.

This EA was prepared in accordance with the National Environmental Policy Act of 1969 as amended (40 CFR 1500-1508), regulations of the CEQ (40 CFR 1508.9), and FHWA regulations (23 CFR Part 771).

MassDOT is the project proponent and FHWA serves as the lead agency for NEPA compliance.

8.2 Applicable Laws, Regulations, Required Coordination, and Permits

The proposed Mitchell River Bridge will be on a similar alignment as and the functional equivalent of the existing structure. Therefore, the project will be exempt, per Section 13 of An Act Financing An Accelerated Structurally-Deficient Bridge Improvement Program, Chapter 233 of the Acts of 2008, August 4, 2008, from the state provisions of:

- Massachusetts Environmental Policy Act (MEPA) M.G.L. Section 61, and Sections 62A to 62H, inclusive of Chapter 30;
- M.G.L Chapter 91, and
- Wetlands Protection Act, Section 40 of M.G.L. Chapter 131.

The following permits and regulatory reviews are required:

- National Environmental Policy Act compliance;
- Section 106 Memorandum of Agreement;
- Programmatic Section 4(f) Evaluation for FHWA Projects that Necessitate the Use of a Historic Structure;
- Section 4(f) *de minimis* impact determination;
- U.S. Coast Guard Bridge Permit;
- U.S. Army Corps of Engineers Section 404 Individual Permit;
- MassDEP Section 401 Water Quality Certification;
- Massachusetts CZM Federal Consistency Review;
- Magnuson-Stevens Act Fisheries Conservation and Management Act;
- MADMF Consultation;
- Endangered Species Act Section 7 Consultation;
- U.S. Environmental Protection Agency National Pollutant Discharge Elimination System Permit for construction-related stormwater discharge;
- Fish and Wildlife Conservation Act.

Chapter 9 Public and Interagency Coordination

9.1 Introduction

Throughout the preliminary stages of project development for this project, federal, state, and local agencies with regulatory authority over the project have been contacted to provide input and comment. In addition, as numerous other stakeholders have stepped forward or been identified, MassDOT has made efforts to solicit comments through public information meetings, the design public hearing, and through the Section 106 consultation process. This section summarizes the agency and public outreach, as well as stakeholder groups involved in the project.

9.2 Public and Stakeholder Meetings

Public involvement for the project has been conducted in compliance with the MassDOT Project Development and Design Guide, as well as FHWA's public involvement guidance. The primary purpose of public meetings is to keep stakeholders informed about the status of the project and help identify issues of concern related to the project. The Section 106 Consultation Process also included a series of meetings with official "consulting parties." Over the course of the meetings described below, the design for the replacement of the Mitchell River Bridge has evolved in consultation with the stakeholders with the goal to provide a structurally-sound and functional bridge with a context sensitive design.

A review of key public meetings is listed below:

- Public Information Meeting held on September 3, 2009: The first public information meeting for the project was held at the Chatham Community Center. The purpose of the meeting was to provide notification of the upcoming project and to provide the scope of work, budget and schedule, as well as to solicit concerns and answer questions from the public. At this meeting, a preliminary concept (3-span, fully-modern structure with varying bascule span types) was proposed.
- Stakeholder Meeting held on November 13, 2009: Meeting with Cape Cod Commission and town stakeholders at the Chatham Historical Society covering further Context Sensitive Design (CSD) elements, NR status and ABP requirements. At that time, MassDOT was developing the project under a "not eligible for listing on the NR" determination from the MA SHPO (Appendix I). MassDOT stated that re-evaluation under Section 106 would not be conducted unless FHWA requested.
- Public Information Meeting held on November 19, 2009: The second public information meeting for the project was held to provide an update to the public on the current status of the design, as well as to solicit feedback and answer questions. At this meeting, further options to include wood in the superstructure design as well as cladding ideas were discussed.
- 25 Percent Design Public Hearing held on March 18, 2010: MassDOT presented to the public the 25% design and solicited comments from the public on the project development process. The design presented at the meeting incorporated elements from previous comments and meeting sessions to provide context sensitive solutions for the proposed bridge. Since the November 19, 2009 meetings the MA SHPO twice re-affirmed the determination of "not eligible for listing in the NR" for the Mitchell River Bridge in response to requests for determinations of eligibility made by private entities (Appendix I).
- Meeting with Chatham BOS held on August 17, 2010: MassDOT and FHWA presented information about the bridge project to the BOS. Questions were answered for the BOS, and public comments were accepted. At the conclusion of the meeting, the BOS voted unanimously in favor of supporting MassDOT design recommendations. Between the March 18, 2010 25% Design Public Hearing and the August 17, 2010 meeting, coordination between the National Trust for Historic Preservation, the ACHP and the FHWA resulted in the FHWA formally requesting a determination of eligibility from the Keeper of the National Register regarding the Mitchell River Bridge. Correspondence between these groups can be found in Appendix I while the Keeper's determination of "eligible for listing on the NR" can be found in Appendix H.
- Meeting with Chatham BOS held on October 29, 2010: As a result of the Keeper's determination, MassDOT met with the BOS to notify them of the intent to keep the bridge in the ABP and continue with developing a project that is compliant with all state/federal preservation regulations. Following the Keeper's determination, FHWA and MassDOT identified consulting parties to participate in a formal Section 106 Consultation Process.
- First Section 106 consulting parties Meeting held on January 25, 2011: This Section 106 consulting parties meeting was held to present the status of the project, the steps to move forward in the process, and the issues that needed to be addressed during the Section 106 consultation process.
- Second Section 106 consulting parties Meeting held on May 17, 2011: The second Section 106 consulting parties meeting was held to present the analysis and conclusions reached in the *Bridge Repair/ Rehabilitation Feasibility Study* that was completed in February 2011 and the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* completed in April 2011. Following the meeting and review of the documents, the Chatham Board of Selectmen, acting as the owners of the structure, voted to support Alternative 3 from the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison* (Appendix I).
- Conference call between Section 106 consulting parties held January 4, 2012. At the request of the ACHP, the Adverse Effect Finding, the draft MOA (transmitted from FHWA November 9, 2011 and included in Appendices I & J) and comments received on the draft MOA were discussed (Appendix I).
- As a result of the January 4, 2012 conference call, revisions were made to the draft MOA and transmitted to the consulting parties for review on January 26, 2012. On March 8, 2012, the final MOA was transmitted after further revisions of the MOA language resulting from comments received regarding the January 26, 2012 draft MOA. One of the stipulations of the MOA outlined public involvement moving forward:
    - Public hearing in Chatham during the EA public comment period,
    - An additional Section 106 consulting parties meeting to discuss aesthetic elements and materials for pier cap construction, and
    - An additional design public hearing in Chatham at the next stage of design.

All referenced correspondence regarding Section 106 Consultation can be found in Appendices H, I & J.

9.3 Section 106 Consulting Parties

The following list presents the Section 106 consulting parties:

- Federal Highway Administration (federal agency)
- Advisory Council on Historic Preservation (federal agency)
- Massachusetts Historical Commission (state agency)
- Massachusetts Department of Transportation (state agency)
- Chatham Board of Selectman (local government board)
- Chatham Historical Commission (local government commission)
- The Friends of the Mitchell River Wooden Drawbridge (local non-profit organization)

- Pease Boat Works and Marine Railway (local business)
- Preservation Massachusetts (statewide non-profit organization)
- National Trust for Historic Preservation (national non-profit organization)
- Historic Bridge Foundation (non-profit organization)
- Indiana Historic Spans Taskforce (non-profit organization)
- James L. Cooper, Ph.D. (consulting party to Section 106 process)
- George Meyers (consulting party to Section 106 process)

9.4 Interagency Coordination

A comprehensive interagency coordination effort is required to ensure that information is shared on a timely basis and approvals are received within a timeframe commensurate with the project schedule. The following agencies and groups have been and will continue to be consulted with: United States Coast Guard, NOAA's National Marine Fisheries Service, Massachusetts Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program, Massachusetts Department of Marine Fisheries, Chatham Board of Selectmen, Chatham Historical Commission, Chatham Conservation Commission, Chatham Harbormaster, Chatham Traffic Engineer, and the Section 106 consulting parties. Additional agencies will be consulted with during the permitting phase of the project. This includes: United States Army Corps of Engineers, Massachusetts Department of Environmental Protection, and Massachusetts Office of Coastal Zone Management.

Chapter 10 Section 4(f)

10.1 Section 4(f) Introduction

The *U.S. Department of Transportation Act of 1966*, Section 4(f) requires Department of Transportation agencies to avoid if feasible certain resources when implementing transportation improvements. These resources, collectively referred to as Section 4(f) resources, include publicly owned parks, recreation areas, wildlife or waterfowl refuges, or public or private historic properties of national, state, or local significance. This chapter describes the Section 4(f) resources within the project area that would be impacted by the alternatives under consideration.

10.2 *De Minimis* Impact Determination

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU: Pub. L. 109-59) simplified the processing for approval of projects that have only *de minimis* impacts on properties protected by Section 4 (f). A *de minimis* impact is defined as one that will not adversely affect the activities, features, and attributes that qualify the resource for protection under Section 4(f).

10.2.1 Section 4(f) Resource

Parcel 15A-1 is a Town-owned landing laid out and accepted by the town in 1908, with an area of 4252 square feet southeast of the Mitchell River Bridge. A predominantly densely wooded parcel, it abuts Bridge Street and the parcel's principal feature is a narrow natural pathway from Bridge Street that provides pedestrian access to the eastern shoreline of the Mitchell River. It is the only public way to the Mitchell River in this vicinity; the next closest public access is 0.25 to 0.5 miles away. As such, after coordination with the Town of Chatham, FHWA has determined that the parcel is a significant recreational resource because it is the lone access point to the tidal flats on the southeast quadrant of the bridge. The path is used by both recreational and commercial shell fishermen year round. The intertidal and sub-tidal portions of Mitchell River contain important shellfish resources with both natural and seeded sets of quahogs.

10.2.2 Effects of The Preferred Alternative on Section 4(f) Resource

The current design of the project will result in Parcel 15A-1 being permanently altered by the placement of rip-rap along a retaining wall. This will be accomplished by a permanent easement of 1173 square feet (28% of the parcel), although that area will remain Chatham's property. The rip-rap slope is necessary to prevent undermining associated with

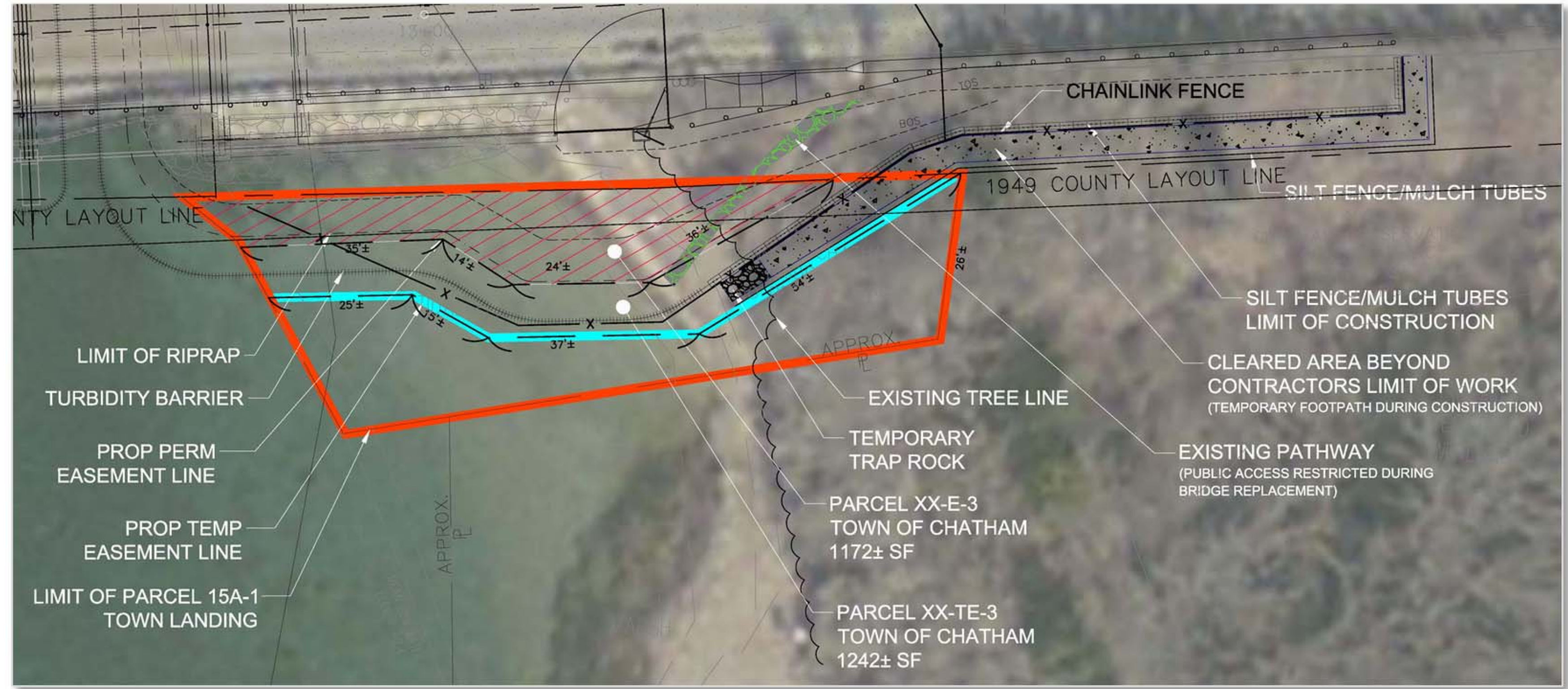

Figure 20 Parcel 15A-1

Figure 21 Parcel 15A-1 Existing Path

scour. Incorporation of a retaining wall and steeper reinforced slopes in this location minimize the alteration to the property (see figure 17). Safety concerns associated with the proximity of the existing path to the construction zone will necessitate the temporary restriction of public access to the existing path during construction.

10.2.3 Mitigation Measures

The Federal Highway Administration and the Massachusetts Department of Transportation understand that maintaining this public access is important to the community and access will be preserved as part of the reconstruction efforts of the Mitchell River Bridge. To mitigate the loss of the path during construction, the project will include a temporary path in the same quadrant of the bridge and on the same parcel allowing for equivalent access during construction (see figure 17).

The project will incorporate the temporary access path mitigation as a binding and enforceable project commitment measure that the contractor will take to ensure that equivalent public access is maintained. This will be accomplished through design elements and language in the construction contract's special provisions including notification requirements in the event that the temporary path is briefly inaccessible. FHWA will ensure that MassDOT works with the town to develop an appropriate restoration plan for the parcel and path upon completion of the bridge reconstruction.

10.2.4 Coordination

FHWA has informed the Chatham Board of Selectmen in a letter dated July 17, 2012 of its intent to make a *de minimis* impact determination for parcel 15A-1. The Town of Chatham is the owner of the parcel and, as such, the Board of Selectmen are the officials with jurisdiction over the parcel. The letter solicits comments from the board on the FHWA approach to applying the *de minimis* impact. The EA public comment period will serve as the public comment for the Section 4() *de minimis* impact determination. The *de minimis* impact determination will not be final until after the public comment period is closed and the Board of Selectmen, as officials with jurisdiction, have provided written concurrence with the determination presented in the EA. Once this concurrence is received, FWHA can determine that the use of the parcel is a *de minimis* impact.

10.3 Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges

On October 1, 2010, the Keeper of the National Register of Historic Places determined that the Mitchell River Bridge, constructed in 1980, was eligible for listing in the National Register of Historic Places. The removal of the National Register-eligible Mitchell River Bridge to construct a new bridge on the same alignment constitutes an Adverse Effect under Section 106 of the National Historic Preservation Act on the bridge, and thus a "use" of a Section 4(f) property.

10.4 Purpose and Need

In keeping with the goals of the MassDOT ABP, the purpose of the project is to remedy the bridge's structural deficiencies and functional obsolescence, while keeping with the context of the surrounding area and accommodating all existing and future uses of the bridge. For a more detailed description of the project's purpose and need, refer to Chapter 2.

10.5 Description of Project

The proposed project consists of the replacement of the Mitchell River Bridge (Bridge Street over the Mitchell River, Bridge No. C-07-001). The project location is shown on Figure 1.

The existing bridge has a NBI Sufficiency Rating of 45.9 out of 100 and the bridge is currently classified as "structurally deficient" primarily due to the poor condition of the substructure. The current condition of the timber throughout the bridge varies from "satisfactory" to "poor" and conditions are conducive to continuing deterioration. Doing nothing or performing only normal maintenance will not correct the conditions that cause the bridge to deteriorate. Furthermore, currently available maintenance and repair techniques will not extend the service life of the timber element's reasonable duration in this environment.

Based on the results of MassDOT's *Bridge Repair/Rehabilitation Feasibility Study*, dated March 8, 2011 (Appendix D), the *Bridge Alternatives Evaluation and Life Cycle Cost Comparison and Addendum*, dated April 28, 2011, including Addendum dated May 12, 2011 (Appendix E), and a Section 106 consultation with interested local, state, and national parties, MassDOT proposes to replace the existing Mitchell River Bridge with a new bridge consisting of a timber superstructure on a concrete and steel substructure with a steel bascule leaf on a concrete bascule pier (see Figures 13, 14, and 15). A detailed description of the Preferred Alternative, the Timber Superstructure on Concrete and Steel Substructure, is provided in Section 3.3.2.2 of Chapter 3.

10.6 Programmatic Section 4(f) Applicability

Section 4(f) of the Department of Transportation (DOT) Act of 1966, as amended in 1983, specifies that: "The Secretary of DOT may approve a transportation program or project requiring the use of publicly owned land of a park, recreation area, of wildlife or waterfowl refuge, or land of a historic site of National, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, recreation area, refuge, or site) only if:

- There is no feasible and prudent alternative to using that land; and
- The program or project includes all possible planning to minimize harm to the park, recreation area, wildlife or waterfowl refuge, or historic site resulting from the use.

Section 4(f) is governed by the regulations in 23 CFR 774. 23 CFR 774.3(d) states: "Programmatic Section 4(f) evaluations are a time-saving procedural alternative to preparing individual Section 4(f) evaluations under paragraph (a) of this section for certain minor uses of Section 4(f) property. Programmatic Section 4(f) evaluations are developed by the Administration based on experience with a specific set of conditions that includes project type, degree of use and impact, and evaluation of avoidance alternatives. An approved programmatic Section 4(f) evaluation may be relied upon to cover a particular project only if the specific conditions in the programmatic evaluations are met."

As part of administering this act, the FHWA has prepared a Programmatic Section 4(f) Evaluation for certain federally-assisted highway projects affecting bridges that are on or eligible for inclusion on the National Register of Historic Places. The criteria that must be met to apply this programmatic evaluation and the proposed project's applicability are as follows:

The bridge is to be replaced or rehabilitated with Federal funds.

MassDOT proposes to use federal GANS to replace the Mitchell River Bridge.

The project will require the use of a historic bridge structure which is on or eligible for listing on the National Register of Historic Places.

On October 1, 2010, the Keeper of the National Register of Historic Places determined that the Mitchell River Bridge is eligible for listing in the National Register, qualifying the bridge as a Section 4(f) property. MassDOT proposes to replace the bridge with a new structure at the same location. In accordance with Section 106 of the National Historic Preservation Act, the FHWA determined, and the Massachusetts Historical

Commission concurred, that the replacement of the bridge will result in an Adverse Effect, and thus there will be a Section 4(f) "use" of the bridge.

The bridge is not a National Historic Landmark.

The Mitchell River Bridge is not listed as a National Historic Landmark.

The FHWA Division Administrator determines that the facts of the project match the sections of the Programmatic Section 4(f) Evaluation for FHWA Projects that Necessitate the Use of Historic Bridges labeled Alternatives, Findings, and Mitigation.

This document has been prepared in compliance with the requirements of the FHWA Programmatic Section 4(f) Evaluation for FHWA Projects that Necessitate the Use of Historic Bridges. MassDOT considered four alternatives (see Section 10.7 for the alternatives analysis) for the proposed project including the:

- No-Build Alternative;
- Build on New Location Without Using Old Bridge Alternative;
- Rehabilitation Without Affecting the Historic Integrity of the Bridge Alternative; and
- Bridge Replacement Alternative.

Agreement among the FHWA, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) has been reached through procedures pursuant to Section 106 of the NHPA.

FHWA and MassDOT coordinated a series of meetings of the Section 106 consulting parties in January and May 2011 and January of 2012. The Section 106 signatories consisted of FHWA, the Advisory Council on Historic Preservation (ACHP), and the Massachusetts State Historic Preservation Officer (SHPO) while MassDOT and the Chatham Board of Selectmen were invited signatories. Concurring parties who participated in the Section 106 consultation process included the Chatham Historical Commission, the National Trust for Historic Preservation, the Friends of the Mitchell River Wooden Drawbridge (an ad hoc local historic preservation advocacy group), Preservation Massachusetts, Pease Boat Works, Indiana Historic SPANS Taskforce, the Historic Bridge Foundation, James Cooper, PhD, and George Meyers. At the conclusion of these Section 106 consultation meetings (allowing adequate time for the parties to provide written comments to FHWA and MassDOT, included in Appendix I), MassDOT prepared appropriate documentation describing the project's unavoidable Adverse Effect on the NR-eligible bridge. The Adverse Effect finding and draft MOA were transmitted to Section 106 consulting parties on November 8, 2011. A conference call between all Section 106 consulting parties was held on January 4, 2012, at the request of the ACHP, to discuss the Section 106 Adverse Effect Finding, the draft MOA and comments received regarding the MOA. The MOA was revised twice further and transmitted on January 26, 2012 (as Draft) and March 8, 2012 (as Final). The final MOA was executed with all required signatories concurring and is included as Appendix J.

10.7 Description of the Section 4(f) Resources

The Mitchell River Bridge (Bridge No. C-07-001) carries Bridge Street over the Mitchell River between Stage Harbor Road and Main Street in Chatham, Massachusetts. The bridge is 192 feet long and consists of a 12 span, timber trestle structure including a single-leaf bascule-type lift span.

There has been a timber drawbridge at this location continually since 1858 or 1871 (historical records are unclear). The bridge has been replaced, reconstructed, and modified numerous times since the bridge was initially constructed. Within the last century, the bridge has required major reconstruction or complete replacement in 1925, 1949, and 1980. The current Mitchell River Bridge is 32 years old.

The 1980 reconstruction required the complete replacement of the Mitchell River Bridge superstructure. Only some of the existing timber piles and the concrete abutments were retained. The pivot for the bascule span was relocated to the opposite side of the channel. Additional piles were added to supplement the existing piles and the timber pile caps and bracing were replaced.

On October 1, 2010, the Keeper of the National Register determined that the Bridge was eligible for listing on the National Register of Historic Places (see Appendix H). The Keeper's finding overturned a series of earlier findings by the MA SHPO in 1984, 1985, and more recently in January, February, and July of 2010, that the bridge was not eligible for listing in the National Register (Appendix I).

10.7.1 Existing Bridge Characteristics

The Mitchell River Bridge currently has a clear roadway width of 24 feet and carries one lane of traffic in each direction. The bridge includes sidewalks on each side of the roadway behind timber curbs, with timber bridge railings at the back of sidewalk. The sidewalks range in width from over 2 feet to over 5 feet wide.

The superstructure includes a 3 x 8-inch sawn lumber plank timber wearing surface with the planks oriented at 60 degrees to the roadway centerline extending the width of the roadway. The timber wearing surface is supported on and nailed to 4 x 8-inch sawn lumber plank timber structural deck, with the planks oriented perpendicular to the roadway centerline extending the full width of the bridge. The timber deck is supported on 6 x 16-inch sawn lumber stringers at 15.5 inches on center. The timber curbs consist of 8 x 8-inch sawn lumber members elevated on top of 6 x 8-inch spacers at 6 feet on center. The timber bridge railing consists of 8 by 8-inch posts, 6 x 6-inch top rails, 10 x 5-inch intermediate rails and 6 x 4-inch bottom rails and curbs.

The substructure at the ends of the bridge consists of concrete abutments supported on timber piles. The abutments include integral concrete wing walls (retaining walls) that extend along the approach roadway at the back of sidewalk that retain the roadway embankment. The substructure over the waterway consists of pile bents with timber piles and 16 x 14-inch sawn lumber caps and 6 x 12-inch sawn lumber lateral and longitudinal timber bracing members.

The bascule span provides approximately 19 feet of horizontal clearance between fenders and approximately 7 feet of vertical clearance above mean high water with the bascule leaf in the lowered position. The pivot for the bascule leaf is on the west side of the navigation channel. The bascule leaf is approximately 23 feet from pivot to tip. It rotates to a maximum angle of approximately 75 degrees from the horizontal position in the fully raised position. With the bascule leaf in the fully raised position, the bascule leaf overhangs the west fender and provides unlimited vertical clearance for a width of approximately 15 feet between leaf tip and east fender. The timber stringers for the bascule leaf are located between the timber stringers of the approach spans.

In order to reduce the loads on the operating machinery, the bascule leaf is balanced with a counterweight hung from the underside of an extension of bascule leaf timber stringers that extends under the approach span deck a length of approximately 9 feet from the pivot. The counterweight consists of a galvanized steel box filled with concrete and steel ballast. The bascule span is operated by a pair of electric winches, one in each sidewalk on the approach spans, west of the bascule span. Each winch draws in and pays out a five-eighths inch wire operating rope attached to a pulley system for additional mechanical advantage. An electrical control cabinet is located on the north sidewalk behind the winch. Traffic is controlled during bridge operations using electrically operated, horizontally pivoting warning gates and post mounted traffic signals along the roadway approaching the bridge.

10.7.2 Bridge Condition

Overall, the Mitchell River Bridge is in poor condition, particularly the substructure. The bridge currently has an NBI Sufficiency Rating of 45.9 out of 100 and is currently classified as "structurally deficient" primarily due to the poor condition of the substructure. Sufficiency Ratings are used in part to determine whether a bridge is eligible for Federal Highway Bridge Program replacement funds. A bridge with a Sufficiency Rating less than 50 is eligible for FHWA bridge replacement or bridge rehabilitation funds. The current condition of the timber throughout the bridge varies from "satisfactory" to "poor" and site conditions (timber structure within a marine tidal environment) are conducive to continuing deterioration.

In addition to the current deficiencies in the structural condition, there are functional and safety concerns that need to be addressed. The bridge would be classified as "functionally obsolete" due to the substandard roadway width, if it were not for the current "structurally deficient" classification. Functional and safety concerns include substandard curbs and bridge railings, substandard guardrails and associated end treatments and transitions, substandard sidewalk widths that do not meet accessibility requirements, and substandard pedestrian railings.

Further, the drawbridge does not operate reliably and the operating equipment does not meet standards for safety and maintainability. The current navigation opening is inadequate to serve the needs of the boating community.

10.8 Impact on Section 4(f) Resources

The proposed project requires the removal and replacement of the Mitchell River Bridge. Since the bridge is individually eligible for listing on the NR, it is a Section 4(f) property. The proposed demolition of the bridge has resulted in an Adverse Effect under Section 106 of the NHPA, which triggers the preparation of a Section 4(f) evaluation.

10.9 Alternatives to Avoid Section 4(f) Resources

MassDOT evaluated numerous alternatives for this project. Throughout this evaluation, MassDOT sought ways to avoid or minimize impact to Section 4(f) resources. The avoidance alternatives MassDOT evaluated include:

- The No-Build Alternative;
- The Build on a New Location without Using the Old Bridge Alternative; and
- The Rehabilitation without Affecting the Historic Integrity of the Bridge Alternative.

The results of the evaluation of each of these alternatives are presented below. A comparison of all alternatives evaluated by MassDOT is provided on Table 1 on page 6.

10.9.1 No-Build Alternative

The No-Build Alternative has been dismissed because it would not meet the purpose and need of the project. The existing bridge is in very poor condition, having a NBI Sufficiency Rating of 45.9 out of 100. The bridge is currently classified as "structurally deficient" primarily due to the poor condition of the substructure. The current condition of the timber throughout the bridge varies from "satisfactory" to "poor" and conditions are conducive to continuing deterioration. Doing nothing or performing only normal maintenance will not correct the conditions that cause the bridge to deteriorate, ultimately resulting in bridge closure. In this environment, currently available maintenance and repair techniques will not extend the service life of the timber elements to a reasonable duration.

Furthermore, due to a design error in the 1980 bridge replacement, the bascule span of the existing bridge does not extend into a full upright position. The operating machinery is also unreliable. If the operating machinery were to fail, the bascule span of the existing bridge would need to be removed to ensure safe passage of boats. Even this condition may not satisfy the maritime safety concerns of the USGC who may ultimately request that the entire bridge be removed.

The No-Build Alternative would not satisfy the purpose and need of the project because this alternative would not remedy the bridge's structural deficiencies and functional obsolescence while keeping with the context of the surrounding area and accommodating all existing and future uses of the bridge. The No-Build Alternative is further described in Section 3.3.1 of Chapter 3.

10.9.2 Build on a New Location Without Using the Existing Bridge Alternative

The Build on a New Location Without Using the Existing Bridge Alternative is not considered to be a feasible or prudent alternative. This alternative would require construction of a new bridge and approach roadways on new location either to the north or south of their current location, while maintaining roadway access between Stage Harbor Road and Main Street in Chatham. The project area is an ecologically sensitive location, having wetlands (including salt marsh), shellfish growing areas, anadromous fish species habitat, FEMA floodplain, publicly-owned parcels, residences, and the Stage Harbor Marina all within close proximity of the bridge (Figure 16).

The bridge is located at the narrowest point of the Mitchell River. A replacement structure on a new location would require a longer span, resulting in substantially greater disruption of the previously mentioned natural and social environmental resources and greatly increased construction cost.

Under this alternative, it would not be feasible and prudent to preserve the existing bridge. The existing bridge has been found to be beyond rehabilitation for transportation. As the structure continues to deteriorate, the bridge would be unsuitable for alternative uses. At a certain point, USCG may require removal or demolition of the bridge.

The following sections provide more detail on replacing the bridge either north or south of its existing location.

10.9.2.1 Relocating Bridge to the South

Relocating the bridge and approach roadways immediately to the south (within 150 feet) would require the full acquisition of four residential properties along Bridge Street and a partial taking of the Stage Harbor Marina. This alternative would also require the acquisition of a parcel owned by the Town of Chatham and a conservation parcel owned by the Chatham Conservation Foundation.

Relocating the bridge and approach roadway further to the south (within 500 feet) would require constructing the approach roadways within a greater area of floodplain compared to existing and would require acquisition of public open space parcels west of the river. A partial property taking from a residential property on Cotton Sedge Way would also be required.

Either option for relocating the bridge to the south would result in substantial impact to sensitive natural environmental resources within the Mitchell River and Stage Harbor Embayment, including greater wetlands impacts and EFH impact. The current bridge is located at a narrow opening in the river, and any relocation to the south would require a substantially longer bridge with more piers and piles in the waterway. A longer span would increase the cost of the bridge replacement project substantially.

10.9.2.2 Relocating Bridge to the North

Relocating the bridge and approach roadways immediately to the north (within 150 feet) would require construction within floodplain and the full acquisition of two residential properties along Stage Harbor Road. The floodplain within the project area is described in Section 4.3.4.

Relocating the bridge and approach roadway further to the north (within 500 feet) would require constructing the approach roadways within floodplain (east and west of the river) and would require acquisition of public parcels owned by the Town of Chatham west of the river. Acquisition of a large residential property east of the river on Bridge Street would also be required.

Either option for relocating the bridge to the north would result in substantial impact to sensitive natural environmental resources within the Mitchell River and Stage Harbor Embayment, including greater wetlands impacts and EFH impact compared to the current proposal. The current bridge is located at a narrow opening in the river, and any relocation to the north would require a substantially longer bridge with more piers and piles in the waterway. A longer span would increase the cost of the bridge replacement project substantially.

Overall, the Build on a New Location Without Using the Old Bridge Alternative is not prudent because of the extraordinary social, economic, and environmental disruption building on a new location would cause in the project area. For the reasons stated above, the Build on a New Location Without Using the Old Bridge Alternative is not considered feasible and prudent and has been dismissed.

10.9.3 Rehabilitation Without Affecting the Historic Integrity of the Bridge Alternative

MassDOT evaluated the Rehabilitation without Affecting the Historic Integrity of the Bridge Alternative to determine if there was a way to avoid or minimize adverse effects on the National Register-eligible Mitchell River Bridge through bridge rehabilitation.

As documented in the *Bridge Repair/Rehabilitation Feasibility Study* (Appendix D), there is not a feasible and prudent rehabilitation alternative for the Mitchell River Bridge. Further, even if there were a feasible and prudent manner to rehabilitate the bridge so that it would no longer be classified as "structurally deficient", the bridge would remain "functionally obsolete" due to the substandard roadway width. The bridge has two 12' travel lanes with no shoulders, which is considered substandard.

The following are the conclusions of the *Bridge Repair/Rehabilitation Feasibility Study* (Appendix D) describing the numerous specific reasons why rehabilitation of the Mitchell River Bridge is not a feasible and prudent alternative.

> *"Although technically feasible to repair or rehabilitate the existing bridge, all feasible schemes have significant consequences or leave significant deficiencies. Although some of the consequences and deficiencies individually may be considered minor, the cumulative impact of these is significant. Specific consequences of maintaining, repairing or rehabilitating the existing timber bridge include the following:*
>
> - *The effort to maintain the existing timber bridge will continue to be a significant effort and a burden to the Town of Chatham in terms of maintenance cost and disruptions to the traveling public with continual piecemeal replacement and/or repair of timber members.*
> - *Although not all timber elements of the bridge currently need to be replaced, it is not cost effective or technically feasible to repair, strengthen or replace certain elements without removing other elements. Although certain timber members can be replaced on an individual basis (e.g. wearing surface, railing, curbs, bracing, fender system, sheave poles and lifting beam) other major elements (e.g. structural deck, stringers, cap beams, and piles) cannot be replaced without removal of a significant number of other elements.*
> - *Continued replacement, repair and strengthening of the timber cannot be sustained indefinitely as this work will eventually weaken members and create conditions that promote further decay. As such, all timber members will eventually need to be replaced.*
> - *Modern strengthening methods such as fiber reinforced polymer (FRP) sheets or pile jackets are expensive relative to the cost of the timber, do not have a long term performance history for use in salt water environments, and may introduce visual impacts.*
> - *Extending the service life of the existing timber members using in-place preservative treatments is not prudent due to the need for frequent reapplication of the treatment and because of significant environmental and human health concerns. The currently available treatment techniques and chemical preservatives have limited effectiveness and require frequent reapplication (every 5 to 10 years). Some of the treatment would require removal of significant portions of the bridge to provide access for the retreatment. Because of the human health and environmental contamination risks, there is a risk that this treatment will not be permitted for use in this environment.*
> - *Repair or rehabilitation will not fully address the limited navigation opening. Navigation through the bridge continues to be a challenge and a safety concern for the boating community. As such, the boating community has requested improvements to the navigation opening with a preferable minimum horizontal clear opening width with unlimited vertical clearance of 25'-0". Evaluation of the existing bascule span geometry confirmed, with the existing constraints, modifications to the bascule span would at best yield only a 19'-4" wide navigation opening with unlimited vertical clearance. A major repair or rehabilitation effort that replaces the majority of timber components throughout the bridge may be viewed by the US Coast Guard as more of a bridge replacement and as such there is a risk that the project may not be permitted unless the navigation channel is improved to adequately address the concerns of the boating community.*
> - *Although rehabilitation can correct some of the functional and safety concerns, it is not feasible to significantly improve the narrow roadway width on the bridge. With the narrow roadway width, it is advisable to maintain low traffic speed across the bridge. The current significant wear of timber wearing surface promotes lower traffic speeds, which reduces the likelihood of crashes. However, with the replacement of the timber wearing surface and corresponding improvement in the smoothness of the riding surface, traffic speeds are anticipated to increase, which increases the concerns with the narrow roadway width."*

Further, it is not be possible to rehabilitate the bridge without affecting the historic integrity of the bridge. Rehabilitation of the bridge would require replacement of a majority of the bridge elements (this would result in a project virtually the same as Bridge Replacement Alternative 1), possibly resulting in an adverse effect under Section 106. A Section 106 Adverse Effect finding would result in a Section 4(f) use of the bridge.

For the reasons stated above, the Rehabilitation Without Affecting the Historic Integrity of the Bridge Alternative is not feasible and prudent, will not satisfy the purpose and need of the project and, therefore, has been dismissed.

10.9.4 Conclusion

The three alternatives to avoid the impact to Section 4(f) resources are not prudent and feasible, and they do not satisfy the purpose and need of the project. Neither of these alternatives would address the structural deficiencies of the existing bridge, as documented in the *Bridge Repair/Rehabilitation Feasibility Study* (Appendix D). As such, these avoidance alternatives have been dismissed from further consideration.

10.10 Replacement Alternative – Preferred Alternative

Section 10.9 presents information that there's no prudent and feasible alternative to the replacement of the Mitchel River Bridge. Therefore, MassDOT evaluated the seven bridge replacement alternatives in light of the project's purpose and need, the requirements of the ABP, and the results of the design criteria evaluation. In order to analyze the ability of these seven alternatives to meet the project purpose and need, six design criteria were identified. The design criteria utilized were:

<u>Roadway Function and Safety</u>: Alternative meets current design criteria and standards for functionality and safety for all users; traffic railings that separate the sidewalks from the roadway for protection of pedestrians from vehicular traffic; sidewalks meet accessibility and safety standards; loading capacity is adequate.

<u>Context Sensitivity</u>: Alternative is context sensitive to the site and character of the surrounding area and mitigates the adverse impacts to the NR-eligible bridge.

<u>Navigational Function and Safety</u>: Alternative improves navigation safety and reliability by promoting optimum navigable clearances for commercial and recreational users of Mitchell River and Stage Harbor.

<u>Life Cycle Costs</u>: Alternative provides a cost effective design striving to meet a service life of at least 75 years with low maintenance costs.

<u>Maintenance and Reliability</u>: Alternative minimizes future maintenance, improves operational safety and reliability, and reduces operation duration while minimizing disruption to all users.

<u>Environmental Resources</u>: Alternative considers initial and future impacts to environmental resources.

As shown in Table 1, each alternative was rated on how well it met the design criteria. An alternative could be rated as good, satisfactory, fair, or poor in each design criteria category.

MassDOT also carefully considered the input from the Section 106 consulting parties. Ultimately, MassDOT selected Alternative 3 as the preferred alternative. In a letter dated May 31, 2011, the Chatham Board of Selectmen indicated their support for Alternative 3 as the preferred alternative as "embodying the most prudent balance of aesthetic, functional, and financial benefits for the Town of Chatham" (Appendix I).

Alternative 3 has the best balance of a context-sensitive timber superstructure with a long lasting concrete and steel substructure. Alternative 3 will provide a new bridge structure that will fit in well with the existing rural coastal community in Chatham and will also provide a substantially improved bascule span opening width with reliable operating machinery that will benefit the boating community. Also, Alternative 3 would not require the more frequent substructure replacement, with associated disturbances of the marine environment, related to the alternatives with timber substructures.

10.11 Measures to Minimize Harm

MassDOT proposes to mitigate the Adverse Effect on the Mitchell River Bridge (C-07-001) through use of a context-sensitive design, continued coordination with the Section 106 consulting parties, and archival-quality photographic recordation of the bridge. In addition, MassDOT will advertise the existing Mitchell River Bridge as available for an alternative use, provided a responsible party is identified who agrees to maintain and preserve the bridge.

The MOA includes mitigation of the project's Adverse Effect to the bridge (Appendix J). The MOA has been signed by FHWA, MassDOT, ACHP, the MA SHPO, and the Town of Chatham. The MOA's mitigation program consists of the following:

- FHWA shall ensure that MassDOT designs and constructs a context-sensitive bridge to replace the existing National Register-eligible Mitchell River Bridge;
- FHWA shall invite all Section 106 consulting parties to a public meeting in Chatham to consult on further refinement of the sketch plans and aesthetic details of the proposed new bridge. This public meeting will be held in addition to the project's design public hearing and the NEPA Environmental Assessment public hearing; and
- FHWA and MassDOT shall afford the Section 106 consulting parties the opportunity to review and comment on sketch plans and ornamental and aesthetic details of the new replacement bridge and pier cap materials;
- FHWA shall ensure that MassDOT prepares archival-quality photographic documentation depicting numerous views of the Mitchell River Bridge and context views showing the bridge in relation to its setting.
- MassDOT and FHWA will assist in efforts for an NR eligibility determination for the replacement bridge being made by any of the consulting parties.

10.12 Coordination with Public Officials

During the project development process (summer 2009 through present), MassDOT and FHWA have conducted numerous meetings with the public concerning the Mitchell River Bridge Project, including the Chatham Board of Selectmen, the Chatham Historical Commission, the Cape Cod Commission, individual groups, public information meetings, and the 25 Percent Design Public Hearing. Chapter 9 further details the project development process with the public, stakeholders and Section 106 consulting parties.

In compliance with Section 106 of the National Historic Preservation Act, FHWA and MassDOT initiated a Section 106 consultation process to reach consensus on the most appropriate bridge replacement structure type. Meetings were held with the Section 106 consulting parties and other interested parties in Chatham, Massachusetts on January 25, 2011, May 17, 2011 and a conference call with all Section 106 consulting parties was held on January 4, 2012. The Section 106 consulting parties consist of representatives from the following organizations:

- FHWA
- MassDOT
- ACHP
- SHPO
- BOS

The following is a list of interested parties who participated in Section 106 consultation meetings:

- Chatham Historical Commission
- National Trust for Historic Preservation
- Preservation Massachusetts
- Pease Boat Works
- Friends of the Mitchell River Wooden Drawbridge
- George Meyers, Chatham Resident
- Historic Bridge Foundation
- Indiana Historic Bridge Taskforce
- James Cooper, Bridge Historian

Ultimately, FHWA, MassDOT, the ACHP, the SHPO, and the Chatham BOS entered into a Section 106 MOA to mitigate the adverse effect that will be caused by the removal of the National Register-eligible Mitchell River Bridge. That MOA went into effect on May 14, 2012 upon its being signed by the Executive Director of the ACHP (Appendix J).

10.13 Findings

Based on the above consideration, there are no prudent and feasible alternatives to the replacement of the National Register-eligible Mitchell River Bridge (C-07-001). The proposed action includes all possible planning to minimize harm that will be caused by the use of the Mitchell River Bridge.

MassDOT examined several project alternatives including the No-Build Alternative, the Build on a New Location without Using the Existing Bridge Alternative, and the Rehabilitation without Affecting the Historic Integrity of the Bridge Alternative. MassDOT undertook an extensive examination of bridge rehabilitation alternatives in MassDOT's *Bridge Repair/Rehabilitation Feasibility Study*, (Appendix D).

MassDOT also carefully considered the input from the Section 106 consulting parties. Ultimately, MassDOT selected Alternative 3 as the preferred alternative. Alternative 3 has the best balance of a context-sensitive timber superstructure with a long lasting concrete and steel substructure. Alternative 3 would provide a new bridge structure that will fit in well with the existing rural coastal community in Chatham and would also provide a substantially improved bascule span opening width with reliable operating machinery that will benefit the boating community. Also, Alternative 3 would not require the more frequent substructure replacement, with associated disturbances of the marine environment, related to the alternatives with timber substructures.

MassDOT proposes to minimize the Adverse Effect of the replacement of the Mitchell River Bridge with the completion of the mitigation measures outlined above.

This Programmatic Section 4(f) Evaluation for the Mitchell River Bridge Replacement Project (Bridge No. C-07-001) has been prepared pursuant to Section 4(f) of the Department of Transportation Act of 1966, 49 USC 303 and 23 USC 138. Based upon the attached information:

I have determined that the project meets the applicability criteria set forth in the PROGRAMMATIC SECTION 4(f) EVALUATION FOR FHWA PROJECTS THAT NECESSITATE THE USE OF HISTORIC BRIDGES.

I have determined that all alternatives set forth in the Findings section of the PROGRAMMATIC SECTION 4(F) EVALUATION FOR FHWA PROJECTS THAT NECESSITATE THE USE OF HISTORIC BRIDGES have been fully evaluated and that there are no feasible and prudent alternatives to the replacement of Bridge No. C-07-001, Bridge Street over the Mitchell River.

I have determined that the project complies with the Measures to Minimize Harm section of the PROGRAMMATIC SECTION 4(F) EVALUATION FOR FHWA PROJECTS THAT NECESSITATE THE USE OF HISTORIC BRIDGES and assure that these measures will be implemented.

Pamela S. Stephenson   Oct 25, 2012

Pamela S. Stephenson   Date
Division Administrator
Massachusetts Division
Federal Highway Administration

Attachments

Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ABP	Accelerated Bridge Program
ACHP	Advisory Council for Historic Preservation
ACOE	Army Corps of Engineers
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
ASMFC	Atlantic States Marine Fisheries Commission
AUL	Activity Use Limitation
AWPA	American Wood Protection Association
BFE	Base Flood Elevation
BMP	Best Management Practice
BOS	Board of Selectmen
BUAR	Board of Underwater Archaeological Resources
BVW	Bordering Vegetated Wetlands
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHC	Chatham Historical Commission
CMR	Code of Massachusetts Regulations
CO	Carbon Monoxide
CSD	Context Sensitive Design
CZM	Coastal Zone Management
DPA	Designated Port Area
DSGA	Designated Shellfish Growing Areas
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
Friends	Friends of the Mitchell River Wooden Drawbridge
FWS	Fish and Wildlife Service
GAN	Grant Anticipatory Notes
HAPC	Habitat Areas of Particular Concern
HTL	High Tide Line
IVW	Isolated Vegetated Wetland
Keeper	The Keeper of the National Register of Historic Places
LCCA	Life Cycle Cost Analysis
LUW	Land Under Water
MassDEP	Department of Environmental Protection
MassDOT	Department of Transportation
MassGIS	Geographic Information System
MDMF	Department of Marine Fisheries
MEPA	Massachusetts Environmental Policy Act
MGL	Massachusetts General Law
MHC	Massachusetts Historical Commission
MHW	Mean High Water
MLW	Mean Low Water
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum
NBI	National Bridge Inventory
NBIS	National Bridge Inspection System
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHESP	National Heritage and Endangered Species Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOx	Nitrogen Oxide
NPL	National Priorities List
NR	National Register
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
Pb	Lead
PM10	Inhalable Coarse Particulate Matter
PM2.5	Fine Particulate Matter
ROW	Right of Way
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SHPO	State Historic Preservation Office
SO2	Sulphur Dioxide
SOB	Special Obligatory Bonds
TMDL	Total Maximum Daily Load
USC	United States Code
USCG	United States Coast Guard
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WHSRN	Western Hemisphere Shorebird Reserve Network
YOY	Year of Young

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