# ENVIRONMENTAL ASSESSMENT

# and DRAFT SECTION 4(f) EVALUATION

Brunswick-Topsham

Frank J. Wood Bridge

Cumberland and Sagadahoc County, Maine

Federal ID:  STP-2260(300)

MaineDOT WIN: 22603.00

February 2018

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Submitted pursuant to 42 U.S.C. 4332
and 23 CFR 771
and 49 U.S.C. 303 and 23 CFR 774
By the

Federal Highway Administration
and
Maine Department of Transportation

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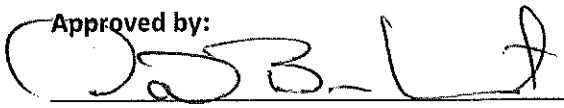

David Bernhardt, MaineDOT Commissioner — 2/22/18 Date

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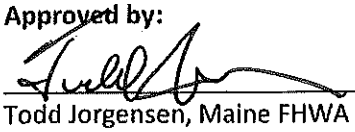

Todd Jorgensen, Maine FHWA Division Administrator — 2/27/18 Date

# Table of Contents

List of Appendices

# Introduction

The National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] Part 1500 through 1508), and the Federal Highway Administration (FHWA) regulations implementing NEPA (23 CFR Part 771.101 through 771.139) direct FHWA to take into consideration the environmental consequences of proposed federal actions. In compliance with NEPA and its implementing regulations, this environmental assessment (EA) analyzes potential environmental impacts of the Preferred Alternative and other reasonable alternatives that would meet the purpose and need of the proposed project as well as a No Build Alternative. The No Build Alternative also serves as an environmental baseline against which all other alternatives can be compared. FHWA will use the findings in this EA to determine whether to prepare an Environmental Impact Statement (EIS).

# Background

The Frank J. Wood Bridge carries US 201 and ME 24 over the Androscoggin River between the Towns of Brunswick and Topsham. The Brunswick Hydroelectric Dam is approximately 500 feet upriver of the bridge and is a power generation facility licensed to Brookfield White Pine Hydro, LLC. The Federal Energy Regulatory Commission (FERC) Boundary for the hydroelectric project is at elevation 17.35 (NAVD 88) which includes areas upstream and downstream of the existing bridge as well as portions of the existing bridge. Upstream fish passage at the dam also occurs via a vertical slot fish way adjacent to the powerhouse and on the western bank upstream. The Brunswick approach south of the bridge includes the 250th Anniversary Park east of US 201/ME 24 and the Fort Andross Mill Complex (originally the Cabot Mill) on the west. The Topsham approach includes the Bowdoin Mill Complex (originally the Pejepscot Paper Company) on the eastern side and a mixed use commercial building west of US 201/ME 24. Both Fort Andross and the Bowdoin Mill house a variety of shops, businesses, and restaurants. Figure 1 shows all of these properties in relationship to the Frank J. Wood Bridge. The Frank J. Wood Bridge is a key vehicular and pedestrian connection between the business districts and communities of Brunswick and Topsham.


**Figure 1: Frank J. Wood Bridge Project Vicinity**

The Frank J. Wood Bridge is one of three vehicular crossings of the Androscoggin River between Brunswick and Topsham. Approximately 19,000 vehicles a day travel across the bridge. About 2 miles upstream, I-295 crosses the river; it has interchanges with U.S. 1 on the Brunswick side and ME 196 on the Topsham side. Less than 1 mile downstream, ME 196 (also known as the Coastal Connector) crosses the river. In addition to these vehicular crossings, the Androscoggin Swinging Bridge is a pedestrian crossing of the river about ½ mile upstream of the Frank J. Wood Bridge. Figure 2 shows these crossings.


**Figure 2: Existing Androscoggin River crossings between Brunswick and Topsham**

The Frank J. Wood Bridge was constructed in 1932. It is an 805-foot-long, three span steel through-truss bridge supported by concrete abutments and two concrete piers. The travel way through the truss is 30 feet wide, with two 11-foot travel lanes and two 4-foot shoulders. The existing bridge carries a single sidewalk on the west side of the bridge. Because the outer 2 feet of the shoulders are made of an open steel grid, the usable shoulder width for bicycle travel is reduced to 2 feet on either side.

The Frank J. Wood Bridge was rehabilitated most recently in 2015, 2006, and 1985. It is a "fracture critical" structure, indicating it is vulnerable to sudden collapse if certain components fail. The truss diagonal and bottom chord members and their connections and the floor beams are the critical components (see Figure 3 for structure terminology). A "fracture critical" bridge is defined by the FHWA as a steel member in tension, or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse. Fracture critical bridges, of which there are a total of about 18,000 throughout the U.S., lack redundancy, which means that in the event of a steel member's failure there is no path for the transfer of the weight being supported by that member to hold up the bridge. Because of this designation, more detailed inspections are required and have been completed. Inspections by MaineDOT, most recently in August 2016, June 2016, and in 2012 found many deteriorated areas. There is corrosion and section loss in the steel floor system supporting the deck (the transverse cross beams, longitudinal stringers, and transverse floor beams). The floor system, bottom chords, and the concrete deck are currently in poor condition. Corrosion at the deteriorated areas is continuing and accelerating. Further, MaineDOT completed a load rating in 2013, updated it in August 2016, and found some floor system members are no longer adequate to support Maine's legal vehicle weights. The bridge is now posted for 25 tons.

MaineDOT initiated a Bridge Improvement Project for the Frank J. Wood Bridge in February 2015. The scope of the project was to assess the feasibility of a range of alternatives to address the bridge condition, from rehabilitation to full replacement. In April and May 2017, MaineDOT completed temporary repairs to address the most critical needs. Steel was added to the worst sections of the floor system beneath the deck, and missing and deteriorated rivets were repaired or replaced. These temporary repairs will maintain the current 25-ton load rating for until 2022 when long-term capital improvements can be developed and completed.

FHWA and MaineDOT initially proposed to prepare a Categorical Exclusion for this project under 23 CFR 771.117(d)(3). However, due

to the presence of several environmental resources within the project area such as historic properties and districts, and threatened and endangered species and critical habitat, in addition to substantial public interest and controversy, FHWA and MaineDOT decided to prepare an Environmental Assessment (EA). The EA will help decide whether an Environmental Impact Statement would be needed and if there would be significant impacts resulting from the proposed action.

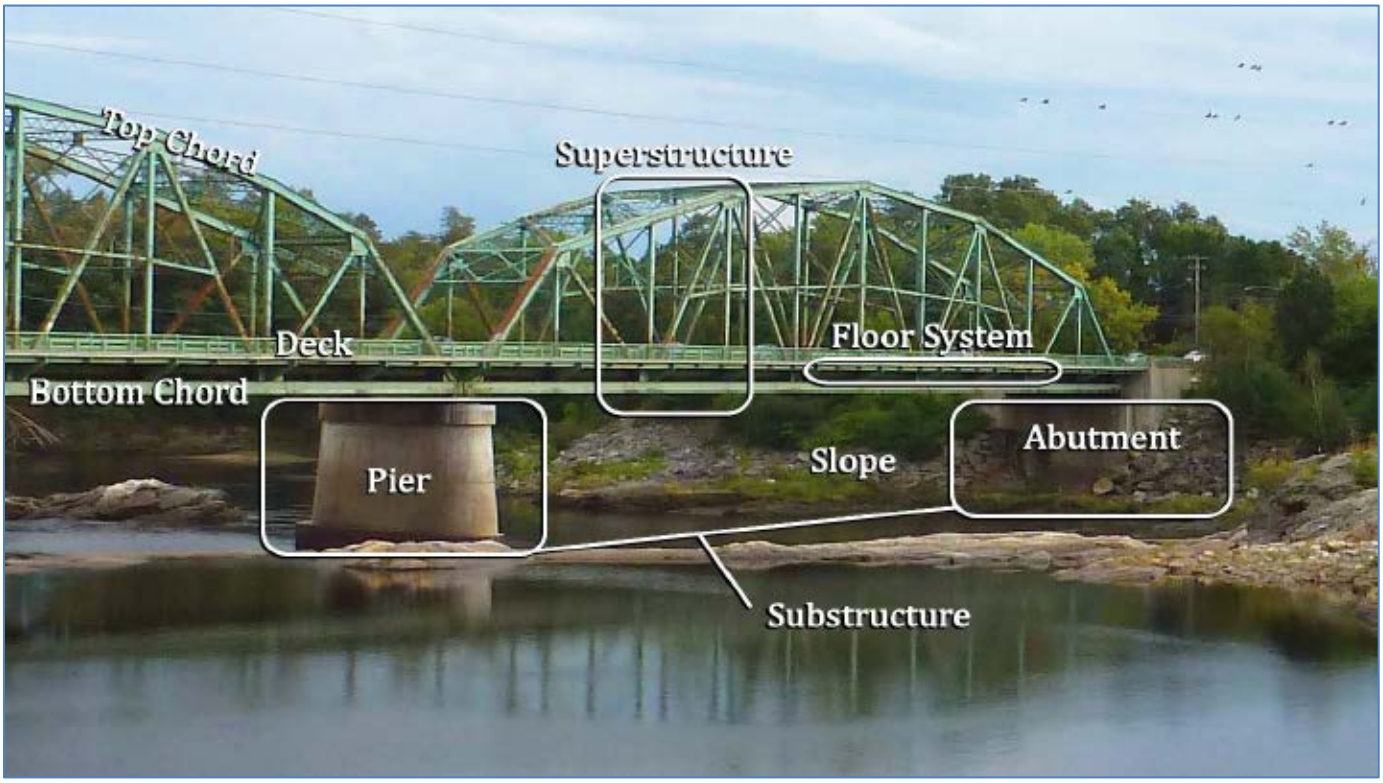


**Figure 3: Steel Through-Truss Bridge Terms**

## Purpose and Need for Action

The purpose of the project is to address poor structural conditions and load capacity issues on the Frank J. Wood Bridge and to address mobility and safety concerns for pedestrians and bicycles.

Bridge improvements are needed to improve the condition ratings of the superstructure and deck from a rating of 4 (poor condition) to 7 (good condition). Because of the age of the bridge, 85 years old, and the considerable number of heavy loading cycles it has already experienced, steel fatigue concerns on critical tension members need to be addressed to continue to carry heavy truck traffic [1]on the existing truss. Additionally, the floor beams and stringers need improvements to bring their load rating factors to a 1.0[2] for all MaineDOT legal loads. The load rating ultimately results in the determination of what vehicle(s) can safely and repeatedly use the bridge.

This bridge is classified by FHWA as structurally deficient with superstructure and deck condition ratings of 4 (poor condition) out of 9. The three truss spans are fracture critical, meaning that failure of certain steel tension members could cause any of the three spans to collapse. Some of the steel truss bridge components are fatigue sensitive, susceptible to cracking and fracture because of heavy cyclic loading. The floor beams and stringers within the truss spans do not meet current design load or MaineDOT legal load standards.

The bridge supports foot traffic on the western side of the bridge only. Pedestrians crossing from Brunswick, on the east side of Routes 201/24 must cross the highway at existing mid-block pedestrian crossings before crossing the river. Bicycle traffic is limited

[1] Traffic data provided in Appendix G of the Preliminary Design Report states that traffic on the bridge is approximately 3% heavy trucks.
[2] The load rating is a measure of bridge live load capacity; it represents load that can safely use the bridge.

by the 4-foot shoulder that consists of two feet of pavement and two feet of open steel grid. These conditions have been identified as safety concerns that increase the likelihood of pedestrian/vehicle interactions, bicycle/vehicle interactions and vehicle/vehicle interactions.

## Description of Alternative Alignments

MaineDOT identified and considered several alternatives to address the Purpose and Need during the planning phase of the project. The alternatives were refined and expanded based on input from the public and the Section 106 Consulting Parties. This section describes the alternatives and the discussion of impacts are in the sections that follow. A Matrix of Alternatives is provided in Appendix 1 that summarizes the alternatives and impacts.

MaineDOT evaluated five alternatives in addition to a No Build Alternative. Figure 4 shows the location of the alternatives relative to the existing bridge. Rehabilitation of the existing bridge would maintain the current alignment (shown in yellow below in Figure 4). The replacement options include on-alignment, upstream and downstream alignments.

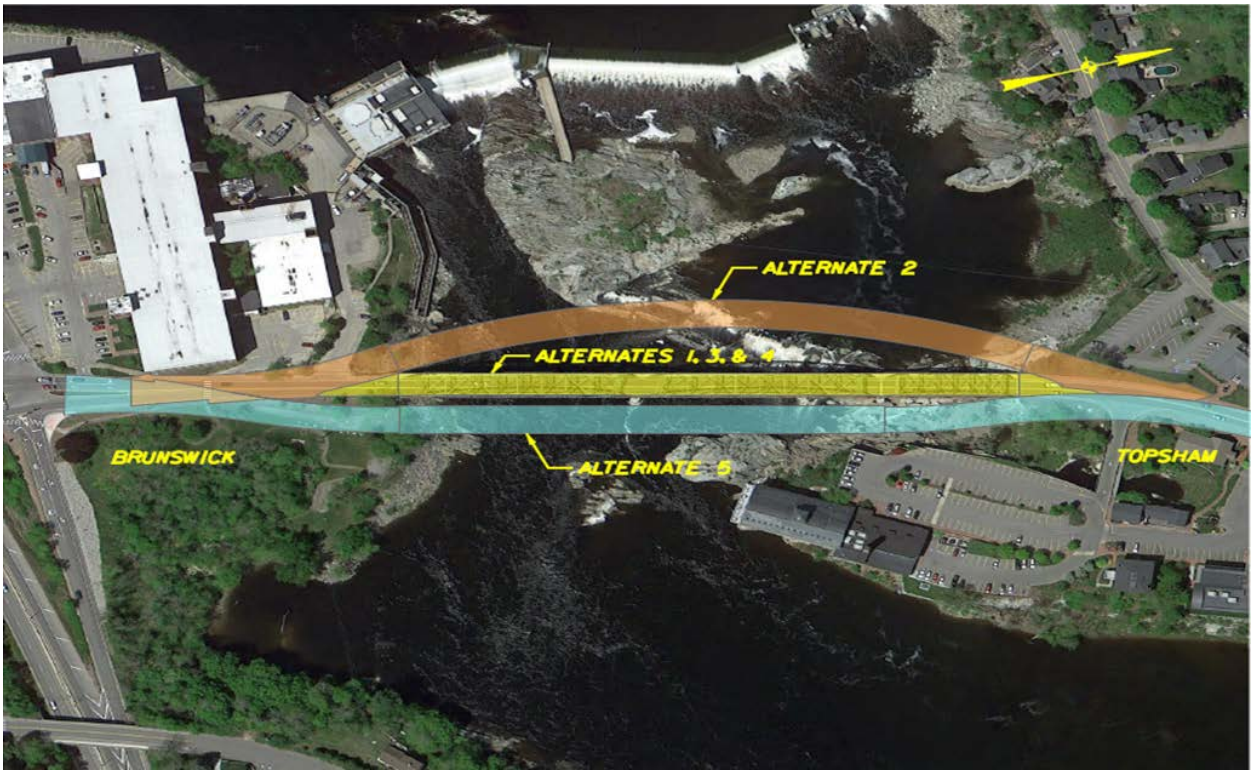


**Figure 4: Alternative Alignments**

### No Build Alternative

The no build alternative presumes the existing structure remains unchanged except for required regular maintenance activities. The No Build Alternative serves as the baseline for which other alternatives can be compared. In August 2016, MaineDOT completed a detailed inspection of the bridge to summarize deterioration and target expected repairs over the next 5 years[3]. The inspection revealed rapid deterioration of structural steel and resulted in posting the bridge at a 25-ton load limit. The inspection identified repairs to the structural steel, particularly in the vicinity of floor beam ends and connection plates required to maintain the 25-ton load posting for approximately 5 years. The repairs, which costs $200,000, were completed in May 2017. A summary of the repairs completed can be found in the Preliminary Design Report[4] (Appendix 2).

Repair and maintenance, such as the repairs completed in May 2017, are included as part of the No-Build Alternative. With no

[3] Inspection Report, 8/1/16-8/2/16, Appendix C of Preliminary Design Report. See Appendix 2.
[4] Summary of Frank J. Wood Repair Contract, Appendix C of Preliminary Design Report. See Appendix 2.

additional capital improvements to the bridge components, the structural steel will continue to deteriorate. This will result in increased inspection frequency. Currently, the 25-ton maximum load posting precludes five axle trucks and other commercial vehicles from crossing the bridge and requires a bypass detour of one mile for these vehicles. Continued deterioration will likely result in further reductions in maximum loads on the bridge and eventual closure. The No Build Alternative will not improve the condition ratings of the bridge and will not address bicycle and pedestrian mobility and safety.

## Alternative 1 – Replacement Bridge on Existing Alignment

Alternative 1 is a new 800-foot-long, multiple span, steel girder bridge on the existing alignment. The new bridge would have two 11-foot lanes, two 5-foot shoulders and two 5-foot sidewalks on both sides of the bridge. The bridge would be a multi-span steel girder structure supported by concrete piers and abutments on bedrock. The span arrangement and number of piers would be selected to minimize footprint impact within the channel of the Androscoggin River. MaineDOT would consider input from the Towns of Brunswick and Topsham, the Section 106 consulting parties, and the public for aesthetic components of the final design including rail and lighting. Construction of Alternative 1 would take approximately 3.5 years and would require a temporary bridge to maintain traffic during construction. The existing bridge would be demolished and removed prior to construction.

## Alternative 2 – Replacement Bridge on Upstream Alignment (Preferred Alternative)

Alternative 2 is a new 835-foot-long bridge on a curved upstream alignment. The bridge would be a steel girder bridge supported by concrete abutments and piers on ledge. A curved bridge reduces the length of approach roadway construction and reduces right of way impacts to abutting properties when compared to a straight bridge in the same upstream location. The span arrangement and number of piers would be selected to minimize footprint impacts within the channel and within the FERC Boundary.

The new bridge would include two 11-foot lanes, two 5-foot shoulders, and two 5-foot sidewalks on both sides of the bridge. The bridge would be a multi-span steel girder structure supported by concrete piers and abutments on bedrock. MaineDOT would consider input from the Towns of Brunswick and Topsham, the Section 106 consulting parties, and the public for aesthetic components of the final design including rail and lighting. Construction of Alternative 2 would take approximately 2.5 years. Traffic would be maintained on the existing bridge during construction. The existing bridge would be demolished and removed when construction is complete.

## Alternative 3 – Bridge Rehabilitation with Existing Westerly Sidewalk

Alternative 3 consists of rehabilitation of the existing truss bridge. The expected life of the rehabilitation work would be 75 years[5]. The work would consist of the following:

- Construct temporary bridge upstream of the existing bridge
- Replace existing bridge deck
- Repair the top of steel sidewalk support brackets
- Replace bridge joints
- Replace steel floor system
- Replace bottom flange angles of the bottom chord of the main trusses
- Replace lattice plates of the bottom chord
- Remove welded steel plates attached to truss vertical members; remediate with cover plates
- Paint entire steel superstructure including all above and below deck components
- Replace all existing utility brackets

[5] This alternative was examined and initially presented at the April 2016 public meeting as a 30-year rehabilitation. It included replacing the bridge deck, repairing the damaged and deteriorated steel bridge members, and painting the entire truss. The consideration of a 30-year solution eliminated the need for future painting of the bridge, one of the costliest components of extending the rehabilitation service life. Lane closures and bridge closures were assumed for maintenance of traffic. Later in 2016, it was determined that the user cost of lane closures and bridge closures were higher than installation of a temporary bridge. Once the construction cost of a temporary bridge was added to the 30-year alternative was no longer a cost effective alternative and was not comparable to the other alternatives that offered a 75 to 100-year service life. It was not given further consideration. A 75-year bridge rehabilitation was then studied and considered.

- Replace abutment backwalls
- Repair stone masonry
- Replace concrete bearing pedestals at Pier 2

The rehabilitation work would be completed in accordance with the United States Secretary of the Interior's Standards for Rehabilitation of Historic Properties[6]. Alternative 3 would maintain the existing two 11-foot lanes and two 4-foot shoulders[7] and one sidewalk on the west side of the bridge. The open grid decking along the outside of the existing shoulders would be replaced with a solid concrete deck. Even after rehabilitation, the Frank J. Wood Bridge would remain fracture critical.

Construction of Alternative 3 would take approximately 3 years and two-way traffic would be maintained with a temporary bridge.

## Alternative 4 – Bridge Rehabilitation with Existing Westerly Sidewalk and a New Easterly Sidewalk

Alternative 4 consists of rehabilitation of the existing truss bridge. The expected life of the rehabilitation work would be 75-years. The work would consist of the following:

- Construct temporary bridge
- Replace existing bridge deck with a new lightweight concrete-filled Exodermic bridge deck
- Repair the top of steel sidewalk support brackets
- Replace bridge joints
- Replace steel floor system
- Replace bottom flange angles of the bottom chord of the main trusses
- Replace lattice plates of the bottom chord
- Remove welded steel plates attached to truss vertical members; remediate with cover plates
- Paint entire steel superstructure including all above and below deck components
- Replace all existing utility brackets
- Replace abutment backwalls
- Repair stone masonry
- Replace concrete bearing pedestals at Pier 2
- Construct a new 5' easterly sidewalk with pedestrian rail

The rehabilitation work would be completed in accordance with the United States Secretary of the Interior's Standards for Rehabilitation of Historic Properties[8]. Alternative 4 would maintain the existing two 11-foot lanes and two 4-foot shoulders[9] and a sidewalk on the west side of the bridge. Alternative 4 would add a 5-foot sidewalk on the east side of the bridge. The open grid decking along the outside of the existing shoulders would be replaced with a solid concrete deck. Even after rehabilitation, the Frank J. Wood Bridge would remain fracture critical because there would still be a lack of redundancy, which means that in the event of a steel member's failure there is no path for the transfer of the weight being supported by that member to hold up the bridge.

To maintain the existing loading on the trusses while adding a new second sidewalk, weight would need to be taken off the truss elsewhere. Various lightweight concrete deck systems such as lightweight concrete, sandwich steel plate systems, and composite deck systems were considered, but a new lightweight concrete-filled Exodermic bridge deck would be recommended for this alternative. This alternative includes the addition of new structural steel framing, concrete deck, and pedestrian rail for the new 5-foot wide sidewalk on the east side of the bridge. Construction of Alternative 4 would take approximately 3 years and two-way traffic would be maintained with a temporary bridge.

[6] 36 CFR 67

[7] In Appendix 1 (Matrix of Alternatives Investigated), two options for travel lane and shoulder widths were provided for this Alternative. The bridge could be restriped for two 10-foot lanes and two 5-foot shoulders. However, regardless of the travel lane and shoulder widths, impacts will remain the same.

[8] 36 CFR 67

[9] In Appendix 1 (Matrix of Alternatives Investigated), two options for travel lane and shoulder widths were provided for this Alternative. The bridge could be restriped for two 10-foot lanes and two 5-foot shoulders. However, regardless of the travel lane and shoulder widths, impacts will remain the same.

## Alternative 5 – Replacement Bridge on Downstream Alignment

Alternative 5 would be a new 800-foot, five span steel girder bridge located downstream of the existing bridge on a straight alignment, between the current bridge and the Bowdoin Mill Complex parking lot. The new bridge would include two 11-foot lanes, two 5-foot shoulders, and two 5-foot sidewalks. The bridge would be a multi-span steel girder structure supported by concrete piers and abutments on bedrock. Construction of Alternative 5 would take approximately 2.5 years. Traffic would be maintained on the existing bridge during construction. The existing bridge would be demolished and removed.

## Preferred Alternative (Alternative 2)

MaineDOT and FHWA have evaluated the alternatives and their relative impacts considering: engineering feasibility, cost, constructability, and environmental impacts and have identified Alternative 2 as the Preferred Alternative. Figure 5 provides a conceptual rendering of the Preferred Alternative.

The effects relative to the following social, economic, natural, and cultural resources have been assessed for Alternatives 1, 2, 3 and 4. A hydraulic analysis showed that Alternative 5 would substantially increase the base flood elevation. The analysis showed that a downstream replacement bridge will raise water levels at the Bowdoin Mill Complex, particularly the end of the mill building where the Sea Dog Brewing Company is located. The hydraulic models suggested that during the design flood, floodwaters would rise more than 6 feet higher than existing conditions near the deck area of the Sea Dog Brewing Company.[10] Based on this, Alternative 5 was dismissed from further consideration and is not discussed further in this Environmental Assessment. A Matrix of Alternatives Investigated and a summary of the potential effects is located in Appendix 1. The environmental impacts of the Preferred Alternative (Alternative 2) and other alternatives considered are discussed in more detail in the sections that follow.

**Figure 5: Preliminary Rendering of Preferred Alternative (Alternative 2)**

[10] See Memo dated August 22, 2017, Re: Brunswick-Topsham, Frank J. Wood Bridge, Downstream Alternative Hydraulics, Appendix 5

# Environmental Impacts: Natural Resources

Compliance with federal environmental laws and regulations is required. Ensuring compliance includes identifying, assessing and documenting environmental resources in the project area and avoiding, minimizing or mitigating impacts on those environmental resources. The below sections list the environmental resources and impacts to those environmental resources that are anticipated to occur within the project area. Alternatives 1, 2, 3 and 4 would all have impacts to natural resources, but at varying degrees. Compliance with environmental laws and regulations for natural resources that are either not present in the project area or that will result in no effect from all the alternatives are documented in the Other Federal Environmental Laws section of this EA.

## 1. Endangered and Threatened Species - Fish

Section 7 of the Endangered Species Act requires each Federal agency to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat.

MaineDOT completed early coordination with the Maine Department of Marine Resources (MDMR) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) about species present within the area of potential impact[11]. In a letter dated June 2, 2017, NOAA Fisheries provided comments on Federally Endangered Species in the project area[12]. NOAA Fisheries commented that federally listed species in the project area include the endangered Gulf of Maine distinct population segment (DPS) of Atlantic salmon, endangered shortnose sturgeon and Atlantic sturgeon. The project area is designated as critical habitat for Atlantic salmon and as critical habitat for Atlantic sturgeon. This project area is also used for spawning and rearing of shortnose and Atlantic sturgeon. Per NOAA Fisheries, Atlantic salmon migrate upstream through the project area in May, June, and July. Shortnose sturgeon spawn in the project area in April and June. Atlantic sturgeon stage and spawn in the same area in June and July.

MaineDOT (on behalf of FHWA) prepared a Biological Assessment and initiated Section 7 Consultation for effects to endangered and threatened species from the Preferred Alternative (Alternative 2) on November 2, 2017. The assessment identifies potential effects to critical habitat and to fish species within NOAA Fisheries jurisdiction. Potential effects to the species from the Preferred Alternative (Alternative 2) include underwater noise, increased sedimentation and turbidity, construction-related boat traffic and entrapment in cofferdams. The construction activities with potential to cause effects include installation of in-water supports for temporary work trestles, cofferdam installation and removal, possible rock removal to prepare for pier construction, and bridge pier demolition.

The Biological Assessment also proposes avoidance and minimization measures (AMMs) to reduce potential effects. Proposed AMMs include minimizing permanent in-water structures; avoiding in-water work during known spawning and migration periods and other times when species are likely to be present; fish observation and evacuation if necessary; and using Best Management Practices for sedimentation and erosion control.

Based on proposed construction activities and known species presence, MaineDOT and FHWA made preliminary determinations that the Preferred Alternative (Alternative 2) was likely to have adverse effects to sturgeon and salmon. However, utilizing AMMs, many of the potential direct effects are related to temporary construction activities which will be conducted when species are less likely to be present. The schedules used to estimate the construction duration of each alternative assumed that in-water work activities most likely to affect endangered fish species would not occur between early April and late August. Based on the proposed AMMs, the Biological Assessment states an overall effect determination that the Preferred Alternative (Alternative 2) "May Affect, is Likely to Adversely Affect"[13] shortnose sturgeon, Atlantic sturgeon, and Atlantic salmon.

Replacement of the bridge will result in permanent conversion of habitat. MaineDOT and FHWA will avoid and minimize permanent impacts by designing permanent features (piers, abutments, scour protection) to use the smallest footprint possible. The Biological Assessment concluded that the project "May Affect, is Likely to Adversely Affect"[14] the physical and biological features of Atlantic salmon Critical Habitat and Atlantic sturgeon Critical Habitat. Effects and AMMs may be modified during the consultation process.

[11] Gail Wippelhauser, Maine Department of Marine Resources, See Appendix 4: Agency Correspondence
[12] See Appendix 4: Agency Correspondence
[13] This language is specific to and defined under 50 CFR 402

Alternative 1 (on-alignment replacement) would require similar in-water activities and durations when compared to the Preferred Alternative (Alternative 2), except that Alternative 1 would also require an on-site temporary detour bridge and one additional year of construction duration. The rehabilitation alternatives (Alternatives 3 and 4) would not require new piers, rock removal or demolition of the existing bridge. However, they would require installation and removal of in-water supports for a temporary detour bridge. The overall duration of construction of the rehabilitation alternatives is estimated to be approximately six months longer than the Preferred Alternative (Alternative 2). Alternatives 1, 3, and 4 would have opportunities to minimize effects during design and construction like those for the Preferred Alternative (Alternative 2). Based on assessments completed to date, none of the alternatives considered would jeopardize the continued existence of these fish species or adversely modify the species' critical habitat.

## 2. Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act requires projects that are funded, permitted, or implemented by federal action agencies to consult with NOAA Fisheries regarding potential adverse impacts to Essential Fish Habitat (EFH).

MaineDOT and FHWA completed early coordination with NOAA Fisheries that included an on-site meeting and other follow-up meetings to discuss EFH species and potential effects from the project. In a letter dated June 2, 2017[14], NOAA Fisheries commented that the Androscoggin River and Merrymeeting Bay are identified as Essential Fish Habitat for Atlantic salmon. In addition, the area supports a number of other diadromous species including alewife, blueback herring, rainbow smelt, American shad, sea lamprey, American eel, and striped bass. American shad and blueback herring spawn in the project area. NOAA Fisheries noted that because many of these species are prey for federally managed species, they are considered a component of EFH. Many of these species use the fish way adjacent to the dam to reach upstream spawning or rearing habitat. Spawning and migration occur in the spring and summer and are the most sensitive to impacts. The MDMR provided a summary of data from the fish way[15] to further define when species are using the project area.

In addition, NOAA Fisheries stated that several other federally managed species occur within the tidal waters downstream of the dam and may occur within the proximity of the proposed project. These include winter flounder, windowpane flounder, bluefish, Atlantic mackerel, red hake, and white hake. EFH for these species are defined by temperature, depth, salinity, and velocity and these characteristics will be addressed in the EFH Assessment Report.

The Preferred Alternative (Alternative 2) will have adverse effects on EFH. Approximate net loss of habitat from permanent structures is approximately 3,000 square feet. Conservation measures will be utilized to mitigate some effects. For example, NOAA Fisheries generally recommends that construction activities resulting in in-water noise or turbidity be avoided between March 15 and July 30 of any year. This recommendation has been considered in developing construction schedule estimates.

MaineDOT (on behalf of FHWA) anticipates initiating EFH Consultation with NOAA Fisheries in January 2018. NOAA Fisheries will respond with a determination and may provide conservation recommendations to be implemented on the project.

Alternative 1 (on-alignment replacement) would require similar in-water activities and durations when compared to the Preferred Alternative (Alternative 2), except that Alternative 1 would also require an on-site temporary detour bridge and one additional year of construction duration. The rehabilitation alternatives (Alternatives 3 and 4) would not require new piers, rock removal or demolition of the existing bridge. However, they would require installation of in-water supports for a temporary detour bridge. The overall duration of construction of the rehabilitation alternatives would be six months longer than the Preferred Alternative (Alternative 2). Alternatives 1, 3, and 4 would have opportunities to minimize effects during design and construction similar to those for the Preferred Alternative (Alternative 2).

## 3. Endangered and Threatened Species - Wildlife

The project is located within the range of the Northern Long-Eared Bat (NLEB). The NLEB was listed as threatened under the Endangered Species Act on April 2, 2015. MaineDOT completed an assessment of potential NLEB habitat in the project area and did not observe any evidence of bat use[16].

[14] See Appendix 4: Agency Correspondence
[15] Gail Wippelhauser, Maine Department of Marine Resources, See Appendix 4: Agency Correspondence
[16] See Appendix 3

The upland habitat at the project site consists primarily of developed space with ornamental vegetation and species that provide limited habitat value for wildlife. However, MaineDOT identified several trees on the north side of the bridge that may potentially provide summer roosting habitat for NLEB. Although the immediate surrounding upland habitat is mostly developed, at a landscape scale NLEB and other bats could use this area for summer roosting since available flight corridors (e.g. along the river) provide connectivity to contiguous areas of forested habitat in the area, several of which are protected from development. MaineDOT surveyed the existing bridge and did not observe any evidence of bat use.

The Preferred Alternative (Alternative 2) will result in removal of suitable roost trees (approximately 0.25 acres). MaineDOT (on behalf of FHWA) filed a Streamlined 4(d) Consultation Form with the U.S. Fish and Wildlife Service (USFWS) on May 5, 2016. Each alternative would have required similar extents of clearing to accommodate an off-alignment replacement or a temporary detour bridge to accommodate an on-alignment replacement or rehabilitation. The limited tree removal required for the Preferred Alternative (Alternative 2) results in a "May affect, but is Not Likely to Adversely Affect"[17] determination for the NLEB. The USFWS review period expired June 10, 2016, concurring with this determination. See Appendix 4.

## 4. U.S. Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act provides the basic authority for the USFWS and NOAA Fisheries involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It also requires Federal agencies that construct, license or permit water resource development projects to first consult with USFWS or National Marine Fisheries Service (NMFS, NOAA Fisheries), as appropriate, and the State fish and wildlife agency regarding the impacts on fish and wildlife resources. Consultation regarding fish and wildlife species has occurred with NOAA Fisheries and USFWS and will continue through project design. Conservation measures and opportunities to minimize effects during design and construction are expected to be similar for Alternatives 1, 2, 3 and 4.

## 5. Wetlands and Waterbodies

### a. Clean Water Act

Section 401 of the Clean Water Act (CWA) prohibits Federal permitting or licensing agencies from issuing authorizations for construction activities having discharges into navigable waters, until the appropriate water quality certifying agency has issued a water quality certification (WQC) or waiver procedures have been satisfied.

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation.

The Maine Department of Environmental Protection (DEP) has combined the decision concerning WQC with the review of an application for a state permit that already requires compliance with state water quality standards. Compliance with Section 401 is through the issuance of WQC with a state permit or by meeting an exemption.

Since all the alternatives will involve in-water work, all the alternatives would require coordination with the Maine DEP to discuss impacts and issuance of a Section 401 WQC with a state permit or by meeting an exemption. Final impacts and any required mitigation will be incorporated in an application and discussed with the U.S. Army Corps of Engineers to obtain a permit which will satisfy Section 404 of the Clean Water Act[18]. MaineDOT and FHWA anticipate that the Preferred Alternative (Alternative 2) will require an Individual Permit because of its potential adverse effects to endangered and threatened species and critical habitat.

### b. Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers, for the construction of any structure in or over any navigable water of the United States. Structures or work outside the limits defined for navigable waters of the United States require a Section 10 permit if the structure or work affects

[17] This language is specific to and defined under 50 CFR 402
[18] The Section 404 permit is typically obtained after the NEPA process.

the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling, re-channelization, or any other modification of a navigable water of the United States, and applies to all structures.

Section 9 of the Rivers and Harbors Act of 1899 and the General Bridge Act of 1946 require authorization from the U.S. Coast Guard (USCG) to construct a new bridge or causeway or reconstruct or modify an existing bridge or causeway across navigable waters[19] of the United States. MaineDOT has requested an exemption under Title 23 U.S.C. Section 144(h) and Title 23 C.F.R. 650.805 "Bridges not requiring a USCG Permit".

For any of the alternatives, final impacts and any required mitigation will be incorporated in an application and discussed with the U.S. Army Corps of Engineers and/or the U.S. Coast Guard to obtain a permit or confirm an exemption in accordance with Sections 9 and 10 of the Rivers and Harbors Act.

### c. Wetland and Waterbody Impacts

MaineDOT completed a natural resources survey within the proposed project area. The survey results are provided in Appendix 3.

#### *Permanent Wetland and Waterbody Impacts*

There is one freshwater wetland in the project area that would be avoided by all of the alternatives. Each of the alternatives considered would impact the Androscoggin River. The pier and span arrangement of the Preferred Alternative (Alternative 2) will minimize the number of piers and maximize the use of ledge outcrops above Highest Annual Tide/Ordinary High Water (HAT/OHW), but will result in new piers below the HAT/OHW of the Androscoggin River (approximately 3,400 square feet). The Preferred Alternative (Alternative 2) will also require placement of riprap in the river to provide scour protection at the new abutments and stabilize the bank (approximately 400 square feet). Removal of the existing in-water pier that supports the existing bridge on the Brunswick side will restore approximately 800 square feet of the Androscoggin River resulting in a net increase in permanent footprint of approximately 3,000 square feet. Based on this amount of impact, compensatory mitigation is not expected. Permanent impacts from the other replacement alternative (Alternative 1) would be similar. The rehabilitation alternatives (Alternatives 3 and 4) would likely not have any additional permanent impacts below the HAT/OHW. All alternatives would be in compliance with Executive Order 11990, Protection of Wetlands.

#### *Temporary Wetland and Waterbody Impacts*

The Preferred Alternative (Alternative 2) will include temporary fill and piles to construct a trestle for access to construct the cofferdams and piers, to erect the structural steel superstructure, to place deck concrete, and to remove the existing bridge. Temporary impacts estimated for Alternative 2 include approximately 2,000 square feet of temporary fill and approximately 800 square feet of temporary work trestle piles. Alternative 1 would have temporary impacts from fill and piles used to construct a trestle (approximately 2,800 square feet), in addition to requiring in-water fill and piles to support a temporary bridge (approximately 5,000 square feet). Temporary impacts from the rehabilitation alternatives (Alternatives 3 and 4) would include in-water piles to support a temporary bridge (approximately 5,000 square feet).

## 6. Coastal Zone Management

The Coastal Zone Management Act (CZM) requires all projects located within the designated coastal zone of a state be consistent with the State's federally approved CZM plan. The CZM grants Maine and other coastal states that have an approved coastal management program the authority to review federal activities, federal license or permit activities, and federally funded activities to ensure that federal actions that may affect its coastal area meet the enforceable policies of the State's coastal program. The process by which a state decides whether a federal action meets its enforceable policies is called federal consistency review.

In Maine, standards and criteria of state environmental permitting and licensing laws and regulations serve as the enforceable policies of the Maine Coastal Program and are satisfied through the issuance of a Maine DEP permit or by meeting an exemption. All the alternatives would require coordination with the Maine DEP for a state permit. The evaluation of alternatives and measures to avoid and minimize impacts to wetlands, waterbodies, and fish and wildlife described in this EA are expected to meet state permit criteria.

[19] For U.S. Coast Guard bridge permitting purposes, a navigable water is defined at 33 CFR, Subpart 2.05-25. It includes any waterway which is subject to the ebb and flow of the tide; or any waterway which is presently used and/or is susceptible to use in its natural condition, or by reasonable improvement, as a means to transport interstate or foreign commerce.

### 7. Floodplains & Hydraulics

Executive Order 11988 requires Federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

A hydraulic analysis was performed to estimate how the river would behave with new piers added in the river. The results showed that the Preferred Alternative (Alternative 2) would closely match existing conditions due to the span arrangement and location of piers on existing ledge outcrops. Additionally, Alternative 1 being on existing alignment and Alternatives 3 and 4 being rehabilitation options, would also match the existing conditions. The hydraulic analysis is provided in Appendix 2.

### 8. Hazardous Materials (Contaminated Properties)

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) requires an environmental site assessment investigation which must address the liability of acquiring portions or all of a property. Initial site assessments have indicated a property on the northwest Topsham approach that was a former gas station. The data suggests the Preferred Alternative (Alternative 2) does not directly impact the site with the initial limits of cuts, fills and property acquisition, but will require additional borings and coordination through final design to ensure compliance. The data also suggests Alternatives 1, 3, and 4 do not directly impact the site with the initial limits of cuts, fills and property acquisition.

### 9. Brookfield Dam & Fish way

A hydropower dam operated by Brookfield Renewable Energy Partners (Brookfield) is located about 500 feet upstream of the existing Frank J. Wood Bridge. Brookfield owns and operates the dam under a license from FERC. No impacts to the Brookfield dam are anticipated for Alternatives 1, 2, 3 or 4. Upstream fish passage at the dam occurs via a vertical slot fish way, which provides passage for important anadromous species. All alternatives would have temporary effects to the fish species utilizing the fish way during construction due to installation of the temporary bridge or temporary trestles. Alternative 2 (the Preferred Alternative) has the potential to affect the fish way permanently indirectly from shadowing and location of the southerly piers. Additional evaluation of potential effects to the fish way is being conducted. Pier locations will be evaluated during final design to minimize impacts. Alternatives 1, 3 and 4 would not have permanent impacts to the fish way.

## Environmental Impacts: Cultural Resources

### 1. Historic Architectural Resources

Section 106 of the National Historic Preservation Act requires that federal agencies take into account the effects of their undertakings on historic properties that are included on the National Register of Historic Places or that meet the criteria for the National Register.

Historic resources within the project area include the following: Summer Street Historic District, Cabot Mill, Pejepscot Paper Company, the Frank J. Wood Bridge, and Brunswick Topsham Industrial Historic District. These resources are described below.

#### *Summer Street Historic District*

The Summer Street Historic District (SSHD), located northwest of the bridge in Topsham, is eligible for listing on the National Register for its local significance in Architecture. The district faces the bridge overlooking an eddy in the Androscoggin River, but has no direct physical connection to the bridge. The district is comprised of six residences and one associated former carriage house. The district contains one-story capes with fenestration patterns associated with the Federal era as well as Queen Anne-style and Stick-style residences. Its period of significance is ca. 1820 to ca. 1890.

#### *Cabot Mill*

The Cabot Mill, located southwest of the bridge in Brunswick, is individually eligible for listing on the National Register for its local significance in Architecture, Engineering, and Industry. The Cabot Mill site was home to an early textile mill in Brunswick and while its current buildings originate in the late 19$^{th}$ century, it still holds integrity under association (the direct link between an important

historic event or person and a historic property). The buildings onsite embody characteristics of a period and type of construction including brick, rectangular massing, full-height, semi-arched windows, and two projecting Renaissance Revival-style towers. These features are the manifestation of the engineering required to design an efficient, functional textile mill in the late 19th century coupled with high architectural style details. Many of the complex's associated buildings, including tenement housing south of the mill, were lost when Route 1 was realigned to its current location. The mill's period of significance is ca. 1850 to ca.1950.

**Figure 6. Left to Right: Summer Street Federal-era House and Cabot Mill**

### *Pejepscot Paper Company*

The Pejepscot Paper Company (PPC), northeast of the bridge in Topsham, was listed on the National Register for its local and statewide significance in Industry (as the earliest paper manufacturer in the state) and Architecture and Engineering (as an early example of the use of the Italianate style in an industrial context) in 1974. The property, as listed on the National Register, includes all of Bowdoin Island. Since its listing, the island has lost a large building to fire. It sat between the mill and the bridge. The PPC's period of significance is 1868 to 1967.

### *Brunswick Topsham Industrial Historic District*

The Brunswick Topsham Industrial Historic District (BTIHD) is eligible for listing on the National Register for its local significance in Architecture, Engineering, and Industry. Its contributing resources are the Cabot Mill, PPC, and the Frank J. Wood Bridge. The district was identified during MaineDOT's Historic Bridge Inventory circa 2001. It represents a localized, intact industrial area that utilized copious water power to produce goods and provide employment throughout its period significance. The district's period of significance is ca. 1850 to ca. 1966. The Frank J. Wood Bridge is considered a contributing resource because its date of construction coincides with the period of significance of the district and the bridge retains sufficient integrity (as defined by the National Park Service).

### *Frank J. Wood Bridge*

The Frank J. Wood Bridge is eligible for listing in the National Register of Historic Places as an individual resource due to its association with the interurban lines connecting the Brunswick area with Lewiston. The bridge was constructed to carry a single track trolley down its center and accommodated a catenary system which powered the trolley line. The Maine State Highway Commission utilized standards published by the American Association of State Highway Officials (AASHO; now known as the American Association of State Highway and Transportation Officials (AASHTO)) to inform the bridge's design and construction. The unchanged standard width and height of the bridge, which allowed it to carry a line, was suitable to convey the trolley line's significance. The bridge's significance is under Criterion A for Transportation and has a period of significance from the bridge's construction in 1932 to the interurban trolley line's end of operations between Bath and Lisbon Falls in 1937. The bridge also is a contributing resource to the Brunswick Topsham Industrial Historic District.

**Figure 7. From Left to Right: Pejepscot Paper Company and Frank J. Wood Bridge**

## a. Historic Resources Consultation

In November 2015, letters were sent to the towns of Brunswick and Topsham and the federally recognized tribes in Maine requesting information on historic resources in the project area. Responses were received in November and December of 2015 from the towns, the Passamaquoddy Tribe, and Penobscot Nation. The historic architectural survey was started shortly after and approved as complete by the Maine Historic Preservation Commission (MHPC) (Maine State Historic Preservation Officer) in May 2016. Properties determined eligible for listing on the National Register of Historic Places and the Area of Potential Effect were concurred with by the State Historic Preservation Office (SHPO) in June 2016. In June 2016, Section 106 consulting parties with demonstrated interests in the undertaking were established. Section 106 consulting party meetings were subsequently held on July 11, August 18 and October 27, 2016 to discuss and receive comments regarding the Section 106 area of potential effect, eligible historic properties, and evaluate the effects on historic properties for each of the proposed alternatives. In February 2017, the draft Section 106 determination of effect on historic properties for each alternative was developed and distributed to the Section 106 consulting parties, the SHPO, and posted for public review and comment. Comments were received and incorporated. In March 2017, the SHPO concurred with the determination of effect on historic properties for each alternative. A public meeting was held on April 5, 2017 utilizing an open house format and comments were received at the meeting and up to April 19, 2017. Responses to common questions were responded to on June 7, 2017 through posting on MaineDOT's public website and e-mail to interested parties. MaineDOT continued to consult under Section 106 and additional comments and concerns were received and considered through December 2017.

In 2003, the Frank J. Wood Bridge was originally determined not individually eligible for the National Register of Historic Places as part of the MaineDOT Historic Bridge Survey, but was eligible as a contributing resource to the Brunswick Topsham Industrial Historic District. Based on comments received from the consulting parties and the SHPO, MaineDOT reevaluated the individual eligibility of the Frank J. Wood Bridge. MaineDOT conducted additional research on the 1936 flood, the interurban trolley, and the Boston Bridge Works Company. MaineDOT determined that the bridge was not individually eligible and sent the documentation to the SHPO on October 25, 2017 for concurrence. The SHPO responded on November 16, 2017 and did not concur. The SHPO stated that the bridge is individually eligible under Criteria A because the Bridge carried the A&K over a major river crossing and seems to have an important association with the interurban railway and that the Bridge possesses sufficient physical design characteristics to convey the fact that it was not designed simply to carry two lanes of highway traffic. Based on MaineDOT's additional research, the SHPO's November 16, 2017 memorandum, and a recommendation from FHWA's federal preservation officer, FHWA determined the Frank J. Wood Bridge was individually eligible for listing on the National Register of Historic Places on December 11, 2017. MaineDOT responded back to the SHPO on December 13, 2017, indicating that FHWA has made the determination that the Frank J. Wood Bridge is individually eligible for listing on the National Register of Historic Places. On December 15, 2017, the Advisory Council on Historic Preservation was formally invited to participate in the Section 106 consultation.

The Preferred Alternative (Alternative 2) was determined to have Adverse Effects on Cabot Mill, the PPC, the Frank J. Wood Bridge, and the BTIHD. The Preferred Alternative (Alternative 2) would result in No Adverse Effect on the SSHD. Alternative 1 would result in Adverse Effects on Cabot Mill, the PPC, the Frank J. Wood Bridge, and the BTIHD. Alternative 1 would have No Effect on the SSHD. Alternatives 3 and 4 would result in No adverse effects on Cabot Mill, the PPC, the Frank J. Wood Bridge, and the BTIHD. Alternatives 3 and 4 would have No Effect on the SSHD.

## 2. Archaeological Resources

MaineDOT has consulted with MHPC regarding potential archaeological resources within the project area. MHPC has identified potential resources associated with all of the alternatives. MHPC has provided a general scope of the additional work that would be required to complete Phase II and Phase III archaeological survey for each alternative. None of the potential resources are considered important for preservation in place. This means that while impacts to these resources should be avoided and minimized, their presence does not preclude any alternative from being selected. In accordance with the National Historic Preservation Act and Maine Statute 27 M.R.S.A 371-378, the information indicating potential locations of archaeological resources is protected from public disclosure. In cases where multiple alternatives may impact archaeological resources, MHPC and MaineDOT typically complete Phase II and Phase III surveys as required for only the selected alternative to minimize unnecessary disturbance to resources.

The Section 106 determination of effects and MHPC concurrence is included in Appendix 6. Section 106 of the National Historic Preservation Act requires continued consultation with the consulting parties on mitigation measures for adverse effects. A Memorandum of Agreement (MOA) will be developed for adverse effects and will include the stipulation that an archaeological Phase II and III survey will be completed for the selected alternative. The Section 106 process will conclude with the signing of the MOA and compliance with any stipulations within the MOA.

## 3. Section 4(f)

A draft Section 4(f) evaluation is required when a Federally-funded transportation action proposes to use land from a historic site that is listed on or eligible for listing on the National Register of Historic Places, or a publicly owned park, recreational area, or wildlife or waterfowl refuge. Section 4(f) states that publicly owned parks, recreation lands, wildlife and waterfowl refuge areas, or historic sites of national, state, or local significance may not be used for US DOT funded projects unless there is no feasible and prudent alternative to the use of such property, and such projects include all possible planning to minimize harm to the property resulting from such use.

Use is defined in 23 CFR 774.17: Except as set forth in 23 CFR 774.11 and 23 CFR 774.13, a “use” of Section 4(f) property occurs:

> (1) When land is permanently incorporated into a transportation facility;
> (2) When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose as determined by the criteria in 23 CFR 774.13(d); or
> (3) When there is a constructive use of a Section 4(f) property as determined by criteria in 23 CFR 774.15.

FHWA must determine whether there are feasible and prudent avoidance alternatives to the use of Section 4(f) properties necessitated by the proposed Federal action and that the proposed action includes all possible planning to minimize harm resulting from such use. A Draft Section 4(f) Evaluation is provided in as part of this EA.

Section 4(f) resources within the project area include the five Section 106 resources described in Section 1 on pages 14 and 15 (Cabot Mill, the PPC, the BTIHD, Frank J. Wood Bridge, and the SSHD). In addition to the historic properties protected under Section 4(f), there is one Section 4(f) park in the project area. The 250th Anniversary Park is located southeast of the Brunswick approach with its frontage on the Androscoggin River. The Brunswick Parks and Recreation Department has been identified as the official with jurisdiction over this park.

The two rehabilitation alternatives (Alternative 3 and 4) would avoid the use of Section 4(f) resources. Because both rehabilitation alternatives would be rehabilitated in accordance with the Secretary of the Interior’s Standards for the Treatment of Historic Properties, they would not result in a Section 106 adverse effect nor a Section 4(f) use. However, the rehabilitation alternatives were determined to be not feasible and prudent because they would each result in additional construction, maintenance and operational

costs of an extraordinary magnitude (23 CFR 774.17(iv)) and a fracture critical bridge would still remain after rehabilitation. Additionally, Alternative 3 does not improve pedestrian and bicycle access. Other alternatives not previously considered were reviewed to determine if it was possible to avoid using Section 4(f) resources, but they were all determined to be not feasible and prudent.

After determining there were no feasible and prudent avoidance alternatives, Alternatives 1 and 2 were reviewed to determine the alternative that causes the least overall harm. Alternatives 1 and 2 would both result in demolition of the existing bridge.

Alternative 1 would use the Cabot Mill and the PPC. Temporary rights of approximately 0.1 acre would be required for the temporary bridge on the Cabot Mill property and approximately 0.1 acre would be required for the temporary bridge on the PPC property. Alternative 1 would permanently use the BTIHD and the Frank J. Wood Bridge due to the removal of the Frank J. Wood Bridge. Alternative 1 would not use the 250th Anniversary Park nor the SSHD. The estimated property rights are based on property lines from tax maps. Final right of way will not be determined until the plan impacts complete phase (final design) of the design process.

The Preferred Alternative (Alternative 2) would use the Cabot Mill. Permanent rights of approximately 0.1 acre for a new retaining wall between Cabot Mill and Brookfield would be required on the Cabot Mill property. Alternative 2 would use the PPC. Permanent rights of approximately 0.1 acre for the reconstruction of the driveway entrance to PPC would be required on the PPC property. Alternative 2 would permanently use the BTIHD due to the removal of the Frank J. Wood Bridge. Alternative 2 would not use the SSHD and would not use the 250th Anniversary Park. Additionally, Alternative 2 would minimize the duration of impacts for non-Section 4(f) protected resources like endangered and threatened species that reside in the Androscoggin River. The estimated property rights are based on property lines from tax maps. Final right of way will not be determined until the plan impacts complete phase (final design) of the design process.

Although an individual Section 4(f) evaluation is included for the Frank J. Wood Bridge use, it does meet the criteria for the Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges. The historic bridges covered by this programmatic Section 4(f) evaluation are unique because they are historic, yet also part of either a Federal-aid highway system or a state or local highway system that has continued to evolve over the years. Even though these structures are on or eligible for inclusion on the National Register of Historic Places, they must perform as an integral part of a modern transportation system. When they do not or cannot, they must be rehabilitated or replaced to ensure public safety while maintaining system continuity and integrity.

Measures to minimize harm will be developed and implemented for any uses of Section 4(f) resources as a result of the proposed project.

## Environmental Impacts: Social and Economic

Alternatives 1, 2, 3 and 4 would all have social and economic impacts, but at varying degrees. Compliance with environmental laws and regulations for social and economic resources that are either not present in the project area or that will result in no effect from all the alternatives are documented in the Other Federal Environmental Laws section of this Environmental Assessment.

### 1. Residential and Business

The crossing of the Androscoggin River at this location is an important connection for businesses, residents. and community services such as school buses and emergency response vehicles. Traffic will be maintained during construction, and access to businesses and residences will be maintained.

### 2. Bicycle and Pedestrian

The existing Frank J. Wood Bridge carries two 11-foot lanes and two 4-foot shoulders. The outer 2 feet of the shoulders is made of an open steel grid, which makes the usable shoulder width for bicycle travel 2 feet. There is one sidewalk on the west side of the bridge. The sidewalk on the west side of US 201/ME 24 extends from downtown Brunswick past Fort Andross and across the bridge to the intersection of US Route 201/24 and Elm Street in Topsham. The sidewalk on the east side of the bridge extends from downtown Brunswick and Federal Street and stops at the 250th Anniversary Park before the Frank J. Wood Bridge. The sidewalk begins again at the Bowdoin Mill Complex and continues north to Elm Street.

Improvements to bicycle and pedestrian mobility and safety is a necessary component of this bridge improvement project per the purpose and need. Pedestrian activity is generated by the mix of business, commercial, residential uses and open spaces located at both ends of the bridge and on both sides of the road. Pedestrians include residents, business patrons, and commuters. Bicycle activity is generated by the same uses along with recreational bicycle through-traffic. There have been two pedestrian crashes in the project area over the past 15 years. Both occurred in 2011. Additionally, there were two bicycle crashes (one each in 2010 & 2013). Each of these incidents resulted in non-fatal injuries.

The Brunswick/Topsham area has an active biking community. The Merrymeeting Wheelers Bicycle Club has advocated for better cycling conditions throughout this area for several years. One of the primary concerns this group has is that the Frank J. Wood Bridge is not friendly to bikers because of traffic speeds, lane widths, and the grating that eliminates a substantial portion of the area "allocated" for cycling. This group also purchased the earliest versions of the 3 ft. Passing Law Signs for the communities, and the town of Brunswick has updated these signs with the new FHWA approved format.

There is no bicycle/pedestrian usage data for the Frank J. Wood Bridge. However, MaineDOT does have data on bicycles and pedestrians on the Androscoggin River Path along the Coastal Connector. May 2014 data for weekday use was nearly 850 people per day with that number more than doubling on the weekends. Bicycles represented approximately 20% of the total users on weekdays and 29% on weekends. These data also indicate, that the primary use for pedestrians is between 8am and 7pm with the peak being early afternoon. Bicycles have a similar time of use, but their peak use is the early evening.

Though there is no specific data to support the increased pedestrian activity at this specific river crossing, MaineDOT understands anecdotally that increased commercial and recreational development on both ends of the bridge has resulted in more pedestrian activity occurring between the two locations. Recent MaineDOT projects have confirmed that a bridge design that promotes access and safety helps generate additional use. MaineDOT also sees an increase in activity when interpretive information and improved viewsheds are included.

Currently, pedestrians approaching the bridge from either Topsham or Brunswick must cross the street to access the sidewalk on the west side of the bridge. One of the desirable outcomes of the bridge improvements is to eliminate these "mid-block" crossings. Designers often assume that pedestrians will cross roadways at established intersections. Observation of pedestrian behavior clearly indicates that people routinely cross at mid-block locations. Pedestrians will rarely go out of their way to cross at an intersection unless they are rewarded with a much-improved crossing, and most will take the most direct route possible to get to their destination, even if this means crossing several lanes of high-speed traffic[20]. Drivers are more likely to anticipate pedestrian crossings at intersections. Midblock crossings inherently have increased risk because drivers do not traditionally expect there to be pedestrians crossing at that location. Locals will anticipate, but others may not even be aware that there is a crossing point at that location. Reducing the number of crossing points reduces the number of opportunities for pedestrian/vehicle conflicts and eliminates unnecessary impediments to traffic flow and movement.

Construction of two sidewalks promotes walkability and substantially improves access and accommodation for those with mobility concerns, impairments, and disabilities. Inclusion of sidewalks on both sides of the road is recommended by Safe Routes to School guidelines and supported by the National Association of City Transportation Officials (NACTO). BIKESAFE, the Bicycle Safety Guide and Countermeasure Selection System, supported by the FHWA to provide guidance to transportation professionals to improve pedestrian and bicycle conditions[21] states that "Sidewalks, provided on both sides of a street, are generally the preferred pedestrian facility. They provide the greatest degree of comfort for pedestrians and the presence of sidewalks has been associated with increased safety for pedestrians." BIKESAFE also recommends that sidewalks on both sides of the road should be required on all suburban highways, major arterials, urban collectors, minor arterials, local streets, and on all commercial urban streets. Sidewalks on both sides are "preferred" on urban local streets and on all streets in industrial areas.

The incorporation of strategically placed pedestrian crossings that include additional safety features (e.g., signage) can improve compliance with drivers stopping for pedestrians by upwards of 80%. This improved compliance directly relates to reduced pedestrian-vehicle incidents.

[20] https://safety.fhwa.dot.gov/PED_BIKE/univcourse/pdf/swless16.pdf
[21] BIKESAFE, www.pedbikesafe.org

For the replacement alternatives (Alternatives 1 and 2), railings would meet standards for vehicle and pedestrian safety. Final design details would consider accommodations for visual enhancements, lighting and viewing points of the river upstream and downstream. Sidewalks on both sides of the bridge would connect the existing sidewalks on the approaches and would improve safety by reducing the need for pedestrians to cross the road. The 5-foot shoulders with no adjacent bridge railing or truss verticals would improve the bridge for bicyclists. The proposed design would incorporate modern traffic calming techniques to slow traffic and provide additional dedicated space to both cyclists and pedestrians.

From a bicycle and pedestrian perspective, Alternative 3 (Rehabilitation) provides the least improvements. Pedestrian facilities under Alternative 3 would consist of the existing sidewalk on the west side of the bridge. The open grid decking along the outside of the existing shoulders would be replaced with solid concrete, providing a continuous 4-foot shoulder with adjacent traffic rails, which would provide an improvement for bicyclists using the shoulders. Alternative 4 would address pedestrian safety with the addition of a 5-foot sidewalk on the east side of the existing bridge. Like Alternative 3, a 4-foot shoulder with adjacent traffic rails would be provided for bicycle traffic. Alternative 4 would provide improvements for bicyclists and pedestrians.

## 3. Construction and Traffic

Construction of this project will temporarily disrupt traffic patterns. Access to all residences and businesses will be maintained throughout construction. There will be noise from construction for the duration of the project. Best Management Practices for erosion and sedimentation control will be implemented and a Stormwater Pollution Prevention Plan detailing the pollutant prevention measures to be employed will be prepared by the contractor and approved by MaineDOT.

Four options were investigated to maintain traffic at this site during construction. They are not all feasible for all of the bridge improvement alternatives.

1. Complete road closure with a detour. Detour all traffic along U.S. Route 1 and State Route 196. The total detour distance is approximately 2.5 miles for through traffic and 3.7 miles end to end (see Appendix 2, Figure 20).

2. Single lane closure with staged construction. One way, southbound traffic would be carried across the bridge on a 12-foot travel-way and all northbound traffic would be detoured. This option can only work for certain construction activities, like painting. This traffic control method has been used successfully in the past on the Frank J. Wood Bridge for short term projects.

3. On-site detour on temporary bridge. Construct a 2-lane temporary bridge parallel to the existing bridge and detour all traffic onto it. Traffic would only be disrupted during the construction of tie-ins to the existing roadway and to the new roadway upon conclusion of the project. These disruptions could be limited by requiring that work be done during off-peak hours. Construction and removal of the temporary bridge would likely extend the total construction duration by about 1½ years (1 construction season for construction of the temporary bridge and half a season for its removal). The cost for a temporary bridge is estimated to be $4 million.

4. Utilize existing bridge. If a new bridge is constructed on a new alignment, the existing bridge could be used to maintain traffic during construction. Traffic would primarily be disrupted during construction of the final tie-in, which is anticipated to include a two-month continuous single lane northbound road closure. Again, this could be mitigated by requiring work during off-peak hours. This option would result in the least traffic disruptions.

Traffic disruption results in indirect costs to the users of the bridge and to the surrounding businesses. A way to quantify the cost of delays to the traveling public is to calculate “user costs.” The average delay for vehicles is estimated and a fixed cost per hour is applied. The average delays for vehicles using an off-site temporary detour are between 3 and 4 minutes, with delays at peak times higher and at off times lower. Based on these delays, the added travel distance of 2.5 miles for thru traffic (and 3.7 miles end-to-end) and the average annual daily traffic of 19,000 vehicles per day, the daily user cost for a full bridge closure (i.e., using an off-site temporary detour) is approximately $22,000 per day, or over $13,000,000 for the estimated 20-month closure required for Alternatives 1, 3 & 4.

The daily user costs for implementing an off-site temporary detour include three components:

1. The cost of extra distance incurred by travelers using a detour
2. The cost of extra travel time incurred by travelers using a detour
3. The cost of extra travel time incurred by travelers due to increased delay at intersections

For this project, daily user costs 1 and 2 were determined with the aid of MaineDOT's travel demand model, which can be used to test the impact of bridge closures on travel patterns on the highway network. With the expected changes in travel volumes at certain major intersections, user cost 3 can be derived by modeling the intersections under peak-hour conditions with traffic simulation software and expanding the peak-hour results to a daily user cost. Added vehicle-miles and vehicle-hours are converted to dollar values by using unit costs of distance and time, respectively. These user costs do not reflect impacts to businesses in Topsham or Brunswick that may be affected by an off-site temporary detour, which is very difficult to quantify the cost of an on-site temporary bridge detour (or temporary bridge) was estimated at $4,000,000. The user costs estimated for an off-site temporary detour exceed this figure by approximately $9,000,000. The onsite temporary bridge detour is included in Alternatives 1, 3, and 4 because the cost of a temporary bridge is less than the anticipated user cost of implementing an off-site temporary detour.

The Preferred Alternative (Alternative 2) has an estimated construction duration of 2.5 years. No temporary bridge is required since traffic could be maintained on the existing bridge during construction. A two-month continuous single lane northbound road closure and detour would be needed to construct approaches of the replacement bridge prior to shifting traffic onto the new bridge.

Alternative 1 would be constructed on the existing alignment; the existing truss bridge would have to be removed completely before new construction could begin. Duration of construction is estimated to be 3.5 years and includes the construction of a temporary on-site detour bridge to maintain two-way traffic during construction. A three-month total non-continuous single lane northbound road closure would be needed for the installation and removal of the temporary bridge approaches. As discussed above, the user costs and other economic impacts such a disruption would cause warrants a temporary bridge for this alternative.

Alternatives 3 and 4 would both close the existing bridge and require a temporary on-site detour bridge[22] to maintain two-way traffic during construction. Construction is estimated to take 3 years. A three-month total non-continuous single lane northbound road closure would be needed for the installation and removal of the temporary bridge approaches.

## 4. Utilities

The existing Frank J. Wood Bridge carries the utilities of Topsham-Brunswick Water District, GWI Communication, Fairpoint Communication, and OTT Communication; Maine Natural Gas, CMP, Brunswick Sewer and Topsham Sewer are located on the approaches. For Alternatives 1 and 2, the utilities would need to be permanently relocated onto the new bridge. Alternatives 3 and 4 would require temporary support or temporary relocation during rehabilitation of the bridge.

The hydropower dam operated by Brookfield Renewable Energy Partners (Brookfield), located about 500 feet upstream of the existing bridge crossing, would not be impacted by any of the alternatives.

## 5. Federal Energy Regulation Commission (FERC) Boundary

The Brunswick Hydroelectric Project is a power generation facility located at river mile 6 of the Androscoggin River and approximately 500 feet upstream of the existing Frank J. Wood Bridge. The generation facility is licensed to Brookfield White Pine Hydro, LLC. The FERC Boundary for the hydroelectric project (FERC Project No. 2284) is at elevation 17.35 (NAVD 88) which includes areas upstream and downstream of the existing bridge as well as portions of the existing bridge (Brunswick abutment and the pier closest to Topsham). Bridge improvements within the FERC Boundary require coordination directly with the licensee (Brookfield).

Throughout the NEPA process, MaineDOT and FHWA have been coordinating with Brookfield Renewable. Upstream fish passage at the dam occurs via a vertical slot fish way adjacent to the powerhouse and on the western bank upstream of the existing Frank J. Wood Bridge. The fish way provides passage for Atlantic salmon, as well as other important anadromous species including alewife and American shad. The fish way was commissioned in 1980 and construction was completed in the early 1980s. Through discussions with Brookfield Renewable, it is possible that at the time of FERC relicensing, changes to the fish way may be needed to improve fish passage at this site and within the Frank J. Wood Bridge project area.

No impacts to the power generation facility are anticipated for any of the bridge improvement alternatives investigated.

[22] When a 75-year rehabilitation was carried forward further, a temporary bridge was added to the scope of work. See Cost section for information on 75-year rehabilitation.

Alternative 2 would reconstruct both abutments and bridge piers within the limits of the FERC Boundary of the dam. Temporary property rights would be needed for construction access along the north side of both approaches (Topsham and Brunswick) within the FERC Boundary.

Alternative 1 would construct the Brunswick abutment and bridge piers within the FERC Boundary. Temporary property rights would be needed for construction access and a temporary detour bridge within the FERC Boundary. Alternatives 3 and 4 would rehabilitate the Brunswick abutment and the pier closest to Topsham that are within the FERC Boundary. No new permanent features within the FERC Boundary would be required. Temporary property rights would be needed for construction access and a temporary detour bridge within the FERC Boundary.

## 6. Right of Way

Based on preliminary design, the Preferred Alternative (Alternative 2) will require permanent property rights from two Brunswick properties and one Topsham property. There will be no residential or business displacements. Construction of the Preferred Alternative (Alternative 2) would require permanent property acquisitions of parts of two properties on the west side of the Brunswick (south) approach and one property on each side of the Topsham (north) approach. The south approach property impacts would include reconstruction of a retaining wall between the driveway entrances to the small Fort Andross parking lot and the Brookfield hydroelectric station at the dam. The 250th Anniversary Park located at the southeast corner of the bridge is a Brunswick town park constructed on land leased from Brookfield. At this location, permanent structures and fill slopes would be within the existing State-owned right-of-way. The north approach would have a new 130-foot-long retaining wall along the northwest approach to limit impacts to the property and parking area. Reconstruction of the driveway entrance to the Bowdoin Mill complex will require impacts beyond the existing MaineDOT right of way. Temporary property rights would be needed to construct work access platforms like work trestles. These rights would be similar to temporary rights needed for a temporary bridge. Additionally, for the Preferred Alternative (Alternative 2), the abutments and three of the four bridge piers would be located within the limits of the FERC Boundary of the dam. Temporary property rights would be needed for construction access along the north side of the approaches and within the FERC Boundary. The Uniform Relocation Assistance and Real Property Acquisition Policies Act for Federal and Federally Assisted Programs will be followed.

Alternatives 1, 3 and 4 (bridge rehabilitation or bridge replacement on the existing alignment) would not require permanent property impacts. However, temporary property rights would be needed for any temporary bridge. Temporary rights for the temporary bridge would be required during construction from the same properties as discussed above for the Preferred Alternative (Alternative 2). Right of way impacts are located Figure 5 of the draft Section 4(f) evaluation.

## 7. Cost

In response to the 2007 collapse of the I-35W Bridge in Minneapolis, Minnesota, the National Transportation Safety Board (NTSB) issued a series of recommendations to the FHWA and the American Association of State Highway and Transportation Officials (AASHTO). One of the three recommendations to the FHWA would require “bridge owners [to] assess the truss bridges in their inventories to identify locations where visual inspections may not detect gusset plate corrosion and where, therefore, appropriate nondestructive evaluation technologies should be used to assess gusset plate condition.” In August 2007, then Maine Governor John Baldacci issued an executive order (EO) directing the MaineDOT to review Maine’s Bridge Inspection and Programming. The substance of the order was, in part, to:

1. Review Maine's bridge inspection program to assure it continues to meet or exceed all applicable federal standards;
2. Utilize the available information on the cause of the Minneapolis bridge collapse to reassess the safety of Maine’s bridges and take appropriate action to mitigate any safety concerns;
3. Analyze MaineDOT's capital programming processes and levels for bridges and other critical transportation infrastructure, the failure of which would likely cause loss of life or other significant public safety impacts.

The result was a report titled *Keeping Our Bridges Safe* (KOBS), published on November 26, 2007. In 2014, the MaineDOT Commissioner directed the MaineDOT Chief Engineer to reconvene a team of bridge experts to examine the progress in keeping the state’s bridges safe. The team consisted of structural engineers from within MaineDOT and outside consultants, bridge maintenance engineers, bridge contractors, University of Maine engineering faculty, the FHWA Maine Division Bridge Engineer, and the MaineDOT Chief Engineer. The team was instructed to:

- Report on MaineDOT's progress on the 2007 report recommendations,
- Define the current status of bridges in Maine,
- Establish strategies to improve overall bridge conditions and safety,
- Find opportunities to impact costs, and
- Identify funding needs.

In the time between 2007 and 2014, MaineDOT has endeavored to better organize and understand the condition of its infrastructure using the principles of asset management including prioritizing highway corridors and identifying customer service levels for Maine's transportation infrastructure.

MaineDOT does not anticipate adequate funding levels (State and Federal assistance) to maintain the current condition of the bridge network and certainly does not anticipate receiving enough funding (State and Federal assistance) to improve overall condition. Therefore, MaineDOT must constantly evaluate which bridges to address knowing that it will result in the delay of improvements to other bridges, some of which are structurally deficient, fracture critical, or in poor condition. MaineDOT makes these decisions knowing that some bridges on lower priority highway corridors may change from fair condition to poor as a consequence of prioritizing the improvements on higher priority corridors (Highway Priority Corridors 1, 2, or 3). These decisions are made to improve the safety and reliability of the most utilized infrastructure. Many of the bridges that Maine is unable to improve due to lack of adequate funding result in load restriction postings due to their condition. Maine's posted bridges are unable to provide full public or economic use. Each project alternative and cost (both construction and service life) is considered in concert with the needs of the entire bridge network.

MaineDOT and FHWA used several tools to evaluate the cost of each of the alternatives considered for improvements to the Frank J. Wood Bridge. Each of the methods have advantages and limitations.

**Construction costs estimates** are generated based on recent bid histories for similar projects. These costs only include the initial costs to construct the project and do not consider future improvements or maintenance.

**Life cycle costs analysis (LCCA)** is a standard engineering economic analysis tool useful in comparing the relative merit of competing bridge improvement alternatives. This evaluation technique converts all estimated bridge costs throughout the life of each bridge improvement alternative into current dollar equivalents, termed present value. The LCCA accounts for estimated construction cost on the current project and the translated present value of anticipated future inspection, maintenance, and rehabilitation costs. It also accounts for anticipated future bridge replacement dates for each alternative. The LCCA assumes money could be set aside today for future work and incorporates economic concepts and techniques such as earned interest on investments, inflation factors, and discounting the opportunity value of time. While LCCA is a tool that can identify the most cost effective alternative, it is not an indicator of the actual costs a transportation agency will expend on an alternative over the timeframe used for the analysis. Typical State transportation agencies are not able to set money aside today, and make interest earning investments, to pay for future work.

**Service life costs** analysis provides a much more accurate comparison of the expected real costs to an agency when examining bridge improvement alternatives. A service life cost estimate (SLCE) similarly totals all the estimated bridge costs throughout the life of each alternative but does not translate or discount these costs to current dollar equivalents. The SLCE is a running total of initial construction cost and all anticipated future inspection, maintenance, and rehabilitation costs associated with each alternative. Cost estimate details are located in Appendix H of the Preliminary Design Report, included in Appendix 2.

Service life is defined as the number of years a bridge can be part of the transportation system with maintenance, repair, and/or rehabilitation before its eventual replacement. Service life for the rehabilitation takes into account the current age of the structure, including its piers and abutments as well as MaineDOT's institutional knowledge of how bridges will perform over a certain age.

Estimated Yearly Average Maintenance & Operations Costs of Service Life are calculated as follows: *(Total Cost over Service Life – Preliminary Construction Estimate)/Number of Service Life Years*. Figures are based in cost estimates found in the Preliminary Design Report (Appendix 2).

### a. Construction Costs

Construction costs are estimated using rates based on the bid histories of recently constructed similar projects. Factors affecting bid

prices for individual components of a project include location and constructability and are adjusted based on professional engineering judgment. Appendix H of the Preliminary Design Report (Appendix 2) includes a Structural Cost Estimate for each alternative).

Each of the construction cost estimates carry a contingency cost. This is to recognize variation in estimates and changes during construction. Contingencies are estimated based on past project history for similar type bridge projects. This site is unique due to the exposed and highly variable bedrock, exposure to high velocity flows, and proximity to the upstream dam. Due to the uncertainties associated with rehabilitating an existing deteriorated truss bridge, a higher amount of contingency costs is typically carried for rehabilitation options. It is difficult to know the precise condition of all the bridge elements until the work is underway. As components of the bridge are exposed, additional section loss and more deterioration than anticipated is common. Uncertainty regarding condition can cause prices to inflate. Replacement of the entire deck system reduces this uncertainty. However, there are additional areas of concern that may have not been specifically identified, but may require additional repair, replacement, or strengthening. Repair needs become more evident when preparing the truss for painting. The need to remove all deterioration, rust, and old paint will often uncover additional steel areas that need strengthening, repair, or replacement. Replacement or repair of deteriorated rivets and strengthening or replacement of gusset plates are examples of these needs. A 15% rehabilitation contingency was used for Alternatives 3 & 4. All alternatives carry a 7% contingency cost for items such as traffic control plans and field offices.

The cost of materials can also fluctuate over time which can affect the accuracy of estimates. For example, the cost of steel included in the current estimates is $7.80/lb. The price has more than doubled since the original estimate; recent low bids for steel repairs on steel girder and steel arch style bridges range from $11/lb. to $24.50/lb., making the 15% for rehabilitation contingencies a conservative estimate.

The construction cost of Alternative 1 is estimated at $16,000,000. This cost includes the construction of a temporary bridge needed during construction for vehicular traffic.

The construction cost of Alternative 2 is estimated at $13,000,000. A work trestle would be needed during construction for access to construct the cofferdams and piers, to erect the structural steel superstructure, to place deck concrete, and to remove the existing bridge. A cost premium of $1 million is included in the estimate to account for the added expense of a work trestle.

The construction costs of Alternative 3 and Alternative 4 are estimated at $15,000,000[23] and $17,000,000, respectively. These costs include the construction of a temporary bridge needed during construction for vehicular traffic. These costs also include a 15 percent contingency above the repair work identified. Rehabilitation projects nearly always discover issues not previously found in inspections, causing budget overruns. This contingency is based on MaineDOT bid history data. Alternative 4 is estimated at $2,000,000 more than Alternative 3 because Alternative 4 includes a more expensive lightweight deck and a new sidewalk.

### b. Maintenance and Service Life Costs

The Service life costs consider the total cost of the alternative for the life of the structure (the construction cost + maintenance costs).

The service life costs for the replacement alternatives (Alternative 1 and Alternative 2) are estimated at $4,300,000 and include future inspections, maintenance, paint and wearing surface replacement over 100 years. Therefore, for Alternative 1, the total cost over service life is estimated to be $20,300,000. For Alternative 2, the total cost over service life is estimated to be $17,300,000. The primary anticipated maintenance of a new bridge would be to mill and resurface the asphalt wearing surface at regular intervals and to paint the girders. Biannual inspections of a non-fracture critical bridge can be completed relatively quickly and at low cost.

The service life cost of Alternative 3 is estimated and projected at $20,200,000 and includes future inspections, maintenance, paint, deck replacement, and substructure rehabilitation over 75 years. Therefore, the total cost over service life is estimated to be $35,200,000. The service life cost of Alternative 4 is estimated and projected at $23,200,000 and includes future inspections, maintenance, paint, deck replacement, and substructure rehabilitation over 75 years. Therefore, the total cost over service life is estimated to be $38,200,000.

[23] The cost of Alternative 3 at a 30-year rehabilitation was estimated at $8 million. See Cost section for information on 75-year rehabilitation.

Alternatives 1 and 2 estimate an annual inspection cost and annual routine maintenance cost. These costs are broken down into annual costs even though inspections would be conducted every two years. The biannual inspection of a new bridge typically requires an inspection team spending a couple of hours looking at major items that may have changed in the two-year span between inspections. The inspection would be followed by the preparation of a report detailing any findings. Routine maintenance for a new bridge would include annual washing of the drains, curb lines, and joints as well as washing of any debris that might have built up on the structure.

Alternatives 3 and 4 also estimate an annual inspection cost and annual routine maintenance cost. The annual inspection of an older, fracture critical bridge requires an inspection team performing hands-on inspection of all fracture critical members. This hands-on inspection can only be done with the use of expensive equipment (under bridge crane, bucket truck, etc.) and temporary traffic control. This work would generally take one to two weeks of on-site work preceded with several days of preparation work and followed by one to two weeks of report preparation. Routine maintenance for an older structure would include all the maintenance mentioned above for a new structure and also repairs to failed steel members. This is difficult to quantify but very likely anticipated because of the age of the bridge. Even after rehabilitation, this bridge would remain fracture critical.

## Secondary or Indirect Impacts

Secondary, or indirect, impacts[24] are defined as effects which are caused by the action and are later in time or father removed in distance, but are still reasonably foreseeable. Secondary, or indirect, effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR Part 1508.8, CEQ Regulations). The baseline for evaluating potential secondary impacts is the existing environment.

Alternatives 1, 2, 3 and 4 would not induce development and would not result in adverse secondary impacts to economic development. The rehabilitation alternatives and the replacement alternatives would have similar, if not the same, approach tie-ins as the existing Frank J. Wood Bridge. At varying degrees, Alternatives 1, 2 and 4 would improve and accommodate pedestrian and bicycle mobility between Brunswick and Topsham along Route 201. Alternatives 1 and 2 would have two 5-foot shoulders and two 5-foot sidewalks, which may attract more bicycle and pedestrian traffic to the area. Alternative 4 would have two 4-foot shoulders and two 5-foot sidewalks, which also may attract more bicycle and pedestrian traffic to the area. However, substantial changes to the pattern of land use within the project area are not expected. All alternatives would result in expenditures on construction manufacturing labor and materials, which would be a beneficial short-term impact to segments of the local economy.

## Cumulative Impacts

Cumulative impacts are defined as the impacts on the environment which result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR Part 1508.7, CEQ Regulations). The geographic areas considered are those areas directly adjacent to and near the Frank J. Wood Bridge. The project impacts described in this document for the Frank J. Wood Bridge include impacts to cultural and natural resources, in addition to beneficial impacts to bicyclists and pedestrians. This section will first describe the identified past, present, and reasonably foreseeable future actions, followed by a discussion on the impacts of those actions on the cultural resources, natural resources, and bicyclists and pedestrians in the area.

### *Past, Present, and Reasonably Foreseeable Future Actions*

For purposes of analysis, the year 1966 was chosen as the past reference year. This year marks the end of the period of significance for the PPC and the BTIHD. Past actions in the project vicinity include years of residential and commercial development and transportation infrastructure improvements. These past actions have resulted in the current built environment surrounding the Frank J. Wood Bridge, which is generally urbanized. The PPC was listed in the National Register in 1974, the Brookfield dam was constructed in ca. 1985, and the 250th Anniversary Park was dedicated in the early 1990s. Year 2122 was selected as the future conditions analysis year. Since MaineDOT now typically designs bridge projects with a design year of 100, and it is reasonable to assume construction will be complete by 2022, year 2122 would appropriately represent future actions. Since the majority of the

[24] Effects and impacts used in this section are synonymous.

Frank J. Wood Bridge project area is already developed, no redevelopment activities are anticipated to occur. No future residential or commercial development opportunities in the project area have been identified.

Planning documents utilized to identify applicable future projects in the project area include the *Maine Department of Transportation's 2017-2018-2019-2020 Statewide Transportation Improvement Program (STIP)*, the *Maine Department of Transportation's Workplan for Calendar Years 2017-2018-2019* and existing town comprehensive plans and studies, which are specifically called out below.

The following projects are listed in *MaineDOT's 2017-2018-2019-2020 STIP* and *Workplan for Calendar Years 2017-2018-2019* within the study area of the Frank J. Wood Bridge project:

- MaineDOT WIN 22212.00 – new bicycle and pedestrian trail between Brunswick and Topsham, beginning at the Swinging Bridge, to Mill Street, Bow Street and Cabot Street, and ending at the Frank J. Wood Bridge. This project may also be known as part of the Androscoggin Riverwalk. MaineDOT is currently completing a feasibility study on this project jointly with the Towns of Brunswick and Topsham. This project is currently only funded for preliminary engineering.
- MaineDOT WIN 13353.00 – new bicycle and pedestrian trail beginning at Topsham Crossing subdivision and extending 0.56 mile to Route 201. This project is currently only funded for preliminary engineering.

The Town of Brunswick and the Town of Topsham were both contacted on July 26, 2017 and asked about any future work planned within the project area of the Frank J. Wood Bridge. Existing town plans were discussed and utilized to identify applicable projects within the project area. Identified projects include:

- Brunswick Mill Street Streetscape Project – This project includes a portion of the planned Androscoggin Riverwalk corridor but extends those improvements further south on Mill Street to Pleasant Street. The proposed plan calls for a redesign of the right-of-way corridor along Mill Street and further allows the addition of pedestrian and bicycle facilities adjacent to the river where no such facilities exist today. The improvements to Mill Street will be phased over several years. The actual schedule will be based upon the Town's desire to see the pathway extended, available funding sources, the towns' success at securing these funds, and the towns' willingness to raise the necessary matching funds.
- From the *2002 Brunswick Parks, Recreation and Open Space Plan*[25], which features over one hundred prioritized action items:
    - Item 35 – Prepare gateway landscape/cleanup plans at Outer Pleasant Street and Mill Street and make improvements to grass esplanades on Inner Pleasant Street
    - Item 67 – Acquire riverfront property north of the Brookfield dam to the Durham town line
    - Item 86 – Open up views of the Androscoggin River by selective cutting along Mill Street
    - Item 111 – Develop a pedestrian underpass at the Frank J. Wood bridge between the 250th Anniversary Park and the Fish Ladder.
    - Item 112 – Create an Androscoggin Riverside Trail to Pejepscot Dam. This would connect with the Androscoggin Riverwalk and the Frank J. Wood Bridge.

Additionally, through online research, other town plans and studies were identified and include:

- The *2005 Topsham Comprehensive Plan*[26] highlights current and future improvements and identifies goals, visions and needs for the community. The plan recognizes resources of importance in the area which include, but are not limited to, historic and archaeological resources; parks and recreation; open space, agriculture and forestry; and marine resources. Many future actions are recommended in the plan related to bicycle and pedestrian improvements throughout the community.
- The *2004 Brunswick Bicycle and Pedestrian Improvement Plan*[27] highlights the need to make further improvements to Maine Street from Bath Road to the Frank J. Wood Bridge and the Topsham town line, making for safer bicycle and pedestrian facilities. The plan calls for the Town of Brunswick and MaineDOT to work closely together to improve pedestrian and bicycle access.

[25] http://www.brunswickme.org/wp-content/uploads/2012/01/Parks-Recreation-and-Open-Space-Plan.pdf
[26] http://www.topshammaine.com/vertical/sites/%7B95A28B10-4485-4BEC-B8FC-5E8BF056A147%7D/uploads/2007_Amenedments_Topsham_Comp_Plan_Parts_1-3_Final.pdf
[27] http://www.brunswickme.org/wp-content/uploads/2011/12/BBPAC-2004-Updated-Plan.pdf

- The *Master Plan for Downtown Brunswick and the Outer Pleasant Street Corridor*[28] – This plan articulates a number of future improvements in the vicinity of the Frank J. Wood Bridge including, but not limited to, establishing an interpretive lookout point, photo opportunity, and potential amphitheater at the 250th Anniversary Park overlooking the Androscoggin River.

Throughout the NEPA process, MaineDOT and FHWA have also been coordinating with Brookfield Renewable. As mentioned previously, the Brunswick Hydroelectric Project is a power generation facility located at river mile 6 of the Androscoggin River and approximately 500 feet upstream of the existing Frank J. Wood Bridge. The generation facility is licensed to Brookfield White Pine Hydro, LLC. The Brunswick Hydroelectric project currently operates under a FERC license which will expire on February 28, 2029. Upstream fish passage at the dam occurs via a vertical slot fish way adjacent to the powerhouse and on the western bank upstream of the existing Frank J. Wood Bridge. The fish way provides passage for Atlantic salmon, as well as other important anadromous species including alewife and American shad. The fish way was commissioned in 1980 and construction was completed in the early 1980s. Through discussions with Brookfield Renewable, it is possible that at the time of FERC relicensing, changes to the fish way may be needed to improve fish passage at this site and within the Frank J. Wood Bridge project area.

### *Impacts of Past, Present, and Reasonably Foreseeable Future Actions*

The main project impacts for Alternatives 1, 2, 3 and 4 are cultural resources (i.e., historic architectural properties and public parks), natural resources (i.e., endangered species and their habitats), and impacts to bicyclists and pedestrians.

Alternatives 1 and 2 would result in demolition of the Frank J. Wood Bridge, which would result in adverse effects under Section 106 to the Cabot Mill, PPC, Frank J. Wood Bridge, and BTIHD. Alternative 1 would not have an effect on the SSHD, but would have a Section 4(f) use on Cabot Mill, PPC, and Frank J. Wood Bridge and the BTIHD. Alternative 2 would have a Section 4(f) use on the Cabot Mill, PPC, Frank J. Wood Bridge and BTIHD, Alternatives 1 and 2 would not have adverse effects on any other historic properties in the project area and would not have a use on any other Section 4(f) protected resources in the project area. Alternatives 3 and 4 would not result in the demolition of the Frank J. Wood Bridge and therefore, would not result in adverse effects under Section 106 but would result in Section 4(f) use on Cabot Mill and BTHID. Foreseeable future actions identified above within the project area, such as bicycle and pedestrian improvements, new trails, and esplanade enhancements, could have visual effects on the surrounding historic properties and districts. However, with the establishment of the Topsham Historic District Commission and a large presence of historical advocacy groups in the area, it is likely these future improvements would go through a local historic review, which would result in avoidance, minimization or mitigation of historic properties. If these actions require federal funds, licenses, permits or approvals, the Section 106 process and associated federal requirements would apply and impacts to historic properties must be identified and avoided, minimized or mitigated. The proposed action, in combination with past and future actions, is not expected to result in substantial cumulative impacts to cultural resources.

All alternatives would result in temporary adverse construction impacts to the endangered Atlantic salmon and its designated critical habitat, the threatened Atlantic sturgeon and its designated critical habitat, the endangered Shortnose sturgeon, and essential fish habitat. Alternatives 1 and 2 would also result in permanent adverse construction impacts. Measures to avoid and minimize impacts to species and critical habitats in the project area will be identified in the Section 7 and Essential Fish Habitat consultations. Foreseeable future actions identified above within the project area are not anticipated to result in in-water work and therefore, are not expected to impact fish or their habitats. Therefore, the proposed action, in combination with past and future actions, is not expected to result in substantial cumulative impacts to endangered or threatened species and their protected habitats.

Lastly, the Preferred Alternative (Alternative 2) would result in beneficial impacts to bicycle and pedestrian movement along the Route 201 corridor between Brunswick and Topsham. Several future actions within State and town planning documents show that there is an emphasis on bicycle and pedestrian improvements within Brunswick and Topsham and between the communities, as indicated above. The Preferred Alternative (Alternative 2) improves bicycle and pedestrian connectivity between the two towns along Route 201 by providing shoulders of additional width and a new easterly sidewalk; and is consistent with the goals and objectives mentioned in overall State and local planning documents.

In conclusion, after a review of the impacts of past, present and reasonably foreseeable future actions in the project area, when added to the potential impacts of Alternatives 1, 2, 3 or 4, substantial cumulative effects to cultural resources, natural resources, and bicyclists and pedestrians are not anticipated to occur.

[28] http://www.brunswickme.org/wp-content/uploads/2012/04/adopted.downtown.master.plan_.pdf

# Other Federal Environmental Laws

Alternatives 1, 2, 3 and 4 were reviewed and analyzed for effects to natural, cultural, social and economic resources protected under Federal environmental laws. For all alternatives, either no resources were found in the project area, or the alternatives were determined to have no effect on the below-mentioned resources.

## 1. Bald and Golden Eagle Protection Act

In accordance with the Bald and Golden Eagle Protection Act, transportation projects are prohibited, except under certain specified conditions, from taking of such birds. There are no known mapped bald or golden eagles' nests within the project limits. None of the alternatives considered would result in a take of Bald or Golden Eagles.

## 2. Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act prohibits the issuance of any federal permit for construction of projects having adverse impacts on a river with values qualifying it for protection under this act. The project location is not within a Wild and Scenic River.

## 3. Coastal Barrier Resources Act

The Coastal Barrier Resources Act established the Coastal Barrier Resources System (CBRS) and was enacted to minimize the loss of human life, wasteful expenditure of federal revenues, and the damage to fish, wildlife and other natural resources associated with coastal barriers. Projects within the CBRS may not receive federal funding unless they are in compliance and meet an exception to the Coastal Barrier Resources Act. The project area is not within a Coastal Barrier Resource.

## 4. Environmental Justice

Executive Order 12898 requires all Federal agencies to ensure that environmental justice consideration is part of their missions by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations in the United States and its territories and possessions. The definition of an adverse effect under environmental justice is the totality of significant individual or cumulative human health or environmental effects and the definition of disproportionately high and adverse as predominately borne by minority and/or low-income populations that is appreciably more severe or greater in magnitude than adverse effects that will be suffered by non-minority and/or low-income population.

As evaluated in accordance with Executive Order 12898, the direct and indirect effects of the replacement of the Frank J. Wood Bridge in Topsham and Brunswick, Maine are not expected to cause disproportionately high and adverse human health or environmental effects that will occur on minority populations and low-income populations.

## 5. Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the MBTA, taking, killing, or possessing migratory birds (other than game birds during valid hunting seasons) is unlawful. Protections extend to migratory bird nests determined to contain eggs or young. In a 12/22/17 legal memo issued by the Interior Department, the Migratory Bird Treaty Act applies only to direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing.

MaineDOT completed a migratory bird survey and no migratory bird nests were detected within the project limits. None of the alternatives will have direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing.

## 6. Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972, as amended, protects populations of marine mammals and prohibits Federal agencies from harassment and take without authorization. There is the potential for seals to be present in the project area. However, no seal haul-outs have been identified or mapped in the project vicinity. MaineDOT consulted GIS data layers maintained by the MDMR and consultation documents from the upstream hydroelectric facility. MaineDOT completed a review of available data and concluded that the presence of an occasional transient harbor seal is possible, particularly during fish migration periods. However, based on the frequency of occurrence and the limits of the timing of in-water work to avoid migration periods for key fish species it is unlikely

that marine mammal presence will coincide with construction activity. If necessary, contract language may be included to require the contractor to stop in-water activities to avoid harassment or take of seals. No other marine mammals are expected within the project area. None of the alternatives considered are likely to harass or take marine mammals.

### 7. Farmland Protection Policy Act

The Farmland Protection Policy Act requires the consideration of adverse effects of all federally funded transportation projects on farmland preservation and to consider alternative actions that could lessen those impacts. The review did not indicate any prime or unique farmland within the project area.

### 8. Section 6(f) of the Land and Water Conservation Fund Act

Section 6(f) ensures that once an area has been funded with LWCFA assistance, it is continually maintained in public recreation use unless the National Park Service (NPS) approves substitution property of reasonably equivalent usefulness and location and of at least equal fair market value. The Secretary must approve all conversions of property acquired or developed with LWCFA assistance under this section to other than public outdoor recreation uses. On June 9, 2017, the Maine Department of Agriculture, Conservation and Forestry confirmed there are no Section 6(f) properties within the project area.

### 9. Clean Air Act

The Clean Air Act established National Ambient Air Quality Standards (NAAQS) for six priority pollutants to protect public health and the environment. Areas that do not meet the NAAQS are designated as nonattainment areas and, as a result, are subject to transportation conformity. Maintenance areas are geographic regions that were previously designated as nonattainment, but are now consistently meeting NAAQS. Transportation conformity requires nonattainment and maintenance areas to demonstrate that all future transportation projects will not hinder the area from reaching and maintaining its attainment goals. On July 20, 2012, the entire State of Maine was designated as attainment for the 2008 8-hour ozone NAAQS, thus transportation conformity is not required. The project is located between Cumberland and Sagadahoc Counties, areas that have been identified as being in attainment for the 8-hour ozone standard and all other NAAQS; therefore, transportation conformity does not apply.

### 10. Noise

The MaineDOT Noise Policy requires highway agencies proposing to use Federal-aid highway funds for Type I projects perform a noise analysis of sufficient scope to provide information needed to make the determination if abatement is required based on it being reasonable and feasible. A traffic noise analysis is not required for this action because it does not involve a Type I project (none of the alternatives would significantly alter the horizontal or vertical alignment of the bridge- move more than ½ the distance closer to a receptor). No further analysis or abatement measures are required.

## Coordination

Coordination with state and federal agencies has occurred throughout the project since the February 2015 initial MaineDOT team meeting. Coordination efforts are summarized in Figure 8 on the following page.

| Date | Contact | Topic |
|---|---|---|
| 2/5/15 | Initial Team Meeting/Project Kickoff | Share baseline information |
| 2/25/2015 | Public | Preliminary Public Meeting |
| 11/3/2015 | Houlton Band of Maliseet Indians, Aroostook Band of Micmacs, Passamaquoddy Tribe, Penobscot Nation and Maine Historic Preservation Commission Archaeology staff | Notification of project and request for information |
| 11/5/2015 | Brunswick and Topsham Town Officials | Letters sent to towns requesting information of historic properties or concerns with historic properties |
| 11/10/2015 | Topsham Town Officials | Response from town regarding information on contributing buildings within the historic district |
| 11/12/2015 | Brunswick Town Officials | Response from town regarding information on contributing buildings within the historic district |
| 11/19/2015 | Penobscot Nation | Response regarding cultural resources received |
| 12/8/2015 | Passamaquoddy Tribe | Response regarding cultural resources received |
| 4/25/2016 | Public | Public Meeting- introduced alternatives from a cost and engineering perspective |
| 5/12/2016 | Department of Marine Resources, National Marine Fisheries Service, | Natural resources coordination meeting (on-site) |
| 6/15/2016 | Section 106 Consulting Parties | Consulting parties were established and notified. |
| 6/16/2016 | Maine Historic Preservation Commission | State Historic Preservation Officer concurs with National Register eligibility within the Area of Potential Effect. |
| 7/11/2016 | Section 106 Consulting Parties | Consulting parties meeting |
| 8/18/2016 | Section 106 Consulting Parties | Consulting parties meeting |
| 9/16/2016 | National Marine Fisheries Service, U.S. Army Corps of Engineers, Brookfield | Coordination meeting to discuss impacts to Brookfield dam, fish way, and natural resources |
| 10/27/2016 | Section 106 Consulting Parties | Consulting parties meeting |
| 2/6/2017 | Public | Public notice published providing the public an opportunity to review and comment on the various alternatives and the effects on historic properties. |
| 2/6/2017 | Maine Historic Preservation Commission | MaineDOT sent effects of the alternatives on historic properties to the State Historic Preservation Officer for review and concurrence. |
| 3/6/2017 | Maine Historic Preservation Officer, Section 106 consulting parties, Public | Concurrence memo on effects received from the State Historic Preservation Officer and comments received from Section 106 consulting parties and the Public. |
| 3/17/2017 | Maine Historic Preservation Commission | MaineDOT submitted additional requested information regarding the Summer Street Historic District to the State Historic Preservation Officer. |
| 3/29/2017 | Maine Historic Preservation Commission | MaineDOT received a concurrence memo regarding the Summer Street Historic District from the State Historic Preservation Officer. |
| 4/3/2017 | Army Corps of Engineers | Coordination |
| 4/5/2017 | Public | Public Open House on for all alternatives |
| 6/1/2017 | National Marine Fisheries Service, Brookfield | Coordination meeting |
| 6/5/2017 | Public | Questions and Responses document was posted regarding the common questions received from the public between October 2016 and April 19, 2017 |
| 7/31/2017 | National Marine Fisheries Service, Brookfield, FHWA | Section 7 Endangered Species Act Coordination |
| 8/23/17<br>8/29/17<br>10/5/17 | National Marine Fisheries Service, Brookfield, FHWA | Section 7 Endangered Species Act Coordination |
| 6/2017 - 12/2017 | Section 106 consulting parties | Continued correspondence between the consulting parties, State Historic Preservation Officer and FHWA. |
| 10/25/2017 | State Historic Preservation Officer | MaineDOT/FHWA sent determination of individual eligibility for the National Register to the SHPO for review and concurrence |
| 11/16/2017 | State Historic Preservation Officer | State Historic Preservation Officer does not concur with the Frank J Wood not being individually eligible (states the bridge is eligible under Criteria A). |
| 12/15/2017 | State Historic Preservation Officer and consulting parties | Federal Highway Administration updated the consulting parties on the individual eligibility of Frank J. Wood Bridge. |
| 12/15/2017 | State Historic Preservation Officer and consulting parties | Federal Highway Administration updated the consulting parties on the individual eligibility of Frank J. Wood Bridge. |
| 12/15/2017 | Advisory Council on Historic Preservation | Federal Highway Administration invited the advisory Council to participate. |

**Figure 8. Coordination with Agencies, Public and Section 106 consulting Parties**

# Public Involvement

MaineDOT initiated a Bridge Improvement Project for the Frank J. Wood Bridge in February 2015. The scope of the project was to assess the feasibility of a range of alternatives to address the bridge condition, from rehabilitation to full replacement. Baseline information regarding project constraints and existing conditions relative to right-of-way, traffic, utilities, environment, maintenance, and community needs was collected. A preliminary public meeting was held on February 5, 2015 to obtain feedback and understand concerns as preliminary engineering was begun to examine improvement alternatives for the bridge. MaineDOT had anticipated that the improvement analysis could show that cost effective repairs could be made to the bridge to extend the service life for several years. MaineDOT proceeded with the engineering feasibility study over the following year.

In March 2016, MaineDOT reviewed the preliminary results of the feasibility study. In April 2016, MaineDOT presented the public with the range of alternatives considered and the results of the feasibility study. The purpose of the meeting was to inform the public that the in-depth engineering examination of the extent of repair of the bridge, and associated costs, revealed that a rehabilitation alternative would not be as cost effective as a bridge replacement. While replacement was the preliminary recommendation due to the cost findings, it was recognized at that time that many additional environmental analyses would have to occur, including the Section 106 review process before final decisions were made.

Public comment was mixed between support of replacement and support of rehabilitation alternatives. Several individuals and groups raised concerns regarding consideration of historic resources in evaluating the alternatives. In response to public comment, MaineDOT refined the alternatives, added alternatives not previously considered and evaluated all the alternatives for engineering, cost, and environmental impacts, including impacts to historic resources. From April 2016 to April 2017, MaineDOT continued to evaluate each alternative. MaineDOT and FHWA solicited, received, and considered input from the public, the Section 106 Consulting Parties and other state and federal resource agencies

Some of the key issues raised during the public meetings, Section 106 consulting party meetings, meetings with town officials and agencies are as follows:

- Historic nature of existing bridge and area
- Bicycle and pedestrian connectivity
- Aesthetics
- Importance of detour route/business access
- Costs and community interests

All of the comments received are posted to the MaineDOT project website: http://www.maine.gov/mdot/env/frankjwood/

Public involvement continued through the Section 106 Process as described in the Environmental Impacts: Cultural Resources section of this document. Public involvement will continue through publication of this EA. A public meeting will be held in 2018 and public comment on the EA will be accepted and considered.

# Draft Section 4(f) Evaluation

## Introduction

The Federal Highway Administration (FHWA) and the Maine Department of Transportation (MaineDOT) have prepared this evaluation to meet the requirements set forth in Section 4(f) of the United States Department of Transportation Act of 1966 (49 USC 303) and 23 Code of Federal Regulations Part 774 (23 CFR 774).

A Section 4(f) evaluation is required when a Federally-funded transportation action proposes to use land from a historic site that is listed in or eligible for listing in the National Register of Historic Places, or a publicly owned park, recreational area, or wildlife refuge. Section 4(f) states that publicly owned parks, recreation lands, wildlife and waterfowl refuge areas, or historic sites of national, state, or local significance may not be used for US DOT funded projects unless there is no feasible and prudent alternative to the use of such property, and such projects include all possible planning to minimize harm to the property resulting from such use.

Use is defined in 23 CFR 774.17: Use. Except as set forth in 23 CFR 774.11 and 23 CFR 774.13, a “use'' of Section 4(f) property occurs:

(1) When land is permanently incorporated into a transportation facility;

(2) When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose as determined by the criteria in 23 CFR 774.13(d); or

(3) When there is a constructive use of a Section 4(f) property as determined by criteria in 23 CFR 774.15.

This evaluation provides the necessary information for the Secretary of Transportation to render a Section 4(f) finding. The Secretary must determine whether or not there are feasible and prudent avoidance alternatives to the use of Section 4(f) properties necessitated by the proposed Federal action and that the proposed action includes all possible planning to minimize harm resulting from such use. The FHWA Maine Division has elected to forgo the use of the FHWA Programmatic Section 4(f) Evaluation and Approval for FHWA Projects that Necessitate the Use of Historic Bridges for the proposed use of the Frank J. Wood Bridge; rather, it is incorporated in the individual evaluation that is required for the additional historic resources that will be used by the proposed undertaking.

## Purpose and Need

The purpose of the project is to address poor structural conditions and load capacity issues on the Frank J. Wood Bridge and to address pedestrian and bicycle mobility and safety concerns.

Bridge improvements are needed to improve the condition ratings of the superstructure and deck from a rating of 4 (poor condition) to 7 (good condition). Because of the age of the bridge, 85 years old, and the considerable number of heavy loading cycles it has already experienced, steel fatigue concerns on critical tension members need to be addressed to continue to carry heavy truck traffic on the existing truss. Additionally, the floor beams and stringers need improvements to bring their load rating factors to a 1.0 for all legal loads. The bridge is currently posted at 25 tons.

This bridge is classified by the FHWA as structurally deficient with superstructure and deck condition ratings of 4 (poor condition) out of 9. The three truss spans are fracture critical, meaning that failure of

certain steel tension members could cause any of the three spans to collapse. Some of the steel truss bridge components are fatigue sensitive, susceptible to cracking and fracture as a result of heavy cyclic loading. The floor beams and stringers within the truss spans do not meet current design load or MaineDOT legal load standards.

Pedestrians on the east side of Routes 201/24 cannot cross the river without crossing the highway at existing mid-block pedestrian crossings. Bicycle traffic is limited by the 4-foot shoulder that consists of two feet of pavement and two feet of open steel grid.

## Proposed Action & Alternatives Description

The existing Frank J. Wood Bridge is located on US Route 201 (Highway Corridor Priority 3 road). Its structural deficiency and poor condition would be addressed with the rehabilitation options outlined in the following sections; however, it would remain a fracture critical bridge. Additional information regarding the current condition of the Frank J. Wood Bridge is found in its most recent Inspection Report (2016), included in Appendix 2 (Preliminary Design Report). The August 15, 2016 MaineDOT Load Rating/Posting memo is included in Appendix 10. It is currently posted at 25 tons.

MaineDOT is proposing to replace the Frank J. Wood Bridge (Bridge #2016) over the Androscoggin River. The bridge connects the town of Brunswick in Cumberland County, and the town of Topsham in Sagadahoc County. The proposed action (Alternative 2) would include a new 835' long, multi-span, steel girder replacement bridge on a curved upstream alignment. A curved bridge reduces the length of approach roadway construction and reduces right of way impacts to abutting properties. This structure would have spans that better accommodate the Brookfield power station outflow channel to minimize impacts. The span arrangement and number of piers would be designed to minimize footprint impacts within the channel and within the Federal Emergency Regulatory Commission (FERC) Boundary and to maximize the efficiency (amount used, weight on each pier, and constructability) of the superstructure. Also, the existing hydraulic clearance over the river would be maintained as a minimum.

The estimated construction duration for the proposed action is approximately 2½ years. No temporary bridge would be required since traffic would be maintained on the existing bridge during construction. A short term (approximately 2 month) single lane northbound road closure and detour would be needed during the final tie-in of the approaches. The existing bridge would be removed. The placement of piers and the abutment slopes would result in permanent environmental impacts. Temporary environmental impacts would include the construction of a work trestle.


*Figure 1. Aerial view of the Project Area.[1] Each number denotes a Section 4(f) property, which are all discussed later in this document.*

## Background

In response to the 2007 collapse of the I-35W Bridge in Minneapolis, Minnesota, the National Transportation Safety Board (NTSB) issued a series of recommendations to the FHWA and the American Association of State Highway and Transportation Officials (AASHTO). One of the three recommendations to the FHWA would require "bridge owners [to] assess the truss bridges in their inventories to identify locations where visual inspections may not detect gusset plate corrosion and where, therefore, appropriate nondestructive evaluation technologies should be used to assess gusset plate condition." In August 2007, then Maine Governor John Baldacci issued an executive order (EO) directing the MaineDOT to review Maine's Bridge Inspection and Programming. The substance of the order was, in part, to:

1. Review Maine's bridge inspection program to assure it continues to meet or exceed all applicable federal standards;
2. Utilize the available information on the cause of the Minneapolis bridge collapse to reassess the safety of Maine's bridges and take appropriate action to mitigate any safety concerns;
3. Analyze MaineDOT's capital programming processes and levels for bridges and other critical transportation infrastructure, the failure of which would likely cause loss of life or other significant public safety impacts.

The result was a report titled *Keeping Our Bridges Safe* (KOBS), published on November 26, 2007. In 2014, the MaineDOT Commissioner directed the MaineDOT Chief Engineer to reconvene a team of

[1] This view refers to some Section 4(f) properties with modern names. The Bowdoin Mill Complex was historically the Pejepscot Paper Company and the Fort Andross Mill Complex was historically the Cabot Mill.

bridge experts to examine the progress in keeping the state's bridges safe. The team consisted of structural engineers from within MaineDOT and outside consultants, bridge maintenance engineers, bridge contractors, University of Maine engineering faculty, the FHWA Maine Division Bridge Engineer, and the MaineDOT Chief Engineer. The team was instructed to:

- Report on MaineDOT's progress on the 2007 report recommendations,
- Define the current status of bridges in Maine,
- Establish strategies to improve overall bridge conditions and safety,
- Find opportunities to impact costs, and
- Identify funding needs.

In the time between 2007 and 2014, MaineDOT has endeavored to better organize and understand the condition of its infrastructure using the principles of asset management including prioritizing highway corridors and identifying customer service levels for Maine's transportation infrastructure. Highway Corridor Priorities are listed in the below figure.

| Highway Corridor Priority | Miles | % Miles | % Traffic | Definitions and Examples |
|---|---|---|---|---|
| Priority 1 | 1760 | 7% | 42% | These roads include the Maine Turnpike, the interstate system and key principal arterials like Route 1 in Aroostook County, the Airline (Route 9), Route 2 west of Newport, and Route 302. The 1,760 miles of Priority 1 roads represent only 7 percent of the miles, but carry 42 percent of all vehicle miles traveled in Maine. |
| Priority 2 | 1350 | 6% | 17% | These roads total about 1,350 miles. They are non-interstate, high value arterials that represent about 6 percent of the total miles of road but carry 17 percent of overall traffic in Maine. |
| Priority 3 | 2199 | 9% | 16% | These roads generally are the remaining arterials and significant major collector highways. These 2,199 miles of Priority 3 represent only 9 percent of miles, but carry 16 percent of the traffic in Maine. |
| Priority 4 | 3731 | 16% | 9% | These roads generally are the remainder of the major collector highways, minor collector highways, and often also part of Maine's unique state aid system, in which road responsibilities are shared between the state and municipalities. These 3,731 miles represent about 16 percent of total miles, and carry 9 percent of the traffic in Maine. |
| Priority 6 | 14,432 | 62% | 13% | These roads are local roads and streets, and are the year-round responsibility of our municipal partners. Though they carry just 13 percent of the statewide traffic, these 14,432 miles make up 62 percent of the total miles. |
| The miles and traffic percentages of the previous highway priority 5 have been incorporated into 4 and 6, as appropriate. | | | | |

*Figure 2: MaineDOT Highway Corridor Priorities*

Customer service levels (CSLs) are described in Maine law as a way to report priorities and capital goals. MaineDOT CSLs are based on reliability, condition, and service. The CSLs are communicated as letter grades A-F, with A representing excellent and F representing unacceptable. Bridge reliability grading is based on a pass/fail. An example of a fail is if one or more major members of a bridge is in serious condition or is scour critical. Bridge Condition CSL is based on the National Bridge Inventory (NBI) Condition (0-9), and service CSL is created by the bridge's posting relative to the highway corridor priority. The Frank J. Wood Bridge has an overall D Customer Service Level (CSL) due to its posting and congestion. The highway it carries, Route 201, is part of the National Highway System and is a MaineDOT HCP 3. US Route 201 has an overall B CSL rating. The D rating is in larger part dictated by the fact that it is a fracture critical and structurally deficient structure.

The updated KOBS (2014) report (included in Appendix 8) is a comprehensive overview of the state of Maine's bridge infrastructure; placing bridges in context with highway corridor priority and CSLs. The KOBS (2007) report identified 44 fracture critical bridges.[2] Frank J. Wood was identified as a fracture critical bridge. Since 2007, 11 fracture critical bridges have been replaced. Both KOBS reports highlight that older bridges were not designed to carry current loads. Part of the initial KOBS report and goal was to initiate and use new bridge rating and bridge posting guides. The report states: "understanding what a bridge can safely carry is critical to public safety and mobility. At times, posting a re-rated bridge for less than legal loads may have minimal impacts. Other times it could pose hardships." These hardships include a long detour and/or no practical strengthening options.

Per KOBS (2014) MaineDOT's 2744 bridges and short spans are getting older – 776 bridges and 150 steel culverts are past their 50-year service life. Generally, older bridges require more maintenance and attention to keep them safe. In 2007, 65% of MaineDOT's bridges and minor spans were in fair condition and 9% in poor condition. In 2014, while the percentage of bridges and minor spans in fair condition had decreased to 61%, the number of bridges in poor condition rose to 11%. Much attention is paid to bridges that are categorized as structurally deficient; however, that designation is only applicable to federal bridges with a 20' or longer span. The MaineDOT has found that this classification underestimates the population of bridges in poor condition. Even so, the percentage of structurally deficient bridges in Maine rose from 14.99% in 2011 to 15.24% in 2013 (with peaks of 16.68% in 2001 and 16.26% in 2010). The Frank J. Wood Bridge was determined structurally deficient in June 2016 as part of its routine National Bridge Inspection (NBI). In August 2016, MaineDOT undertook a two-day field inspection with representatives from the Bureau of Project Development and Maintenance & Operations. The result of these efforts was that the Frank J. Wood Bridge was posted at 25 tons.

Another issue facing MaineDOT is the level of funding needed to maintain the condition of bridges compared to available funding. For the KOBS (2014), MaineDOT used asset management software to assess bridge needs. The software generated conditions and service levels for 25 years for four funding levels (per year): $70 million, $105 million, $140 million, and $175 million. The results showed overall condition of bridges owned by MaineDOT throughout the state would deteriorate with funding less than $140 million. The KOBS (2014) concluded:

> A long-term investment of $140 million per year will eliminate at least 90% of the structurally deficient and poor bridges on Highway Corridor Priorities 1-3. This funding level will improve the average condition of Maine's bridges over the next twenty-five years. It will also reduce the deterioration of bridges that are in good condition which presents the opportunity to save money in the future. It will not be enough to eliminate all bridges with CSLs of D's and F's. It does dramatically change the number of bridges with D and F ratings from 38% at the current funding levels to 15% over the next 25 years.

In this context, elimination does not equate to absolute removal of all bridges of that rating, rather addressing the factors that result in the rating. Addressing these factors includes repair, rehabilitation,

[2] Fracture critical bridges are bridges with no redundancy – if a single member within the bridge fails it may ultimately lead to a catastrophic failure of the entire bridge.

or removal/replacement. MaineDOT would require $217 million per year to maintain the entire bridge system and substantially meet service, condition, and safety goals.

Another factor MaineDOT has to consider in bridge funding levels is the financial impact of Maine's thirty-six Forever Bridges.[3] Forever Bridges are considered "high value bridges which, when replaced, will create extraordinary impacts to customers or create significant funding needs that could severely impact bridge resources." These factors may include significant permitting and constructability issues in concert with providing critical access routes. These bridges must last 75-100 years or longer. Over a 15-year period (2002-2017), MaineDOT has spent approximately one-third of its annual bridge program budget on construction or heavy capital work on these bridges. This decreases the amount of resources that can be directed towards other bridges, even considering that Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grants have and may continue to offset the financial burden of Forever Bridges.

MaineDOT has a goal to eliminate 90% of the structurally deficient and poor bridges on highway corridor priorities 1-3. This goal can be accomplished with $140 million per year funding. However, MaineDOT is running at a deficit. The 2017-2018-2019 MaineDOT Work Plan and State Transportation Improvement Program (STIP) show an annual average of $121 million for bridge projects with an average 13% annual shortfall for bridge projects.

**Core Highway and Bridge Programs**
**CY 2017-2018-2019 *Work Plan* vs. Need, to Meet Statutory Goals**
(in millions of $)

| Work Group | Average Annual $ from 2017-2018-2019 *Work Plan* | Annual $ Needed to Meet Basic Statutory Goals | Average Annual $ Shortfall | Dollar % Shortfall* |
|---|---|---|---|---|
| Bridge Projects | $121 | $140 | -$19 | -13% |
| Highway Reconstruction/Rehab | $78 | $100 | -$22 | -22% |
| Pavement Preservation | $90 | $108 | -$18 | -17% |
| Light Capital Paving | $27 | $27 | $0 | 0% |
| **Total - Core Programs** | **$316** | **$375** | **-$59** | **-16%** |

*Figure 3: MaineDOT Core Highway and Bridge Program Anticipated Funding for CY 2017-2018-2019*

As illustrated by Figure 3, MaineDOT does not anticipate adequate funding (State and Federal assistance) to maintain the current condition of the bridge network and certainly does not anticipate funding (State and Federal assistance) to improve overall condition. Therefore, MaineDOT has to constantly evaluate which bridges to address knowing that it *will* result in the delay of addressing other bridges, some of which are structurally deficient, fracture critical, or in poor condition. The MaineDOT makes these decisions knowing that some bridges on lower priority highway corridors may change from fair condition to poor while needing to increase the rating or improve the infrastructure condition on a

[3] A list of Maine's forever bridges including location is included as an appendix within the updated KOBS document. Frank J. Wood Bridge is not considered a Forever Bridge.

Highway Corridor Priority 1, 2, or 3. This decision is made to improve the safety and reliability of the most utilized infrastructure. Each project alternative and cost (both construction and service life) is considered in concert with the needs of the entire bridge network, including Forever Bridges.

## Section 4(f) properties within the Project Area

There are six (6) Section 4(f) resources within the project area. Each is described in the following section.

### Historic Resources

There are five (5) historic Section 4(f) properties within the project area: the Summer Street Historic District, Cabot Mill, Pejepscot Paper Company, the Brunswick Topsham Industrial Historic District, and the Frank J. Wood Bridge.

The Summer Street Historic District (SSHD) (#1 on Figure 1), located northwest of the bridge in Topsham, is eligible for listing in the National Register of Historic Places for its local significance in Architecture. The district faces the bridge overlooking an eddy in the Androscoggin River, but has no direct physical connection to the bridge. The district is comprised of six residences and one associated former carriage house. The district contains one-story capes with fenestration patterns associated with the Federal era as well as Queen Anne- and Stick-styles residences. Its period of significance is ca. 1820 to ca. 1890.

The Cabot Mill (#2 on Figure 1), located southwest of the bridge in Brunswick, is individually eligible for listing in the National Register for its local significance in Architecture, Engineering, and Industry. The Cabot Mill site was home to an early textile mill in Brunswick and while its current buildings originate in the late 19$^{th}$ century, it still holds its integrity of association. The buildings onsite embody characteristics of a period and type of construction including brick, rectangular massing, full-height, semi-arched windows, and two projecting Renaissance Revival-style towers. These features are the manifestation of the engineering required to design an efficient, functional textile mill in the late 19$^{th}$ century coupled with high architectural style details. Many of the complex's associated buildings, including tenement housing south of the mill, were lost when Route 1 was realigned to its current location. The period of significance is ca. 1850 to ca.1950.

The Pejepscot Paper Company (PPC) (#3 on Figure 1), northeast of the bridge in Topsham, was listed in the National Register for its local and statewide significance in Industry (as the earliest paper manufacturer in the state) and Architecture and Engineering (as an early example of the use of the Italianate style in an industrial context) in 1974. The property, as listed in the National Register, includes all of Bowdoin Island. Since its listing, the island has lost a large building to fire. It sat between the extant mill and the bridge. Additionally, the predecessor to the Frank J. Wood Bridge was aligned directly between those buildings. The construction of the Frank J. Wood Bridge on the existing alignment west of the PPC occurred during its period of significance. The PPC's period of significance is 1868 to 1967.

*Left to Right: Pejepscot Paper Company and Cabot Mill*

The Brunswick Topsham Industrial Historic District (BTIHD) (#4 on Figure 1; comprised of #1, #2, and the Frank J. Wood Bridge) is eligible for listing in the National Register for its local significance in Architecture, Engineering, and Industry. Its contributing resources are the Cabot Mill, PPC, and the Frank J. Wood Bridge. The district was identified during MaineDOT's Historic Bridge Inventory circa 2001. It represents a localized, intact industrial area that utilized copious water power to produce goods and provide employment throughout its significance. The district's period of significance is ca. 1850 to ca. 1966. The Frank J. Wood Bridge is considered a contributing resource because its date of construction coincides with the period of significance of the district and the bridge retains sufficient integrity (as defined by the National Park Service).

The Frank J. Wood Bridge (#5 on Figure 1) is eligible for listing in the National Register of Historic Places as an individual resource due to its association with the interurban lines connecting the Brunswick area with Lewiston. The bridge was constructed to carry a single track down its center and accommodated a catenary system which powered the line. The Maine State Highway Commission utilized standards published by the American Association of State Highway Officials (AASHO); now known as the American Association of State Highway and Transportation Officials (AASHTO)) to inform the bridge's design and construction. The bridge is an individually eligible property in addition to a contributing resource to the Brunswick Topsham Industrial Historic District. The bridge's significance is under Criterion A for Transportation and has a period of significance from the bridge's construction in 1932 to the interurban's end of operations between Bath and Lisbon Falls in 1937.

*Left to Right: Frank J. Wood Bridge and Summer Street Federal-era house*

## Parks, Recreation Areas, and Refuges

There is one (1) Section 4(f) park resource in the project area. The 250th Anniversary Park (#6 on Figure 1) is approximately 2.75 acres and is located southeast of the Brunswick approach with its frontage on the Androscoggin River. Access to the park is via an at-grade crossing near the Cabot Mill and the sidewalk along the eastern side of US Route 201. Per the Brunswick Parks and Recreation department, the park includes scenic overlooks, a fishing area, and a canoe/kayak put in to facilitate portage around the Brookfield hydroelectric dam.

As depicted on tax maps, the park consists of three parcels east of US Route 201. The northwestern parcel, situated on the bank of the Androscoggin River, is owned by Brookfield; however, it is leased to the Town of Brunswick. The Town owns the southwestern parcel. MaineDOT owns the eastern parcel. The park is comprised of three separate areas which are not discreet to individual parcels. The first, located adjacent to US Route 201 slopes downhill to a sharp drop off at the location of the abutment for the previous crossing. This area holds a metal pipe railing to assist pedestrians, a granite monolith with the name of the park inscribed, and the slab foundation of an unknown structure. Interestingly, the configuration of the railing may be to keep pedestrians away from the foundation. The second area is on a plateau below an easterly slope from the first and is connected by a wide wood and brick staircase. This area includes benches, a monument installed by the Brunswick Rotary, and provides access to traversable rocks along the bank. The monument is a granite bolder with a bronze plaque. The inscription reads “When the Abakanaki were the sole inhabitants of this land, the water here was called Ammoscoggin. The word means ‘fish come in spring. – Brunswick Rotary Club, 2001”. The third area is connected to the second by a primitive path leading to a wide wood and brick staircase that opens up to a flat area at the river’s shore. This area can be used as the portage point. The park is used regularly for fishing, likely due to the prolific activity of many different species. The pools accessed from this area are the first pools open to recreational fishing downstream of the bridge. The southern Frank J. Wood Bridge abutment marks a limit of the park as access to areas upstream are prohibited, as illustrated by numerous signs on the property.


*Left to Right: Steps leading to portage point at shoreline; installed monument*

There are no other historic resources, public recreation areas, or wildlife or waterfowl refuges in the project area protected under Section 4(f).

## Project Analysis and Impacts to Section 4(f) Properties

A federal transportation agency must show that there are no prudent and feasible avoidance alternatives to using a Section 4(f) resource before a proposed project can proceed. 23 CFR 774.17 provides guidance on the definition of whether or not an alternative is feasible and prudent. An alternative is not feasible if it cannot be built as a matter of sound engineering judgement. An alternative is not prudent if:

i. It compromises the project to a degree that is unreasonable to proceed with the project in light of its stated purpose and need
ii. It results in unacceptable safety or operational problems
iii. After reasonable mitigation, it still causes:
    a. Severe social, economic, or environmental impacts
    b. Severe disruptions to established communities
    c. Severe disproportionate impacts to minority or low income populations
    d. Severe impacts to environmental resources protected by other Federal Statutes
iv. It results in additional construction, maintenance, or operational costs of an extraordinary magnitude
v. It causes other unique problems or other unusual factors;
vi. It involves multiple factors in paragraph (i-v) of this definition, that while individually minor cumulatively cause unique problems or impacts of extraordinary magnitude.

### Alternatives Dismissed from Further Consideration

MaineDOT and FHWA examined alternatives early in project development; however, some were found not to be prudent and were removed from further consideration. Additionally, the No Build and a

downstream alternative were examined but found not to be prudent. A brief overview of the alternatives and a description of why they are not prudent (with references to Section 774.17 i-vi) for this project and location follows.

Bridge Rehabilitation without Consideration of the Secretary of the Interior (SOI) Standard and Guidelines for the Treatment of Historic Properties

This alternative would consist of much of the undertaking as described in Alternatives 3 & 4. This is because the cost of construction and cost over service life for the two rehabilitation alternatives found in the following section were initially calculated without incorporating the costs of the use of the SOI standards. This was done because rehabilitation would be completed in the deck system and would not change the integrity of design and materials of the BTIHD. The integrity of the BTIHD would similarly be unaffected if the rehabilitation did not include painting of the bridge elements. While this option would avoid the use of a Section 4(f) resources, this alternative was found to meet the definition of not prudent at 23 CFR 774.17(iv) due to the maintenance and operation costs outlined in the following sections.

Minor Bridge Rehabilitation resulting in Removal of Heavy Traffic and Posting the Bridge

In 2016, MaineDOT completed a National Bridge Inspection Standards (NBIS) Fracture Critical inspection of the Frank J. Wood Bridge (Inspection Report is located in the Preliminary Design Report in Appendix 2 and the MaineDOT posting memo in Appendix 10). As a result of that inspection, the bridge was posted at 25 Tons. The posting removed heavy traffic, detouring it 4 miles in either direction and partially on heavily congested US Route 1. At the time of posting, MaineDOT determined the bridge would require a $200,000 rehabilitation or repair in the next 12 months in order to retain a posted crossing for approximately 5 years. This effort was completed in 2017. If no additional action is taken, the MaineDOT anticipates posting a further reduction of load and diverting even more traffic to US Route 1 within the 5-year window. Additionally, this alternative does not address the need for improved bicycle and pedestrian safety and would retain a fracture critical bridge within the transportation network. While this alternative would avoid the use of Section 4(f) resources, it was found to meet the definition of not prudent at 23 CFR 774.17(iv-vi).

Bridge Rehabilitation with Reduction to One-Travel Lane and Load Posting

This alternative would retain one direction of traffic. User costs would be approximately $10,000 per day or more by diverting all heavy traffic and one direction of traffic off the bridge. The alternate travel way (utilizing existing infrastructure) is a near 4-mile detour along US Route 1 (a heavily congested HCP 1 road within the National Highway System) and the State Route 196 Bypass. A short route exists; however, it is along State Route 24 (Elm Street) in Topsham, which is located in the heart of the large Topsham Historic District. The district is listed in the National Register. The Town of Topsham does not support the introduction of additional traffic through this local community. This alternative would result in additional findings of adverse effects under Section 106 of the National Historic Preservation Act of 1966 (Section 106). This alternative was found to meet the definition of not prudent at 23 CFR 774.17(i), (iii), (iv), and (vi).

Conversion to Bike/Pedestrian Facility; Detour Traffic to Existing Infrastructure

MaineDOT has calculated user costs of approximately $22,000 per day if traffic is removed from this route. Additionally, detouring US Route 201 to existing infrastructure would likely result in a finding of adverse effect under Section 106. Traditionally, if MaineDOT removes automobile traffic from its

infrastructure, it seeks to transition ownership as well. If the bridge leaves MaineDOT ownership as a result of a project that uses federal funds, the federal agency is still required to examine the potential effects transferred ownership may have on the integrity of a historic structure under Section 106. MaineDOT would offer this bridge for adaptive reuse at the conclusion of NEPA. Moving vehicular traffic off of a bridge constructed for that purpose represents a change of use under Section 106. Additionally, MaineDOT anticipates that traffic will increase on State Route 24 (Elm Street) by those seeking to shorten the approximate 4-mile detour. This alternative was found to meet the definition of not prudent at 23 CFR 774.17(i-vi).

Conversion to Bike/Pedestrian Facility; Construction of New Bridge Offsite

This alternative is similar to Conversion to Bike/Pedestrian Facility; Detour Traffic to Existing Infrastructure. However, it would introduce a new bridge somewhere between the existing alignment and the current State Route 196 Bypass downstream. An upstream alignment would require a new spur off the congested US Route 1 connecting to a residential neighborhood. Similarly, the connection for a downstream alignment (but upstream of the bridge that serves as the crossing as part of the approximate 4-mile detour) would need to be tied into two neighborhood streets – Water Street in Brunswick and State Route 24 (Elm Street) in Topsham. It would also likely require the removal of several homes on each street. Elm Street is part of the Topsham Historic District. Additionally, the crossing would likely require a multi-span bridge resulting from the necessity of new piers constructed and placed in critical habitat for fish. This alternative was found to meet the definition of not prudent at 23 CFR 774.17(i-vi).

No Build

The No Build alternative would have no action taken to repair, rehabilitate, or correct any deficiencies of the bridge. This alternative would not meet the purpose and need. It would not correct the poor structural condition and deficiency of the bridge. This option would result in the bridge remaining under current MaineDOT and legal load ratings. Additionally, bicycle and pedestrian mobility and safety deficiencies would not be addressed. Therefore, this alternative was not considered prudent and was dismissed from further consideration. This alternative was found to meet the definition of not prudent at 23 CFR 774.17(i) and (ii).

Alternative 5: Replacement on Parallel Downstream Alignment

Alternative 5 would meet the purpose and need, but it would result in the use of all but one of the Section 4(f) properties. The proposed abutment locations would result in consistent flooding, including flooding the PPC. Additionally, a downstream alignment would require more use of the PPC and would use the Frank J. Wood Bridge and 250th Anniversary Park. The constructability for a downstream alignment was quickly identified as more complicated due to topography and hydraulics/hydrology resulting in increased costs over other alternatives. For these reasons, this alternative was not considered prudent and was removed from further consideration. This alternative was found to meet the definition of not prudent at 23 CFR 774.17(i-vi).

## Avoidance Alternatives

Alternatives 3 and 4 would avoid the use of Section 4(f) properties; however, each would retain a fracture critical bridge within MaineDOT's transportation network. It would address some but not all

bicycle and pedestrian safety concerns due to the physical limitations presented by the width of the bridge.

Alternative 3: Bridge Rehabilitation with Existing Westerly Sidewalk

Alternative 3 would rehabilitate the Frank J. Wood Bridge using the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties. This alternative would not result in a finding of adverse effect under Section 106 and would not result in a Section 4(f) use. The rehabilitated bridge would remain fracture critical. This alternative would increase the roadway width to two 11-foot lanes with two 4-foot shoulders and one 5-foot sidewalk. Construction duration is estimated to be three years, only shorter than Alternative 1. This alternative would require a temporary bridge during construction.

The rehabilitation would extend the bridge's service life by 75 years at an estimated construction cost of $15 million, including a 15% rehabilitation contingency cost. Contingency for rehabilitations are typically carried due to the high likelihood additional problem areas of the fracture critical bridge, currently unseen, would be revealed during rehabilitation. Based on previous experience with rehabilitation of bridges, including of this age, type, and material, MaineDOT initially used 15% contingency estimate for this rehabilitation; however, "after additional conversations, this number may be conservatively estimated."[4] While the condition would improve after rehabilitation; the bridge would remain fracture critical.

MaineDOT has estimated that the cost over service life for this rehabilitation alternative would be approximately $35 million – almost twice the amount of a replacement bridge (with a 100-year service life). The high cost over service life is due to the routine maintenance and inspection needs for a fracture critical bridge. FHWA requires states to inspect bridges every twenty-four months and that fracture critical bridges undergo a specific inspection effort. Inspection of a fracture critical bridge requires a minimum of two inspectors, at least one of whom needs to be a qualified fracture critical bridge inspector, completing hands on inspection of every fracture critical member of the bridge. This type of inspection often requires bridge lane closures and the lease of specialized equipment for access and traffic control. Fracture critical inspection can take up to two weeks onsite versus one or two days for other non-fracture critical bridges as well as one to two additional weeks of effort to produce required reporting. This level of effort results in a yearly Inspection cost of $30,000 versus $1,000 to $2,000 for other non-fracture critical bridges (biannual costs spread between two years). Additionally, this alternative would need a $1 million-dollar deck replacement at year 40. These figures are based on the cost estimating included at the end of the appendices of the PDR (Appendix 2).

In summary, the preliminary construction cost estimate of this alternative represents a 13% increase over the lowest preliminary cost of any alternative and a 626% increase in annual cost over service life. It is for these reasons, and when put in context with the information found in the Background section, that this alternative, while it would avoid the use of Section 4(f) properties, was not found prudent and feasible due to operational and maintenance costs of extraordinary magnitude (23 CFR 774.17(iv)).

[4] MaineDOT, "Frank J Wood Questions and Responses," Frank J Wood Public Comment Period Materials, 2017. (Appendix 7)

Alternative 4: Bridge Rehabilitation with Existing Westerly Sidewalk and a New Easterly Sidewalk

Alternative 4 would rehabilitate the Frank J. Wood Bridge using the Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties. This alternative would likely not result in a finding of adverse effect under Section 106 nor would this alternative result in a Section 4(f) use. The rehabilitated alternative would remain fracture critical. This alternative would increase the roadway width to two 11' lanes with two 4' shoulders and two 5' sidewalks. The existing bridge deck would be replaced by a light weight exodermic deck with concrete wearing surface in order to accommodate the extra weight of a second sidewalk. This alternative does not support the weight of a bituminous surface. Construction length is estimated at three years, only shorter than Alternative 1. This alternative would require a temporary bridge during construction.

The rehabilitation would extend the bridge's service life by 75 years at an estimated construction cost of $17 million dollars, including a 15% rehabilitation contingency cost. Contingency for rehabilitations are typically carried due to the high likelihood of additional problem areas of the fracture critical bridge, currently unseen, and revealed during rehabilitation. Based on previous experience with rehabilitation of bridges, including of this age, type, and material, MaineDOT initially used 15% contingency estimate for this rehabilitation; however, "after additional conversations, this number may be conservatively estimated."[5] While the condition would improve after rehabilitation, the bridge would remain fracture critical.

MaineDOT has estimated that the cost over service life for this rehabilitation alternative would be approximately $38.2 million – over twice the amount of a replacement bridge (with a 100-year service life). As stated in Alternative 3, the high cost over service life are due to the routine maintenance and inspection needs for a fracture critical bridge resulting in a yearly inspection cost of $30,000 to $40,000 versus $1,000 to $2,000 for other bridges (biannual costs spread between two years). Additionally, the exodermic deck would need replacement at year 40, at an estimated cost (2017 dollars) of $2 million versus a $1 million deck replacement for Alternative 3.

In summary, the preliminary construction cost estimate of this alternative represents a 24% increase over the lowest estimated preliminary construction cost of any alternative and a 657% increase in annual cost over service life. It is for these reasons, and when put in context with the information found in the Background section, that this alternative, while it would avoid the use of Section 4(f) properties, was not found prudent and feasible due to operation and maintenance costs (Section 774.17(iv)).

The following chart is a breakdown of anticipated service life, preliminary construction costs, and cost over service life. The information comes from MaineDOT Costs over Service Life table (Figure 4).

[5] Ibid.

## Preliminary Cost & Cost over service life v. Length of Service Life

| | Service Life (years[6]) | Preliminary Construction Estimate | Estimated Service Life Costs[7] | Estimated Yearly Average Maintenance & Operations Cost of Service Life[8] | Increased Percentage Maintenance & Operations; Average Annual Cost Per Service Life Year |
|---|---|---|---|---|---|
| Alternative 1 | 100 | $16 M | $20.3M | $43,000 | 0% |
| Alternative 2 | 100 | $13M | $17.3M | $43,000 | 0% |
| Alternative 3 | 75 | $15M | $35.2M | $269,333 | 626% |
| Alternative 4 | 75 | $17M | $38.2M | $282,667 | 657% |

Figure 4: Costs over Service Life

[6] Service life is defined as the number of years a bridge can be part of the transportation system with maintenance, repair, and/or rehabilitation before its eventual replacement. Service life for the rehabilitation takes into account the current age of the structure, including its piers and abutments as well as MaineDOT's institutional knowledge of how bridges will perform over a certain age.

[7] Service Life Cost analysis is the estimated cost of construction as well as the assumed maintenance and operations expenditures necessary throughout the service life (after construction) of the bridge, but does not translate or discount these costs to current dollar equivalents. Cost over service life estimates are the most accurate MaineDOT is able to calculate to best predict future costs.

[8] Estimated Yearly Average Maintenance & Operations Costs of Service Life are calculated as follows: *(Total Cost over Service Life – Preliminary Construction Estimate)/Number of Service Life Years*. Figures are based in cost estimates found in the Preliminary Design Report (Appendix 2).

| | Prudent & Feasible | | Not Prudent & Feasible | | | |
|---|---|---|---|---|---|---|
| | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 | Alternative 5 | No Build |
| Summer Street Historic District | No Use | No Use | No Use | No Use | No Use | No Use |
| Cabot Mill | Use. 0.1 acre (Temporary; rights for temporary bridge) | Use. 0.1 acre (Permanent; retaining wall) | Use. 0.1 acre (Temporary; construction rights) | Use. 0.1 acre (Temporary; rights for temporary bridge) | No Use | No Use |
| Pejepscot Paper Company | No Use | Use. 0.1 acre (Permanent; new driveway) | No Use | No Use | Use. 0.2 acres (Permanent; new bridge construction) | No Use |
| Brunswick Topsham Industrial Historic District[9] | Use. 0.1 acre (Temporary; Cabot Mill; permanent FJW Bridge) | Use. 0.1 acres (Temporary Cabot Mill& PPC; permanent FJW Bridge) | Use. 0.1 acre (permanent Cabot Mill) | Use. 0.1 acre (permanent Cabot Mill) | Use. 0.2 acres permanent PPC; FJW Bridge) | No Use |
| Frank J. Wood Bridge #2016 | Complete permanent Use by removal | Complete permanent Use by removal | No Use | No Use | Complete permanent Use by removal | No Use |
| 250th Anniversary Park | No Use | No Use | No Use | No Use | Use. 3 acres (Permanent; total use of Park) | No Use |

*Figure 5: Illustrates the approximate use of Section 4(f) resources by Alternatives advanced to the Preliminary Design Report. Final Right of Way will not be complete until Plan Impacts Complete stage (Final Design).*

## Least Harm Analysis

As there are no prudent and feasible alternatives that avoid using Section 4(f) properties, a least harm analysis is required per 23 CFR 774.3(c) to determine the alternative that causes the least overall harm in light of the statute's preservation purpose. 23 CFR 774.3(c)(1) provides the guidance of seven factors to be considered in determining the alternative which causes the least overall harm. The seven factors are:

i. the ability to mitigate adverse impacts to Section 4(f) resources

[9] The total land used for the district is representative of the land used at the Cabot Mill and PPC. Each would use the Frank J. Wood Bridge, thereby making only the different land uses at Cabot Mill and PPC relevant.

ii. the relative severity of remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection
iii. the relative significance of each Section 4(f) property
iv. the views of the officials with jurisdiction over each Section 4(f) property
v. the degree to which each alternative meet the purpose and need
vi. after reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f)
vii. substantial differences in costs among the alternatives

With all other alternatives either removed from further consideration or not prudent and feasible, the least harm analysis was applied to Alternative 1 (Replacement on Existing Alignment) and Alternative 2 (Replacement on Upstream Alignment).

Alternative 1: Replacement on Existing Alignment

Alternative 1 would require an 800-foot, multi-span, steel girder bridge on the existing alignment. This alternative would require the complete removal of the Frank J. Wood Bridge prior to any new construction as well as a temporary bridge. A detour was considered; however, it would result in traffic disruption for two years. This alternative would require a work trestle. Construction would be 3½ years due to the limitations on in-water work and to accommodate the time required to construct a temporary bridge to carry traffic during construction. It would require temporary occupancy of the Cabot Mill as approximately 0.1 acre would be temporarily required for the temporary bridge used during the replacement effort. This alternative would require the removal of the Frank J. Wood Bridge, resulting in a permanent Section 4(f) use of that resource and the BTIHD. This alternative would not use the PPC, SSHD, nor the 250th Anniversary Park.

Alternative 2: Replacement on Upstream Alignment

Alternative 2 would require an 835-foot, multi-span, steel girder bridge on a curved upstream alignment. The estimated time of construction would be 2½ years, a reduction from Alternative 1 as traffic would be carried on the existing bridge for most of the construction duration - eliminating the length of time, money, and in-water work impacts associated with a temporary bridge. This alternative would permanently use the Cabot Mill, the PPC, and the BTIHD as approximately 0.1 acres would be permanently used at the Cabot Mill for a retaining wall and approximately 0.1 acre would be permanently used at the PPC to tie in the island access to the new bridge. This alternative would require the removal of the Frank J. Wood Bridge, resulting in a permanent Section 4(f) use of that resource. This alternative would not use the SSHD nor the 250th Anniversary Park.

Alternatives 1 and 2 have the same ability to mitigate adverse effects; level of severity of remaining effects to the qualifying attributes or features (particularly Section 106 adverse effects and Section 4(f) use); views of the officials with jurisdiction; and degree of meeting the purpose and need. The land needed for each alternative is relatively minimal when compared to the overall size of the Cabot Mill and PPC sites (5 and 16 acres respectively).

Additionally, the Androscoggin River is home to numerous species protected by the Endangered Species Act (ESA), including, but not limited to, Atlantic salmon, Atlantic sturgeon, and shortnose sturgeon and their designated critical habitat, as well as Essential Fish Habitat (EFH). Impacts under the ESA are quantified in part by frequency, impact, and duration of the stressor to which the species may be

exposed. Typically, time of year restrictions for in-water work are placed on projects to minimize, but not fully avoid, stress to and harassment of fish and wildlife by reducing exposure during their most active periods. The time of year restrictions would be considered ways to mitigate adverse effects. However, preliminary analyses show that all alternatives (both rehabilitation and replacement) would result in adverse effects under the ESA, even considering the reasonable mitigation of limiting in-water work to between October and March. Additionally, the magnitude of these effects would be increased by Alternative 1 because its construction duration would be 3½ years (versus 2½ years for the preferred alternative). Additionally, Alternative 2 would only require a work trestle rather than both a trestle and temporary bridge as with Alternative 1. Only having a work trestle, instead of having a work trestle and a temporary on-site bridge, reduces the magnitude of in-water work. Decreased adverse effects under the ESA as a result of a shorter construction duration for the preferred alternative is considered the least harm.

The Preliminary Cost Estimate for Alternative 2 is $13 million, or an estimated $3 million (20%) less than Alternative 1 (Replacement on Existing Alignment). Based on historic cost expenditures for similar bridge construction projects (number of spans, physical conditions, location), this constitutes a substantial difference over Alternative 1. More information regarding cost estimating can be found in the PDR (Appendix 2)

While Alternative 2 uses the most Section 4(f) resources, it is the least harm to limit the length of time the project is in the Androscoggin River (habitat and endangered species) while conservatively spending funds. MaineDOT cannot fully fund projects to maintain infrastructure at current levels (which includes many bridges in poor condition or structurally deficient bridges).

FHWA has determined that Alternative 2 results in the least overall harm because:

- It is the alternative that requires the least amount of time for in-water work in areas with endangered species and their habitats; 23 CFR 774.3(c)(1)(iv)
- The 20% decrease in costs between Alternative 1 ($16 million) and Alternative 2 ($13 Million) represents a substantial[10] difference between the two alternatives that are feasible and prudent; 23 CFR 774.3(c)(1)(vii)

## Measures to Minimize Harm

The preferred alternative, Alternative 2 (Replacement on Upstream Alignment), would use four Section 4(f) resources: Cabot Mill, PPC, Frank J. Wood Bridge, and BTIHD as the result of permanent incorporation of land into transportation use. While the Frank J. Wood Bridge would be removed, MaineDOT has endeavored to reduce the amount of land temporarily and permanently used at other Section 4(f) resources by limiting use to no more than .2 acres (combined) of the Cabot Mill and PPC.

Measures to minimize harm for adverse effects will be developed in consultation with MHPC, the consulting parties, and the public. Additionally, the FHWA Maine Division and MaineDOT are working with various agencies to minimize impacts to resources that are protected under other legislation.

[10] "Substantial" is informed by the Background Section and KOBS (2014) report (Appendix 8).

## Coordination

In November 2015, letters were sent to the towns of Brunswick and Topsham and the federally recognized tribes in Maine requesting information on historic resources in the project area. Responses were received in November and December of 2015 from the towns, Passamaquoddy Tribe, and Penobscot Nation. The historic architectural survey was started shortly after and approved as complete by the SHPO in May 2016. The SHPO concurred with the Area of Potential Effect (APE) and properties determined eligible for listing on the National Register of Historic Places by the MaineDOT in June 2016. In June 2016, Section 106 consulting parties with demonstrated interests in the undertaking were established. Section 106 consulting party meetings were subsequently held in 2016 on July 11, August 18, and October 27 to discuss and receive comments regarding the Section 106 APE, eligible historic properties, and to evaluate the effects on historic properties for each of the proposed alternatives. The ACHP participated in these meetings. In February 2017, the draft Section 106 determination of effect on historic properties for each alternative was developed and distributed to the Section 106 consulting parties, SHPO, and posted for public review and comment. Comments were received and incorporated. In March 2017, the SHPO concurred with the determination of effect on historic properties for each alternative. A public meeting was held on April 5, 2017 utilizing an open house format and comments were received at the meeting and until April 19, 2017. FHWA and MaineDOT responded to common questions on June 5, 2017 by posting to MaineDOT's public website and e-mailing to interested parties. MaineDOT and FHWA continued to consult under Section 106 and additional comments and concerns were received and considered through December 2017.

Based on comments received from the consulting parties and SHPO, MaineDOT reevaluated the individual eligibility of the Frank J. Wood Bridge. MaineDOT conducted additional research on the 1936 flood, the interurban trolley, and the Boston Bridge Works Company. MaineDOT determined that the bridge was not individually eligible and sent the documentation to the SHPO on October 25, 2017 for concurrence. The SHPO responded on November 16, 2017 and did not concur. MHPC stated that the bridge is individually eligible for listing in the National Register of Historic Places under Criterion A for its local significance in Transportation for its significant association with regional interurban trolley lines. While most of the features associated with the interurban line are gone, MHPC noted that the standard width and height of the bridge, set specifically to accommodate the interurban was adequate integrity to convey that significance. MaineDOT responded to the SHPO on December 13, 2017 that FHWA has made the determination that the Frank J. Wood Bridge is individually eligible for the National Register of Historic Places. On December 15, 2017, the Advisory Council on Historic Preservation was invited to participate in the consultation process.

The MaineDOT has held three public meetings. In February 2015, the public noted the following aspects as important to them: need for bicycle/pedestrian connectivity, aesthetics, importance of detour routes, costs and life cycle expectations, and historic resources. Additional public meetings were held in April 2016 and April 2017.