Frank J. Wood Questions and Responses

Formal comments from the public, state and federal resource agencies, and the Section 106 consulting parties on the Frank J. Wood bridge project were first received in 2016. The Maine Department of Transportation (MaineDOT) and the Federal Highway Administration (FHWA) have compiled and posted all comments that were received on the Frank J. Wood web page (http://www.maine.gov/mdot/env/frankjwood/), in order to provide the public with an opportunity to view all the comments and other project-related information. All comments have been reviewed by MaineDOT and FHWA and are currently being considered in the decision-making process. The following list of commonly asked questions and answers was compiled for the purposes of helping to answer specific questions received and clarify information about the Frank J. Wood bridge project.

1. Why hasn't MaineDOT's Preliminary Design Report (PDR) been released?

The PDR is a MaineDOT document that is generated by the MaineDOT project team. The PDR discusses the alternatives considered from primarily a cost and engineering perspective. This document identifies a recommended alternative. The Frank J. Wood bridge project PDR will not be finalized until a preferred alternative is identified, and after considering the environmental, engineering and cost impacts. Supporting information that is typically included in the PDR (summary of alternatives, matrix of alternatives, alternative alignments, preliminary costs estimates, service life costs, and cultural and natural environmental impacts) has been shared at Section 106 consulting party meetings, the April 2017 public meeting and posted on the Frank J. Wood web page.

2. Why are there different durations of construction for each alternative?

Alternative 1 estimates the duration of construction to be approximately 3 ½ years, Alternative 2 estimates the duration of construction to be approximately 2 ½ years, and Alternatives 3 & 4 estimate the duration of construction to be approximately 3 years. The construction durations for each alternative were estimated by breaking down the work into major construction activities by using past history and experience with construction rates and duration. Additionally, seasonal constraints were factored into the schedule. For example, bridge painting is only feasible in the warmer months and in-water work is limited to specific time of year windows due to the presence of endangered species. The construction (and removal) of a temporary bridge was estimated to take 1 year. Alternatives 1, 3 and 4 include the construction of a temporary bridge.

3. What is the justification for an on-site temporary bridge detour over closure with an off-site temporary detour (bypass) for Alternatives 1, 3, and 4?

As outlined in the Maintenance of Traffic section of the Summary of Alternatives, the average delays for vehicles using an off-site temporary detour are between 3 and 4 minutes. 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. The table below shows how the three components are combined.

Bridge Closure Scenario	Existing	NB Closed	SB Closed	NB & SB Closed	
Alternative Delay during Peak Hour (veh-hrs)	40.5	34.1	108.4	59.8	
Annual Mobility Benefit Multiplier	1280				
Annual Intersection Delay (veh-hrs)	51855.1	43608.4	138783.3	76566.4	
Daily Intersection Delay (veh-hrs)	142.1	119.5	380.2	209.8	3
Daily Detour Travel Time (veh-hrs)	0	443	445	868	2
Total Daily Alternative Delay (veh-hrs)	142.1	562.5	825.2	1077.8	2+3
Added Vehicle-Hours, Compared to Existing		420.4	683.2	935.7	2+3
Unit Cost of Time ($/veh-hr)	$ 12.89				
Daily User Cost of Time ($)	$ -	$ 5,419	$ 8,807	$ 12,062	2+3
Added Vehicle-Miles		13100	14737	25786	1
Unit Cost of Distance ($/veh-mi)	$ 0.37				
Daily User Cost of Distance ($)	$ -	$ 4,909	$ 5,523	$ 9,663	1
Total Daily User Cost ($)	$ -	**$ 10,329**	**$ 14,329**	**$ 21,725**	1+2+3

This table is strictly user costs and does 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. Imposing these additional impacts to the business districts of Brunswick and Topsham and the users of this crossing through an extended bridge closure was determined not acceptable. 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 on-site temporary bridge detour is included in Alternatives 1, 3, and 4 because it is cost effective. This is also the justification for not conducting a traffic study in conjunction with the 2017 Frank J. Wood repair work.

4. How were the construction costs estimated for each alternative?

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 B includes a Structural Cost Estimate for each alternative. The preliminary construction cost estimates previously provided were based off the Structural Cost Estimates. The first sheet of the Structural Cost Estimate for each alternative is a summary sheet, and the remaining sheets break down the major items into quantified sub-items. Each of the sub-items (including the miscellaneous value of 7% + $1 million) was estimated using historical data from MaineDOT. The miscellaneous value (7% + $1 million work trestle premium) is based on historical information when estimating the major items of a bridge project. The miscellaneous value was estimated for Alternatives 1 and 2 only, as these are the only alternatives that would need a work trestle to facilitate the construction of a new bridge. Generally, the major bid items would include the cost of work platforms and trestles. However, this site is considered more difficult due to its topography so an additional $1 million was added to account for this. This is also based on historical project data and bid items. See question 5 for contingency cost information.

5. How were the contingency costs determined for Alternatives 3 & 4?

Historically, rehabilitation projects have frequently cost more than their preliminary estimates. One of the main reasons for this is because of the unknowns and uncertainties associated with rehabilitation work. It is difficult to know the precise condition of all the bridge elements until the work is underway. As you start dismantling components of the bridge, you may find more section loss and more deterioration than anticipated. Too many unknowns can cause prices to inflate. Replacement of the entire deck system would remove a good portion of the unknowns. 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. To address some of the uncertainties, a 15% contingency was used for Alternatives 3 & 4. The cost of steel was initially estimated at $7.80/lb., however the price has gone up considerably 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 contingencies a conservative estimate. Contingencies are estimated based on past project history for similar type bridge rehabilitations. Due to the uncertainties associated with rehabilitating an existing deteriorated truss bridge, a higher amount of contingency costs are typically carried for rehab options.

6. How were the annual inspection costs and annual routine maintenance costs estimated for each alternative?

Alternatives 1 and 2 (replacement) 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 (rehabilitation) also estimate an annual inspection cost and annual routine maintenance cost. The annual inspection of an older, fracture critical bridge requires an inspection team gaining 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.

7. Explain life cycle costs, service life costs, and construction costs.

Life cycle costs, service life costs, and construction costs are all tools that are used to compare the estimated costs between the alternatives. They are each used to help make a more informed decision. Simply put, life cycle costs are the costs of future investments in today's dollars. **Life cycle costs** include all the total estimated bridge costs throughout the life of the bridge and translate them to current dollar equivalents. Life cycle costs account for estimated construction costs on the current project and the translated present value of anticipated future inspection, maintenance, and rehabilitation. **Service life costs** are the estimated costs to maintain the bridge for its designed service life. Costs are broken down into required annual costs (such as inspections and anticipated maintenance) as well as required periodic items (such as bridge painting, deck replacement, structural rehabilitation). These costs are generated on the historical maintenance needs of similar bridge types and historical data on costs. Service life costs estimate the total cost of the bridge over its life. **Construction costs** include the total estimated costs of building the bridge in today's dollars. Construction unit prices are generated from recent bid history for all items. Unit price is multiplied by the unit quantity required to estimate a total item cost. Life cycle costs, service life costs, and construction costs have been estimated for each alternative and are included in the documents provided on the Frank J Wood bridge project website.

8. Has MaineDOT considered alternative methods to remove pack rust (i.e., crevice corrosion), such as pneumatic pack rust removal?

Yes. MaineDOT and FHWA both reached out to other states to learn more about pneumatic pack rust removal. Specifically, staff from FHWA's Michigan Division, Michigan Department of Transportation, and a Michigan consultant were contacted and several published articles[1] were researched and reviewed. Additionally, MaineDOT's consultant reached out to the TY LIN Virginia office and requested an independent peer review. The scope of the independent peer review was to review the general approach to the proposed rehabilitation work, look at the constructability, and analyze the proposed future maintenance requirements. The independent peer review found that the pneumatic pack rust removal technique has been used in Michigan and in various other places across the country. No testing has been done on the effects this technique may have on changing the properties of the steel; as steel is heated and beaten, it could "harden," even if temperatures are being

[1] *Maniar, D., Engelhardt, M., and Leary, D. "Evaluation and Rehabilitation of Historic Metal Truss Bridges: A Case Study of an Off-System Historic Metal Truss Bridge in Shackelford County, Texas." Center for Transportation Research, University of Texas at Austin, Report No. FHWA/TX-03/1741-3, March 2003. ;
*National Park Service (NPS). "Preservation of Historic Iron and Steel in Bridges and Other Metal Structures." National Center for Preservation Technology and Training. July 14, 2010. ;
*Pfuntner, J. "Wider Load: Rehabilitation of the Checkered House Bridge (VT)." Modern Steel Construction, December 2012. ;
*Virginia Transportation Research Council (VTRC). "Best Practices for the Rehabilitation and Moving of Historic Metal Truss Bridges." June 2006.

monitored, and could result in making the members much more susceptible to fatigue cracking. Also, even if this technique were to remove most of the pack rust, an NACE[2] article suggests that if not all the rust is removed, further acceleration of the corrosion process will occur. So, if corrosion deposits are not completely removed, even after re-sealing and an absence of further external contamination, corrosion can still occur. MaineDOT has determined that pneumatic pack rust removal will not be used for rehabilitation of the Frank J. Wood bridge.

9. Do any of the rehabilitation alternatives include a lightweight deck option?

Yes, Alternative 4 includes a lightweight, exodermic deck. The existing bridge deck is a lightweight, concrete-filled steel grid deck. To maintain the existing loading on the trusses while adding a new second sidewalk as proposed in Alternative 4, weight would need to be taken off the truss elsewhere, or additional structural members added to the existing bridge. 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 is recommended. An exodermic deck system can be as much as fifty percent lighter than a conventional concrete deck of the same span, is more durable than a lightweight concrete deck, and is more cost-effective than other lightweight systems. An exodermic deck is estimated to last approximately 50 years.

10. Why don't the rehabilitation alternatives include a paved wearing surface?

A paved (bituminous) wearing surface was not estimated or proposed for the rehabilitation alternatives (Alternatives 3 and 4) because it adds additional weight to the truss. The current load rating of the critical truss members that would be remaining in a rehabilitated alternative are at or just above legal loads and could not have the added weight of a paved surface.

11. Explain why a 30-year rehabilitation alternative was initially presented and why consideration is now being given to a 75-year rehabilitation alternative.

A 30-year rehabilitation alternative was initially presented in April 2016 and was used to see if the life cycle costs could be comparable to or compete with a replacement alternative. The 30 year rehabilitation looked at the remaining service lives of the major bridge elements and then tried to come up with a rehabilitation option that gained as much additional life from the bridge at a minimal cost. Accounting for future costs out to 30 years, this preliminary analysis would avoid painting the bridge in the future, a major component to the life cycle cost of the rehabilitation. The preliminary analysis of the 30-year rehabilitation included replacing the bridge deck, repairing the damaged and deteriorated steel bridge members, and painting the entire truss but did not estimate a temporary bridge and was analyzed prior to the August 2016 bridge inspection. MaineDOT evaluated a rehabilitation alternative with a 75-year life due to input at the first Section 106 consulting party meeting on July 11, 2016. The rehabilitation alternative with a 75-year life was added and presented to the Section 106 consulting parties at the August 18, 2016 meeting. This alternative does include temporary bridge costs and service life costs such as painting, maintenance and inspections. The 75-year rehabilitation alternative was also posted on the Frank J. Wood bridge project web page in November 2016 and presented at the April 5, 2017 public open house meeting.

[2] National Association of Corrosion Engineers (NACE) International. "Corrosion Control Plan for Bridges." November 2012.

12. What is the process for moving Route 201 from its current location to instead joining Route 1 following the Route 196 connector route?

Route 201 is designated as a state highway in the project area. Information regarding changes to routed highways can be found at the following MaineDOT webpage: **http://www.maine.gov/mdot/csd/mts/routenumbers.htm**. MaineDOT's decision to keep two 11-foot travel lanes, instead of two 10-foot travel lanes, is predicated on the characteristics of the traffic utilizing this section of public road. MaineDOT would not expect the traffic to change materially if the road no longer had the Route 201 designation.

13. Where are we in the Section 106 process?

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. Responses were received in November and December of 2015 from towns, the Passamaquoddy Tribe, and Penobscot Nation. The historic architectural survey was started in January 2016 and approved as complete by the Maine Historic Preservation Commission (Maine State Historic Preservation Officer (SHPO)) in May 2016. Properties determined eligible for listing on the National Register of Historic Places were concurred with by the SHPO in June 2016. In June 2016, Section 106 consulting parties with a demonstrated interest 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 on 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. Supporting information and documents related to the Section 106 process can be found on MaineDOT's project website at http://www.maine.gov/mdot/env/frankjwood/. All the comments and information regarding historic resources and potential effects are being considered as FHWA and MaineDOT identify a preferred alternative.

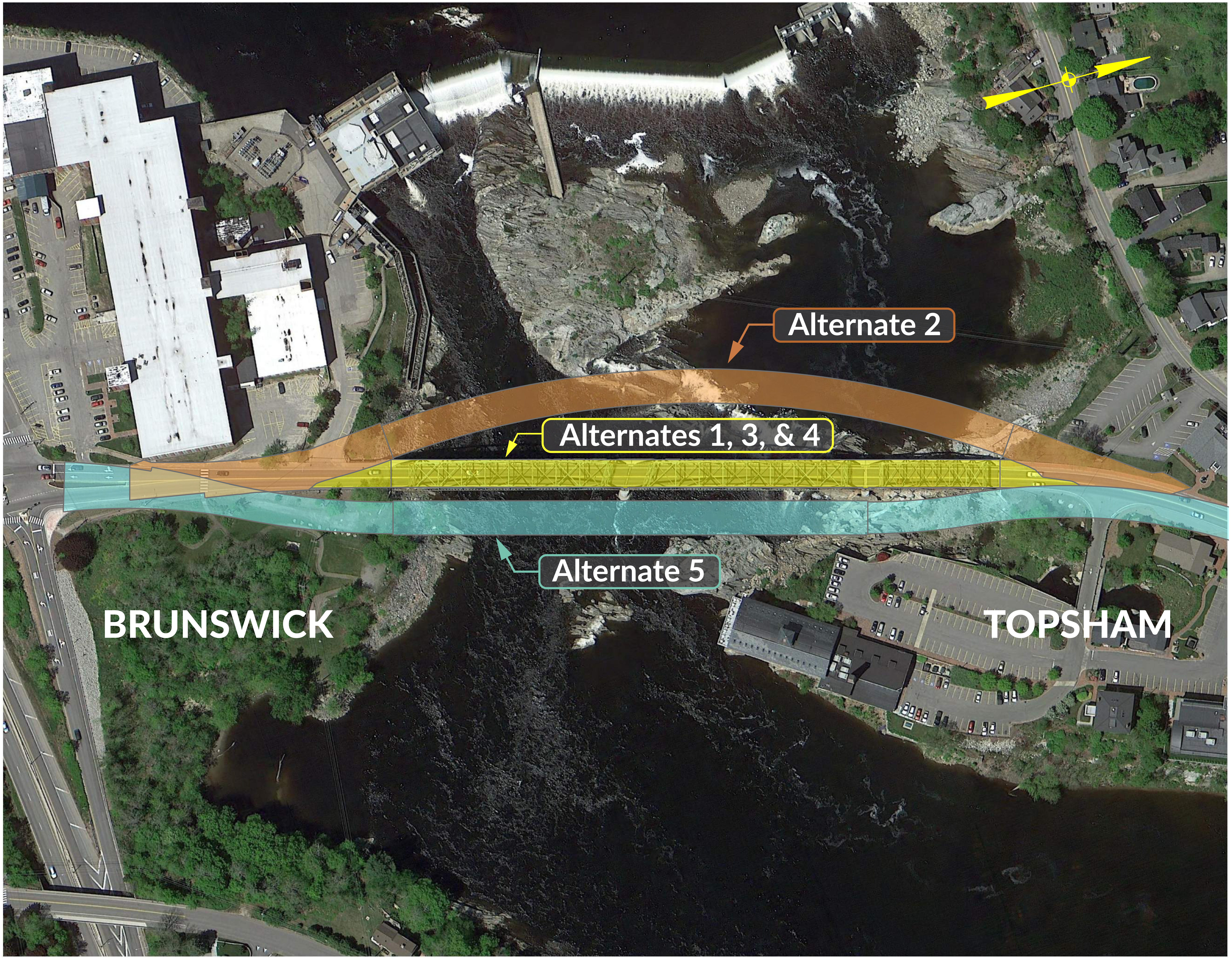
14. Where are we in the overall process and how/when will MaineDOT and FHWA make a decision on a preferred alternative?

At this point in project development, MaineDOT and FHWA are in the process of deciding on a preferred alternative to carry forward into further design. When looking at deciding on a preferred alternative, FHWA and MaineDOT consider the environmental, cultural, social, economic impacts, and transportation needs (i.e., vehicular, bicycle and pedestrian), in addition to considering the engineering, cost, constructability, traffic, utilities, maintenance, and public input. MaineDOT and FHWA will select the alternative that best meets the purpose and need and best balances the considerations listed above. MaineDOT and FHWA anticipate having a preferred alternative that will be announced publicly sometime in June of 2017. Once a preferred alternative is selected and further design is underway, MaineDOT and FHWA will continue to process the preferred alternative under the National Environmental Policy Act (NEPA) and the federal laws and executive orders that fall under the NEPA umbrella. This includes, but is not limited to, compliance with Section 106 of the

National Historic Preservation Act, Section 7 of the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and Section 404 of the Clean Water Act. At this point in time, it is anticipated that MaineDOT will complete NEPA in early 2018, finalize the design and advertise the project for construction in the fall of 2018, with construction beginning in early 2019. These dates are anticipated and could change.

Appendix A –Alternative Alignments Graphic

Brunswick-Topsham, Frank J. Wood Bridge
Alternative Alignments



MaineDOT

TY·LIN INTERNATIONAL

BRUNSWICK – TOPSHAM
FRANK J. WOOD BRIDGE
CUMBERLAND AND SAGADAHOC COUNTY
WIN 22603.00 MARCH 20, 2017

Appendix B –Structural Cost Estimates for Alternatives 1, 2, 3 & 4

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 1
800 ft 5 Steel Girder 5 Span 137.5'-175'-175'-175'-137.5'

Element	Cost
Steel Girder with CIP Deck	$ 5,642,000
South Abutment & Wingwalls	$ 525,000
North Abutment & Wingwalls	$ 112,000
Solid Shaft Piers	$ 1,124,000
Cofferdam - Piers	$ 600,000
Structural Excavation & Borrow	$ 60,000
Riprap	$ 24,000
Miscellaneous Item Contingency @ 7% + $1M work trestle premium	$ 1,942,000
STRUCTURE SUBTOTAL =	$ 10,029,000
Approaches	$ 113,000
Miscellaneous Approach Item Contingency @ 10%	$ 12,000
APPROACH SUBTOTAL =	$ 125,000
Temporary Bridge	$ 4,000,000
Removal of Existing Bridge Structure	$ 1,000,000
Mobilization/Demobilization @ 7%	$ 798,000
CONSTRUCTION TOTAL =	$ 15,952,000
RIGHT OF WAY COST =	$0
TOTAL COST =	$15,952,000
SAY	**$16,000,000**

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 1
800 ft 5 Steel Girder 5 Span 137.5'-175'-175'-175'-137.5'
Steel Girder with CIP Deck

Item	Unit	Quantity	Unit Price	Cost
Hot Mix Asphalt, 9.5mm Nominal Maximum Size	Ton	470	$ 200.00	$ 94,000
Structural Concrete Roadway Slab on Steel Bridges	CY	1450	$ 1,230.00	$ 1,783,500
Reinforcing Steel, Fab & Del	LBS	325000	$ 0.88	$ 286,000
Reinforcing Steel, Placing	LBS	325000	$ 0.78	$ 253,500
High Performance Waterproofing Membrane	SY	2860	$ 23.00	$ 65,780
Structural Steel Fab. & Del., Welded	LBS	1374000	$ 1.46	$ 2,006,040
Structural Steel Erection	LBS	1374000	$ 0.36	$ 494,640
Shear Connectors	EA	8050	$ 7.50	$ 60,375
Steel Bridge Railing, 4 Bar	LF	1610	$ 190.00	$ 305,900
Bridge Expansion Joint, Finger; including Fabric Trough	LF	91	$ 1,560.00	$ 141,960
Permanent Concrete Transition Barrier	EA	4	$ 3,400.00	$ 13,600
Pot or Disc Bearings, Expansion or Fixed (including Installation)	EA	30	$ 4,300.00	$ 129,000
4000000				
			Superstructure Cost Subtotal =	$ 5,634,295

#VALUE!

Round up $ 5,635,000

Cost / sf $ 155

Deck Area = 803' x 45'4" = 36403 155 **$ 5,642,000**

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate

Alternate 1

South Abutment & Wingwalls

Description	Unit	Quantity	Unit Price	Cost
Structural Concrete Abutment & Retaining Wall	CY	460	$ 800.00	$ 368,000
Structural Concrete Abutment & Retaining Wall (UW)	CY	135	$ 210.00	$ 28,350
Structural Concrete Approach Slab	CY	16	$ 490.00	$ 7,840
Reinforcing Steel, Fab & Del	LBS	72000	$ 0.88	$ 63,360
Reinforcing Steel, Placing	LBS	72000	$ 0.78	$ 56,160
			South Abutment Cost Total =	$ 523,710

SAY **$ 525,000**

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate

Alternate 1

North Abutment & Wingwalls

Description	Unit	Quantity	Unit Price	Cost
Structural Concrete Abutment & Retaining Wall	CY	88	$ 800.00	$ 70,400
Structural Concrete Abutment & Retaining Wall (UW)	CY	28	$ 210.00	$ 5,880
Structural Concrete Approach Slab	CY	16	$ 490.00	$ 7,840
Reinforcing Steel, Fab & Del	LBS	16000	$ 0.88	$ 14,080
Reinforcing Steel, Placing	LBS	16000	$ 0.78	$ 12,480
			North Abutment Cost Total =	$ 110,680

SAY **$ 112,000**

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 1
800 ft 5 Steel Girder 5 Span 137.5'-175'-175'-175'-137.5'
Solid Shaft Piers (4 Piers)

Description	Unit	Quantity	Unit Price	Cost
Structural Concrete, Piers (Shaft/Wall)	CY	730	$ 940.00	$ 686,200.00
Structural Concrete, Piers (placed under water)	CY	1020	$ 220.00	$ 224,400.00
Reinforcing Steel, Fab & Del	LBS	127500	$ 0.88	$ 112,200.00
Reinforcing Steel, Placing	LBS	127500	$ 0.78	$ 99,450.00
			Pier Cost Total =	$ 1,122,250

SAY **$ 1,124,000**

Average Cost / Pier = $ 281,000

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 2
835 ft 5 Steel Girder 5 Span 80', 200'-205'-205'-145'

Element	Cost
Steel Girder with CIP Deck	$ 6,459,000
South Abutment & Wingwalls	$ 555,000
North Abutment & Wingwalls	$ 129,000
Solid Shaft Piers	$ 1,056,000
Cofferdam - Piers	$ 600,000
Structural Excavation & Borrow	$ 60,000
Riprap	$ 24,000
Miscellaneous Item Contingency @ 7% + $1M work trestle premium	$ 1,717,000
STRUCTURE SUBTOTAL =	$ 10,600,000
Approaches	$ 450,000
Miscellaneous Approach Item Contingency @ 10%	$ 45,000
APPROACH SUBTOTAL =	$ 495,000
Removal of Existing Bridge Structure	$ 1,000,000
Mobilization/Demobilization @ 7%	$ 737,000
CONSTRUCTION TOTAL =	$ 12,832,000
RIGHT OF WAY COST =	$50,000
TOTAL COST =	$12,882,000
SAY	**$13,000,000**

Prepared by: RMH 10/15
Checked by:DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 2
835 ft 5 Steel Girder 5 Span 80', 200'-205'-205'-145'
Steel Girder with CIP Deck

Item	Unit	Quantity	Unit Price	Cost
Hot Mix Asphalt, 9.5mm Nominal Maximum Size	Ton	490	$ 200.00	$ 98,000
Structural Concrete Roadway Slab on Steel Bridges	CY	1510	$ 1,230.00	$ 1,857,300
Reinforcing Steel, Fab & Del	LBS	339000	$ 0.88	$ 298,320
Reinforcing Steel, Placing	LBS	339000	$ 0.78	$ 264,420
High Performance Waterproofing Membrane	SY	2980	$ 23.00	$ 68,540
Structural Steel Fab. & Del., Welded	LBS	1753000	$ 1.46	$ 2,559,380
Structural Steel Erection	LBS	1753000	$ 0.36	$ 631,080
Shear Connectors	EA	7200	$ 7.50	$ 54,000
Steel Bridge Railing, 4 Bar	LF	1680	$ 190.00	$ 319,200
Bridge Expansion Joint, Finger; including Fabric Trough	LF	91	$ 1,560.00	$ 141,960
Permanent Concrete Transition Barrier	EA	4	$ 3,400.00	$ 13,600
Pot or Disc Bearings, Expansion or Fixed (including Installation)	EA	35	$ 4,300.00	$ 150,500
			Superstructure Cost Subtotal =	$ 6,456,300

Round up $ 6,457,000

Cost / sf $ 170

Deck Area = 838' x 45'4" = 37990 170 **$ 6,459,000**

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate

Alternate 2

South Abutment & Wingwalls

Description	Unit	Quantity	Unit Price	Cost
Structural Concrete Abutment & Retaining Wall	CY	460	$ 800.00	$ 368,000
Structural Concrete Abutment & Retaining Wall (UW)	CY	280	$ 210.00	$ 58,800
Structural Concrete Approach Slab	CY	16	$ 490.00	$ 7,840
Reinforcing Steel, Fab & Del	LBS	72000	$ 0.88	$ 63,360
Reinforcing Steel, Placing	LBS	72000	$ 0.78	$ 56,160
			South Abutment Cost Total =	$ 554,160

SAY $ 555,000

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate

Alternate 2

North Abutment & Wingwalls

Description	Unit	Quantity	Unit Price	Cost
Structural Concrete Abutment & Retaining Wall	CY	88	$ 800.00	$ 70,400
Structural Concrete Abutment & Retaining Wall (UW)	CY	110	$ 210.00	$ 23,100
Structural Concrete Approach Slab	CY	16	$ 490.00	$ 7,840
Reinforcing Steel, Fab & Del	LBS	16000	$ 0.88	$ 14,080
Reinforcing Steel, Placing	LBS	16000	$ 0.78	$ 12,480
			North Abutment Cost Total =	$ 127,900

SAY **$ 129,000**

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 2
835 ft 5 Steel Girder 5 Span 80', 200'-205'-205'-145'
Solid Shaft Piers (4 Piers)

Description	Unit	Quantity	Unit Price	Cost
Structural Concrete, Piers (Shaft/Wall)	CY	720	$ 940.00	$ 676,800.00
Structural Concrete, Piers (placed under water)	CY	760	$ 220.00	$ 167,200.00
Reinforcing Steel, Fab & Del	LBS	126000	$ 0.88	$ 110,880.00
Reinforcing Steel, Placing	LBS	126000	$ 0.78	$ 98,280.00
			Pier Cost Total =	$ 1,053,160

SAY $ 1,056,000

Average Cost / Pier = $ 264,000

Prepared by: RMH 10/15
Checked by: DSM 10/15

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 3
Rehabilitate Existing 800 ft 3 Span Steel Truss

Element	Cost
Rehabilitate Existing 800 ft Steel Truss	$ 7,287,000
Abutment Backwall inc. Removal	$ 120,000
Pier 2 Span 3 Bearing Pedestal Replacement & Bearing Rehab	$ 100,000
Rehabilitation Contingencies @ 15%	$ 1,153,000
Miscellaneous @ 7%	$ 843,000
STRUCTURE SUBTOTAL =	$ 9,503,000
Approaches	$ 50,000
Miscellaneous Approach Item Contingency @ 10%	$ 5,000
APPROACH SUBTOTAL =	$ 55,000
Temporary Bridge	$ 4,000,000
Removal of Existing Slab Full Depth, Inc. Steel Floor Framing	$ 175,000
Mobilization/Demobilization @ 10%	$ 1,174,000
CONSTRUCTION TOTAL =	$ 14,907,000
RIGHT OF WAY COST =	$0
TOTAL COST =	$14,907,000
SAY	**$15,000,000**

Prepared by: RMH 8/16
Checked by: DSM 8/16

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 3
Rehabilitate Existing 800 ft 3 Span Steel Truss
Rehabilitate Existing 800 ft Steel Truss

Item	Unit	Quantity	Unit Price	Cost
Structural Concrete Roadway Slab on Steel Bridges	CY	810	$ 1,230.00	$ 996,300
Reinforcing Steel, Fab & Del	LBS	160000	$ 0.88	$ 140,800
Reinforcing Steel, Placing	LBS	160000	$ 0.78	$ 124,800
Strutural Steel Repairs - Sidewalk Brackets	LS	1	$50,000.00	$ 50,000
Structural Steel, Floor System Fab & Delivered	LBS	444000	$ 2.20	$ 976,800
Structural Steel, Floor System, Erection	LBS	444000	$ 1.80	$ 799,200
Structural Steel, Truss Bottom Chord Flange, Installed	LBS	58000	$ 7.80	$ 452,400
Field Painting	LBS	2700000	$ 0.27	$ 729,000
Surface Prep Existing Str Steel	LBS	2700000	$ 0.46	$ 1,242,000
Containmant and Pollution Control	LBS	2700000	$ 0.46	$ 1,242,000
Disposal of Special Waste Material	LBS	2700000	$ 0.02	$ 54,000
Shear Connectors	EA	27000	$ 7.50	$ 202,500
Steel Bridge Railing, Pedestrian Remove and Reset	LF	810	$ 94.00	$ 76,140
Steel Bridge Railing, 2 Bar Remove and Reset	LF	810	$ 62.00	$ 50,220
Bridge Expansion Joint, Gland Seal	LF	156	$ 840.00	$ 131,040
			Superstructure Cost Subtotal =	$ 7,267,200

Round up $ 7,268,000

Cost / sf $ 226

Deck Area = 808' x 39.9' = 32240 226 **$ 7,287,000**

Prepared by: RMH 8/16
Checked by: DSM 8/16

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 4
Rehabilitate Existing 800 ft 3 Span Steel Truss with New Sidewalk

Element	Cost
Rehabilitate Existing 800 ft Steel Truss with Exodermic Deck and SW	$ 8,622,000
Abutment Backwall inc. Removal	$ 122,000
Pier 2 Span 3 Bearing Pedestal Replacement & Bearing Rehab	$ 100,000
Rehabilitation Contingencies @ 15%	$ 1,353,000
Miscellaneous @ 7%	$ 937,000
STRUCTURE SUBTOTAL =	$ 11,134,000
Approaches	$ 100,000
Miscellaneous Approach Item Contingency @ 10%	$ 10,000
APPROACH SUBTOTAL =	$ 110,000
Temporary Bridge	$ 4,000,000
Removal of Existing Slab Full Depth, Inc. Steel Floor Framing	$ 175,000
Mobilization/Demobilization @ 10%	$ 1,312,000
CONSTRUCTION TOTAL =	$ 16,731,000
RIGHT OF WAY COST =	$0
TOTAL COST =	$16,731,000
SAY	**$17,000,000**

Prepared by: RMH 8/16
Checked by: DSM 8/16

Brunswick-Topsham - F.J. Wood Bridge

Structural Cost Estimate
Alternate 4
Rehabilitate Existing 800 ft 3 Span Steel Truss with New Sidewalk
Rehabilitate Existing 800 ft Steel Truss with Exodermic Deck and New Sidewalk

Item	Unit	Quantity	Unit Price	Cost
Structural Concrete Exodermic Deck Infill	CY	655	$ 880.00	$ 576,400
Exodermic Deck, Installed w/o Concrete	SF	25050	$ 55.00	$ 1,377,750
Reinforcing Steel, Fab & Del	LBS	12800	$ 0.88	$ 11,264
Reinforcing Steel, Placing	LBS	12800	$ 0.78	$ 9,984
Strutural Steel Repairs - Sidewalk Brackets	LS	1	$50,000.00	$ 50,000
Structural Steel, Floor System Fab & Delivered	LBS	444000	$ 2.20	$ 976,800
Structural Steel, Floor System, Erection	LBS	444000	$ 1.80	$ 799,200
Structural Steel, Truss Bottom Chord Flange, Installed	LBS	58000	$ 7.80	$ 452,400
Structural Steel, Sidewalk, Installed	LBS	73000	$ 4.30	$ 313,900
Field Painting	LBS	2700000	$ 0.27	$ 729,000
Surface Prep Existing Str Steel	LBS	2700000	$ 0.46	$ 1,242,000
Containmant and Pollution Control	LBS	2700000	$ 0.46	$ 1,242,000
Disposal of Special Waste Material	LBS	2700000	$ 0.02	$ 54,000
Shear Connectors	EA	28600	$ 7.50	$ 214,500
Steel Bridge Railing, Pedestrian Remove and Reset	LF	810	$ 94.00	$ 76,140
Steel Bridge Railing, 2 Bar Remove and Reset	LF	810	$ 62.00	$ 50,220
Steel Bridge Railing, 4 Bar	LF	810	$ 190.00	$ 153,900
Steel Bridge Railing, 2 Bar	LF	810	$ 130.00	$ 105,300
Bridge Expansion Joint, Sidewalk	LF	34	$ 1,040.00	$ 35,360
Bridge Expansion Joint, Gland Seal	LF	156	$ 840.00	$ 131,040
			Superstructure Cost Subtotal =	$ 8,601,158

Round up $ 8,602,000

Cost / sf $ 227

Deck Area = 808' x 47' = 37980 227 **$ 8,622,000**

Prepared by: RMH 8/16
Checked by: DSM 8/16