

## **Appendix 12**

### **EA Public Comments**

FJW EA Comment #1

From: Communications.MaineDOT@maine.gov

Sent: Saturday, March 24, 2018 3:41 PM

To: Gardner, David

Subject: Frank J. Wood Project Comment

Categories: FJW

The following message was submitted from your MaineDOT website contact form .

Date: 03/24/2018

Name: Joseph Feely

Organization(if applicable): unaffiliated

Phone: 207.844.8195

Email: jafeely2@gmail.com

Topic:

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Comments:

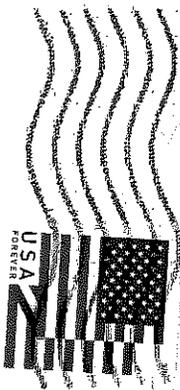
Regardless of the minor historical importance and nostalgia for the FJW bridge, the biggest single argument against saving it (to me) is locking Maine residents into an endless cycle of maintaining and aging structure. I hope your presentation on March 28 will include the life-cycle cost (75yrs? 100yrs?) for the two option - new concrete bridge or repair FJW bridge.

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If required, please respond as soon as possible.



Mr. Jerome Brannigan  
18 Westwind Dr.  
Topsham, ME 04086-5703

SO. MAINE PARADO  
25 MAR 2018 PM 3:1



David Gardner  
Maine Dept. of Transportation  
Environmental Office  
16 State House Station  
Augusta, Me. 04333-0016



March 26, 2018

David Gardner  
Environmental Office  
Dept of Transportation

Re: Frank Wood Bridge

Having lived in Topsham since 1935 and the family since 1914, we all believe a new bridge would be better than redoing the old bridge for many reasons.

Please tear down that rusted piece of junk and build the new bridge!

Thanks,

Jerome Brannigan  
Jerome P. Brannigan  
18 Westwind Pt.  
Topsham, Me 04086

### FJW EA COMMENT #3

From: Paul Womer <pauldoren@yahoo.com>  
Sent: Thursday, March 29, 2018 10:49 AM  
To: Gardner, David  
Subject: Frank J. Wood Bridge - Comments

Dear Mr. Gardner,

After receiving notice from the Bike Coalition of Maine, I attended the open discussion at Mt. Ararat High School on 28 March 2018. Even so, I was (and am) representing myself. I am retired and live in Brunswick. Contact info follows at the end of this note.

As a bicyclist, the issue of safe riding is important to me. However, unlike many others who see bicycling as a weekend avocation, I believe there should be emphasis on bicycling as a routine means of transportation: running errands to the grocery store, a visit to friends, travel to a restaurant, etc. As such, I am very much in accord with last night speakers who favored Alternative 2 because of its wide bike lanes that would promote daily use of the bridge by bicyclists (and pedestrians). Bike lanes that are only four feet wide court trouble.

That said, I was disappointed in the style of Alternative 2. As a person in the row in front of me mumbled, "It's just a highway." She was right. While I have mixed emotions about Alternative 2's location, its style is something only a soulless beancounter could love.

If the state is going to spend millions of dollars on a connector between two vibrant communities, why not spend a few dollars more and invite architects to weigh in and compete for a winning design? I concur with those who believe that eliminating the superstructure of the extant bridge will improve the overall look of the area. So assuming that Alternatives 1 and 2 constitute the semi-finalists, architects could carry the metaphorical ball to the finish line by considering the following:

Stylish observation (and also for fishing?) points to enhance walking and lingering on both sides of the bridge. These could

include benches and appropriate lighting (see below regarding lighting).

Given that neither side of the bridge constitutes a high speed intersection, last night's recommendation that the vehicles lanes incorporate some feature (not speed bumps) to slightly slow the pace and make the drive across a "wonder" and not

simply a point-to-point connection have merit.

Use the Penobscot Narrows (Verona Island), Bunker Hill (Boston) or Paris (France) bridges as inspirations. Even if the replacement bridge will not use overhead lattice work, it should be something more than a concrete connector.

In regards to valid concerns about lighting, consider something indirect that illuminates just the road. Or, and better, advanced mood-enhancing LED lighting that provides changes of color to match the season or mood. Think: Empire State

Building.

The bridge offers an opportunity for the state and communities to excel. Take advantage of it.

Last night's meeting was very interesting, informative, helpful, and well-managed. Thank you.

Sincerely,

Paul Womer  
26 Dionne Circle  
Brunswick, Maine

FJW EA COMMENT #4

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, March 29, 2018 10:46 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 03/29/2018  
Name: Leslie Mortimer  
Organization(if applicable):  
Phone: 2075223772  
Email: lamortimer@gmail.com

Topic:

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Comments:

I am a resident of Topsham. I am in favor of replacing the FJW bridge instead of repairing it. It is more cost effective and will enhance the communities it serves.

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If required, please respond as soon as possible.

## FJW EA COMMENT #5

From: Thomas Connelie <Tom@blacklantern.net>  
Sent: Thursday, March 29, 2018 11:04 AM  
To: Gardner, David  
Subject: Frank J Wood Bridge EA Comments - WIN 22603.00

Attachment (Comments) to MaineDOT Brunswick – Topsham Frank J Wood Environmental Assessment – WIN 22603.00

The following comments are forwarded to be included as part of the Public Comment portion of the March 28 Public Comment Meeting.

As a resident and business owner, Black Lantern Bed and Breakfast, of Topsham I strongly endorse the selection of Alternative 2, Replacement Bridge on Upstream Alignment. The functional benefits of second sidewalk and wider, open bike lanes far outweigh the (subjective) esthetic loss of the existing truss structure. All of our guests as well as my wife and I use the existing bridge, frequenting restaurants on Maine Street, visiting the Bowdoin Campus, Church, etc. Those guests that walk into Brunswick comment on the narrowness of the existing sidewalk, the few that bike into Brunswick say never again. Improving bike access across the river should be a major factor in the design alternative decision.

The recommendation made by “The Friends” to mark the lanes on a Rehabbed version of the existing bridge with narrower vehicle lanes to create wider bike lanes strikes me as simply wrong. Even with elimination of the existing grates on the road surface the width between the trusses is simply too narrow for bikes to traverse safely with two lanes of heavy traffic. Restriping with narrower lanes will not shift the opposing traffic closer together. While the proposed surface width of 32’ is only 2’ wider than the “between the truss width” of the existing structure having a 6” curb on the outside edge as opposed to steel members at riding height will allow bike riders to utilize more of the width of the bike lane on the Alternative 2 replacement..

I strongly support the recommendations of the Bridge Design Advisory Group in their Preliminary Report of Design Recommendations of August 25, 2017. The esthetic features of overhanging light fixtures similar to those presently used on Main Street, low concrete wall with attractive black railings mounted on it and integrated light posts and overlooks will make the walkways user friendly. I particularly support including provisions, preferably as part of the project or, if not, for future development, for walkways under the bridge on both sides of the river. Having lived in Orange County, CA for a number of years I am very familiar with the paved bike and walking trails alongside the Santa Ana River where the trail crosses under every bridge along the 29 mile or so length of the river through the county, approximately 30 under bridge crossings. The trail system gets high usage from both casual walkers and serious cyclists. The replacement bridge option provides a one-time opportunity to provide under bridge connections to the fledgling trail systems on both the Topsham and Brunswick sides of the river. In Orange County the under bridge trail crossings are closed about two weeks each spring during high river flows and the potential for seasonal high flows on the Androscoggin should not preclude designing under river trail crossings accessible the majority of the year. There were several questions regarding both the height of the roadway and visual impact with Alternate two that should be clarified.

Will the depth of the structural steel beams in Alternate two and projected high water levels necessitate raising the road height above the road height of the existing bridge, (and Alternate 3 & 4) and, if so, by how much?

When viewed from the side what will be the depth of the bridge structure (Steel beams plus road deck plus concrete railing plus metal railing)? How does this compare with the visual

depth of the existing truss structure (bottom chord, assorted steel, sidewalk, metal walkway rail)?

I feel that info should have been readily available at the March 28 meeting.

Name: Thomas P Connelie  
Address: 57 Elm Street  
City, State, Zip: Topsham, ME 04086  
Contact Info; Blacklantern@blacklantern.net / 207-725-4165

Judy and Tom Connelie, Innkeepers  
Black Lantern B & B  
57 Elm Street, Topsham, ME 04086  
888-306-4165 / 207-725-4165  
www.Blacklanternbandb.com

FJW EA COMMENT #6

From: Jim Hamilton <jimham1@gwi.net>  
Sent: Thursday, March 29, 2018 3:58 AM  
To: Gardner, David  
Subject: Frank J Wood bridge replacement

Dave,

I attended the public meeting at Mt. Ararat last night and wanted to submit my opinion on the Frank Wood bridge project. First of all, I think the State did an excellent job presenting the facts. As an avid cyclist, I'm strongly in favor of option-2, to replace the bridge with a new one that has adequate bike lanes. The current bridge is very dangerous for cyclists. There is very little room for error. One mistake and a cyclist could be seriously injured or killed. Option-2 would be the safest and least expensive, and would help to bring both communities closer together.

Thank you,  
James Hamilton  
162 Columbia Ave  
Brunswick, ME  
(207)841-1388



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
National Environmental Policy Act

Frank J. Wood Bridge  
Public Meeting - Environmental Assessment  
Mt Ararat High School Commons

March 28, 2018  
6:00 pm

The Federal Highway Administration (FHWA) and the Maine Department of Transportation (MaineDOT) are accepting public comments and community input regarding the National Environmental Protection Act (NEPA) Environmental Assessment through April 11, 2018. This comment sheet can be mailed to the following address:

David Gardner  
Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

whichever option is selected, vehicle lanes should be limited to 10' widths. This will reduce speeds & make travel safer for all users. Give it a try via striping study it & change if needed, but lets start w/ narrower lanes.

(Use additional sheets if necessary)

Name (Please Print ) Richard Roedner Topsham Town Manager  
Street Address 56 Wildwood Dr.  
City, State, Zip Saco ME 04072  
Contact Info (Email or Phone) rroedner@topshammaine.com



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
National Environmental Policy Act

Frank J. Wood Bridge  
Public Meeting - Environmental Assessment  
Mt Ararat High School Commons

March 28, 2018  
6:00 pm

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David Gardner  
Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

The bridge was ugly when it was younger back when I first saw it in the 50's. It is uglier now. It is not historic - it is old.  
Replace it!

(Use additional sheets if necessary)

Name (Please Print ) Mike Dumais  
Street Address 11 Furyside Rd  
City, State, Zip Topsham ME 04086  
Contact Info (Email or Phone) 729-4291



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
National Environmental Policy Act

Frank J. Wood Bridge  
Public Meeting - Environmental Assessment  
Mt Ararat High School Commons

March 28, 2018  
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David Gardner  
Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

Personally I appreciate the concerns of "loss of community" but I don't understand how the connectivity of a community evaporates by upgrading a bridge to make it last longer and safer for pedestrians.  
I personally believe that a safer and ~~longer~~ longer lasting bridge, which is open air, is better for both communities.  
Thank you for the fairness

(Use additional sheets if necessary)

Name (Please Print ) Cory R. King  
Street Address 520 Quaker Meeting House Road  
City, State, Zip Dorham ME 04222  
Contact Info (Email or Phone) executivedirector@midcoastmaine.com

FJW EA COMMENT #10

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, March 29, 2018 2:56 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 03/29/2018  
Name: Tom Rumpf  
Organization(if applicable): Resident  
Phone: 2074158540  
Email: trumpfy@gmail.com

Topic:

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Comments:

I support replacement of the current bridge with a new bridge that is designed for pedestrian and bike traffic, as well as cars. The current bridge is unsafe for bicyclists and blocks views of the historic mill buildings on each side of the river.

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If required, please respond as soon as possible.

13 Main Street  
Topsham, Maine 04086  
March 18, 2018

Ms. Cheryl B. Martin  
Assistant Division Administrator  
Federal Highway Commission  
Edmund S. Muskie Federal Building  
40 Western Avenue, Room 614  
Augusta, Maine 04330

Re: The Frank J. Wood Bridge

Dear Ms. Martin:

I own a historic commercial building that abuts the Frank J. Wood Bridge in Topsham because it is in the Village near two historic mills, the historic Bridge, and the Androscoggin.. MDOT wants to significantly alter the historic quality of the Village by demolishing the Bridge and replacing it with a nondescript, concrete highway forever changing the character of the Towns of Topsham and Brunswick.

My question is why did the MDOT fail to be objective in the Section 106 process? At the first public meeting in April 2016 MDOT presented the new bridge as the only option that made sense, completely ignoring our historic Bridge. The decision had already been made. Topsham and Brunswick were forming an Advisory Committee to design the new bridge before the completion of the Section 106. Many community people left the meeting frustrated by what appeared a flawed process.

After the meeting a group of community members from Topsham and Brunswick formed a non-profit corporation (The Friends of the Frank J. Wood Bridge)) and requested to be included as a party to the Section 106. The Friends have met on an almost monthly basis in an effort to be heard by the MDOT and the U. S. Highway Administration since April 2016, attended all meetings relating to the Bridge, hired an environmental lawyer, formed a Facebook page with over a 1,000 followers, signed petitions, written letters to MDOT, met with experts on historic bridges, and hired an engineering firm from Boston to do a feasibility and cost analysis of a rehabilitated Bridge. To say the least, it has been difficult for us to get answers to our many questions. An example of this is the last public meeting where the U. S. Highway Administration and MDOT changed the framework of the meeting process by breaking people into small groups so that many people were confused and upset and ended up walking away frustrated by not having a free flowing discussion that everyone could hear and participate in.

I still have questions about speed, elevation, and the position of the new bridge as it hits the abutments. Will all the concrete act as a back drop for graffiti? Won't the new bridge alter the quality of life for the historic Summer Street residents, cover up the lower falls, and forever damage that feeling one gets when crossing the Bridge...call it a sense of place?

And what about economic development? I have heard many people from across the country comment positively on the Bridge and how fortunate we are to have it in our community. Actors from the Maine State Music Theatre championed it on TV 207; the Bangor Savings Bank

proudly displays a photograph of the Bridge in its entry way; it's on the cover of the telephone book and in Bowdoin College literature; and painted and photographed by artists from around the world. Maine Preservation's 2017 List of Most Endangered Historic Structures puts it as number one. Do the research—states across the country are saving truss bridges because they have a calming affect on traffic and are good for tourism. I can guarantee most historians, artists, photographers, and Bridge enthusiasts (engineers included) will ignore the new bridge if it is ever built.

Please do the right thing and rehabilitate our Bridge so that future generations shall know what can happen when science and art come together to create an iconic structure: The Frank J. Wood Bridge.

Thank you for your consideration.

Sincerely yours,

Arlene Morris

FJW EA COMMENT #12

From: Communications.MaineDOT@maine.gov  
Sent: Friday, March 30, 2018 7:54 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 03/30/2018  
Name: Georgia Bancroft  
Organization(if applicable): citizen  
Phone: 207-373-0850  
Email: bancrj@comcast.net

Topic:

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Comments:

My husband and I moved to Brunswick from Portland in August of 2017. We began to read about the FJW Bridge project then. My personal reaction to the bridge came one evening when cars filled the lanes both way and I began to wonder, "How much is 25 tons?" We have experienced the change in the Casco Bay Bridge in Portland, Tukey's Bridge to Falmouth and the new Hollis bridge over the Saco River. The former Hollis Bridge was similar to FJW - metal, narrow and a bit scary. In all of the above instances new bridges have allowed for SAFE biking, walking and travel lanes, actual views of the rivers that are not impeded by metal work and wider lines for vehicle travel. I find the aesthetics much better with a new bridge for all the reasons the planning board has mentioned. I appreciate that sometimes we want to preserve history but I don't view this is not a Roebling suspension bridge, but a 1937 era structure. Construction, community priorities and modes of travel have changed since then and new approaches can offer better alternatives. My support would be for a new structure as presented by the design committee. Respectfully submitted.

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If required, please respond as soon as possible.

FJW EA COMMENT #13

From: Kittredge, Joel  
Sent: Monday, April 2, 2018 11:12 AM  
To: Chamberlain, Kristen; Gardner, David; Damren, Janet  
Subject: FW: Question or Comment from the Frank J. Wood website

Categories: FJW

FYI and Tedocs

-----Original Message-----

From: Shofner, Pamela  
Sent: Monday, April 02, 2018 11:10 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: Question or Comment from the Frank J. Wood website

-----Original Message-----

From: jimbyrnedpt@gmail.com [mailto:jimbyrnedpt@gmail.com]  
Sent: Friday, March 30, 2018 7:33 PM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Subject: Question or Comment from the Frank J. Wood website

Comments: To whom it may concern regarding the Frank Wood Bridge project. I read in the Times Record today that comment is being accepted. I wanted to give my strong support on replacing the bridge. From the information I have read it is less costly then repairing the old bridge, would have less immediate impact on traffic flow and personally prefer the look of the new modern bridge. I also support the support for improved pedestrian access with wider side walks and overall feel it will be safer. I look forward to the new bridge someday and thank you for your hard and patient work.

Sincerely, Jim Byrne

Organization: Topsham Resident

E-Mail: jimbyrnedpt@gmail.com

Name: Jim Byrne

Phone: 207 729-3901

Verifiy: 15

FJW EA COMMENT #14

From: Kittredge, Joel  
Sent: Monday, April 2, 2018 11:13 AM  
To: Chamberlain, Kristen; Gardner, David; Damren, Janet  
Subject: FW: Question or Comment from the Frank J. Wood website

Categories: FJW

Tedocs FJW 22603.00

-----Original Message-----

From: Shofner, Pamela  
Sent: Monday, April 02, 2018 10:44 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: Question or Comment from the Frank J. Wood website

-----Original Message-----

From: mpavitt@gmail.com [mailto:mpavitt@gmail.com]  
Sent: Saturday, March 31, 2018 9:32 AM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Subject: Question or Comment from the Frank J. Wood website

Comments: I went to the Frank J. Wood Bridge project presentation recently at Mt Ararat High School and while I can appreciate the replacement opponents' point of view, I think it's clear that Alternative 2, the alternative recommended by the DOT, is the best choice. I think the lower cost, safety and usability of a new bridge significantly outweighs the perceived aesthetics and historical value of the current bridge. I was really impressed by the work done on this project. Thanks.

Organization:

E-Mail: mpavitt@gmail.com

Name: Mark

Phone: 2073145476

Verify: 15

## FJW EA COMMENT #15

From: James Mixon <mixj444@gmail.com>  
Sent: Tuesday, April 3, 2018 2:32 PM  
To: Gardner, David  
Cc: Cheryl.Martin@dot.gov; Phinney Baxter White  
Subject: In support of rehabilitating the Frank J. Wood Bridge

Dear David and Cheryl,

My name is James Mixon. I am 34 years old and have been a resident of Topsham my entire life. I am writing in support of rehabilitation to the Frank J. Wood Bridge, in order that we might preserve some of the only remaining history and charm in our town.

Growing up in Topsham, I've seen a lot of change. The Topsham Fair Mall has grown from a small strip mall with surrounding lands where my mother, father and I used to walk our dogs, to a bustling place of business filled with stop lights and traffic. The quaint town offices are gone, as is the old library, replaced with modern buildings that look like they came out of a catalog.

The river walk in Topsham, once known only to residents of the area, is now a paved and accessible bike/walking path advertised to the public, with ugly signs and bollards on Summer St. and more foot traffic behind the houses of those living on Bridge St.

The "lower village" was a poorly conceived idea that has done nothing to enhance the charm of the town. None of the businesses have any foot traffic, aside from Blueberries perhaps (and the Sea Dog which was already there) yet we have a massive parking lot behind them all that is 90% empty every day. Think of what a missed opportunity this was. What if the town had understood the charm of Topsham, and created a riverside park in place of the enormous brick business building that now sits there, driving visitors and tourists from Brunswick to enjoy a river view while getting food at the businesses nearby. What if the shops in the lower village were similar to those in Downtown Brunswick, where all the foot traffic in the area now is. What if the TOWN of Topsham understood the charm of Topsham like its citizens do?

It is for this reason that I am writing you to encourage you NOT to replace the Frank J. Wood Bridge, but to rehabilitate what we have now. It is the only remaining charming piece of Topsham history we have left.

I worked in Southern Connecticut on independent films when I was fresh out of college, and the amount of care those people put into preserving their towns is admirable. The Merrit Parkway still has the original stone bridges to serve as over passes. The Parkway itself is devoid of ugly guardrails, signage and other things to spoil the beauty of the area. It's one of the most enjoyable drives (despite bumper to bumper rush our traffic) I've ever been on. I believe Topsham could take a page out of their book on how to treat our town.

The Frank J. Wood Bridge sits above the Androscoggin River, not directly above the rapids, but below them slightly, where you can see them if you peer over the edge while walking. It offers not only a great view of the islands below, the dam and the rapids, but also is a picturesque reminder of old Maine when you look at it.

I currently live on Summer St, and the bridge is viewable right out my window, and was raised on Walnut Street, so the bridge has been a large part of my life. I was photographed below it as a child while fishing with my father, a photo that made the front page of the Times Record. The FRONT PAGE! Can anyone imagine these days a simple photo of a boy fishing with his father

being front page news of the Times Record?

Do not mistake this as a yearning for nostalgia. I want to save the bridge because WE want to save the bridge. The residents of this town, clearly voicing their opinions at the last meeting at Mt. Ararat, understand the historical importance of this bridge, as well as the aesthetics it adds to the town. We don't want an ugly overpass like the new Durham Bridge in Lisbon. Who wants to come look at that?

The black bridge is gone, and if the Frank J. Wood bridge goes, what will Topsham be? A rezoned town filled with chain stores that pushed out all the local businesses, while all the tourists and summer visitors spend all their time (and money) in Brunswick, where they can actually enjoy the scenery.

Topsham will have nothing left. The Topsham Fair Mall isn't beautiful, the Lower Village is a place to drive through on your way to the highway, the river walk can only handle so many people, and everyone will end up going to Brunswick to walk around Bowdoin and the downtown mall.

Please, reach out to other contractors to get estimates on preserving the bridge. Sometimes everything isn't always about money. This town has been my home, and I want it to continue to be a place that people love and want to visit. I can't count how many times I've seen people standing on the bridge taking pictures in the summer, sitting down by the river taking pictures of it, or just walking on it at night when it's warm out.

Other concerns have been voiced as well, about this bridge being safer for pedestrians as they are separated from the through traffic by the girders, and I'm sure other estimates could lend themselves to a financial argument as well -- but I'd like to appeal to you to preserve what is left of our town's history and beauty, because the Frank J. Wood Bridge is really all we have left.

Thank you

--

James Mixon

FJW EA COMMENT #16

From: Communications.MaineDOT@maine.gov  
Sent: Tuesday, April 3, 2018 3:20 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/03/2018  
Name: Richard A. Bryant  
Organization(if applicable):  
Phone: 725-5019  
Email: rbryant6@myfairpoint.net

Topic:

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Comments:

I was born in Brunswick and have lived here all my life. I would love to see that dirty, rusty eyesore green bridge replaced with a nice neat new bridge.

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If required, please respond as soon as possible.

FJW EA COMMENT #17

From: Communications.MaineDOT@maine.gov  
Sent: Tuesday, April 3, 2018 4:07 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/03/2018  
Name: Joan Sheldon  
Organization(if applicable):  
Phone:  
Email: joan@hutchinsbrothers.com

Topic:

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Comments:

I live in Topsham and agree that replacement of the bridge is the smart option.

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If required, please respond as soon as possible.

FJW EA COMMENT #18

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 4, 2018 7:18 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/04/2018  
Name: Michael Gray  
Organization(if applicable):  
Phone: 2077219402  
Email: mikegray69@hotmail.com

Topic:

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Comments:

I have lived in the Brunswick/Topsham area for most of my 59 years. The Green bridge (Frank J Woods) has been a problem for all of my years here. The original open grate was very problematic. When that was filled in, I believe the added weight and inability of water to run off has severally damaged the bridge. The bridge has also become an eyesore. When it is refurbished/repainted it looks good for a year, then returns to its shabby look. I agree it is historic, however, if we want to be historic with its original construction, return it to the open grate as it was originally constructed to reduce stress on it! I ride bicycles regularly and will not ride over this bridge as it is totally unsafe for bikers and always has been!

I feel the best option is to replace it with well thought out modern bridge. One with good, safe bike lanes, sidewalks and good visibility.

I also believe that a small part of the FJW should be left as a memorial to its construction. Similar to what was done with the bridge between Bangor/Brewer.

Thank you for your time!

Michael Gray  
Topsham, Maine

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If required, please respond as soon as possible.

FJW EA COMMENT #19

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 4, 2018 9:38 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/04/2018  
Name: Lloyd M. Van Lunen  
Organization(if applicable): N/A  
Phone: 207-729-0584  
Email: boreas-me@comcast.net

Topic:

-----  
Comments:

I cannot express how much I will welcome a new bridge to replace the current structure. The planned design for a replacement is esthetically a vast improvement on the current truss, to say nothing of the practical benefits of wider lanes and a longer life expectancy with lower maintenance costs. In addition to this, we already have a perfectly good example of a truss bridge just downstream in the railroad bridge over the Androscoggin. There is no accounting for taste of course, but the enthusiasm of some for the current structure is truly baffling.

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If required, please respond as soon as possible.

FJW EA COMMENT #20

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 4, 2018 10:38 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

Categories: FJW

The following message was submitted from your MaineDOT website contact form .

Date: 04/04/2018  
Name: william sadler  
Organization(if applicable): none  
Phone: (207) 725-4041  
Email: wstackpole@comcast.net

Topic:

-----  
Comments:

when looking at the drawing of the proposed new bridge, I note there are not hand rails, etc between the road and the sidewalk. can those be added? offers more protection to walkers.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #21

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 4, 2018 11:09 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/04/2018  
Name: Jeff Runyon  
Organization(if applicable): NA  
Phone: 207-373-3958  
Email: jrunyon@yahoo.com

Topic:

-----  
Comments:

I live in Brunswick Me and travel over the Brunswick/Topsham (Frank J. Wood) bridge frequently. It is an eyesore and, most importantly, an unsafe structure. I spent 25 years in the "metals" industry and I know the dangers of the environmental effects on metals and the associated effects of load and vibration stresses on affected structures. You will never be able to permanently remediate this bridge. Money spent will be completely wasted on an outdated, unsafe bridge. This is not a historic home or building. It is a structure that is constantly openly exposed to the elements and varying loads. Remove it as soon as possible and replace it with a functional and safe structure that will last into the next century.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #22

From: Kittredge, Joel  
Sent: Wednesday, April 4, 2018 1:02 PM  
To: Gardner, David; Chamberlain, Kristen; Martin, Cheryl (FHWA)  
(Cheryl.Martin@dot.gov)  
Cc: Damren, Janet  
Subject: FW: MaineDOT Contact Form Submission: project FJW

FYI

-----Original Message-----

From: Shofner, Pamela  
Sent: Wednesday, April 04, 2018 1:00 PM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: funds2raise@gmail.com [mailto:funds2raise@gmail.com]  
Sent: Wednesday, April 04, 2018 11:17 AM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Cc: Shofner, Pamela <Pamela.Shofner@maine.gov>  
Subject: MaineDOT Contact Form Submission: project

The following message was submitted from the MaineDOT contact form.

Date: Wednesday, 04-Apr-2018 09:43:47 EDT  
Name: Mechelle Given  
Phone:  
Email: funds2raise@gmail.com

Topic: project

-----  
Comments:

I am writing in support of the Topsham bridge replacement project which is being heavily discussed at my work place located in downtown Brunswick. I am not a resident of Topsham or Brunswick but I use the current bridge structure. The mere sight of the bridge is a cosmetic eyesore, not to mention the structural soundness leaves me praying that I do not get stuck in traffic and stuck in the middle of the bridge. Since the weight limit was reduced and many articles published about how unstable this bridge has become, I will use another route to get where I need to go for shopping and conducting business, even if it means extra miles to get there. Many folks are passionate about the historic value and their attachment to this bridge that was built before their time; my opinion is let's put up a new structurally sound and cosmetically pleasing bridge; one that I feel safe to drive and walk over. While I am following the details of the arguments for and against, I realize the only ones showing up at the meetings are the ones protesting against demolition and new construction. There is no historical value to this bridge unless Herbert Hoover or Franklyn Roosevelt tinkled off the side of the bridge. I am sure they would both approve of the replacement for the safety of the people utilizing this very valuable passage way. I would love to see a new bridge I can feel confident driving across with my grandchildren in the car.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #23

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 4, 2018 2:11 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/04/2018  
Name: Margaret Schick  
Organization(if applicable):  
Phone: 207-522-0708  
Email: peggyschick@gmail.com

Topic:

-----  
Comments:

I was unable to attend the public meeting on March 28 to discuss the options for the bridge between Brunswick and Topsham and appreciate that you are collecting comments until April 11.

For safety reasons, as a driver, cyclist, and pedestrian I greatly prefer the design of the replacement bridge.

I also feel the visual and economic impact of the new bridge design should not be underestimated. The new design is very attractive and reflects the vibrancy of our towns, versus the design of the old bridge which, even if repainted, would remain an aesthetic eye-sore. Let the beautifully restored buildings and homes in both towns be the heralds of our historic character.

With these points in mind and given that the estimated cost will be higher to repair the bridge--and the anticipated backup in traffic much greater-- it makes no sense at all to repair the existing structure.

Thank you,  
Margaret Schick

10 Brookside Drive  
Topsham

â€

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If required, please respond as soon as possible.

FJW EA COMMENT #24

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 4, 2018 6:02 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/04/2018  
Name: Margaret Wilson  
Organization(if applicable):  
Phone: 207-729-0584  
Email: mawilson911@comcast.net

Topic:

-----  
Comments:

I think the old Frank Wood bridge needs to be replaced. It is not safe for bicycles, not particularly attractive, and the cost to rehab it for a shorter useful life than the new bridge is unconscionable. Please build the new bridge.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #25

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, April 5, 2018 8:56 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/05/2018  
Name: richard s. moll  
Organization(if applicable): citizen of brunswick  
Phone: 207 725 5889  
Email: faithkmoll@gmail.com

Topic:

-----  
Comments:

I want the present outdated and unsafe bridge replaced. Spend my taxpayer dollars responsibly. Also, re-route traffic and build the new bridge without compromised approaches and the chaos of working while traffic is on going. Construction will go faster and the design will be better. Thank you.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #26

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, April 5, 2018 9:04 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/05/2018  
Name: faith k. moll  
Organization(if applicable): citizen of brunswick  
Phone: 207 725 5889  
Email: faithkmoll@gmail.com

Topic:

-----  
Comments:

I urge MDOT to replace the FJWood bridge with a modern, safe and new design. Actually, the new design fits the earliest known bridge over this span of water. The present open truss design is represented in at least 100 other bridges in Maine and they are in much better condition. The lead paint on this bridge is a daily hazard to all. Removing this material seems dangerous and expensive. Opening the view shed, spending less money to construct a new bridge that will last longer and be safe seems to be the correct and responsible course of action for an agency entrusted with proper design and expenditure. You are professional engineers, experienced bridge designers and I hope you will do your duty.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #27

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, April 5, 2018 11:25 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/05/2018  
Name: Robert Pickel  
Organization(if applicable):  
Phone: 207-766-1080  
Email: longshadows@gmail.com

Topic:

-----  
Comments:

We have an opportunity to repair an unsightly and out of date situation in Brunswick/Topsham. A new bridge, pedestrian/bicycle-friendly, attractive and with lower maintenance costs is sorely needed and now is our chance. The current "green monster" has outlived it's days. It's not an "historic structure" by any stretch of the imagination. It's my age and I hardly think I'm anything "historic."

Let's move into the 21st Century and replace this old rusty bridge on the heavily used thoroughfare with something we can all safely enjoy and take pride in for years to come.

Thank you!

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #28

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, April 5, 2018 10:12 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/05/2018  
Name: Richard Mersereau  
Organization(if applicable): Brunswick resident  
Phone: 2078418945  
Email: rmersere@bowdoin.edu

Topic:

-----  
Comments:

The new bridge recommended by MDOT is far superior in every respect to the alternative of saving the not very historical rust bucket of a bridge that cars, bikes, and pedestrians have to endure. Please proceed to build the modern, safer, and more aesthetically pleasing bridge that you've recommended.<sup>15</sup>

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #29

From: Kittredge, Joel  
Sent: Friday, April 6, 2018 7:59 AM  
To: Gardner, David; Chamberlain, Kristen; Martin, Cheryl (FHWA)  
(Cheryl.Martin@dot.gov)  
Cc: Damren, Janet  
Subject: FW: MaineDOT Contact Form Submission: project

Fyi and tedoc.

-----Original Message-----

From: Shofner, Pamela  
Sent: Friday, April 06, 2018 7:07 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: mjbriley@comcast.net [mailto:mjbriley@comcast.net]  
Sent: Thursday, April 05, 2018 2:57 PM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Cc: Shofner, Pamela <Pamela.Shofner@maine.gov>  
Subject: MaineDOT Contact Form Submission: project

The following message was submitted from the MaineDOT contact form.

Date: Thursday, 05-Apr-2018 14:46:44 EDT  
Name: John Briley  
Phone: 207-729-7216  
Email: mjbriley@comcast.net

Topic: project

-----  
Comments:

Regarding the Frank J. Wood Bridge project. I reside in Topsham and am for Option 2. I recommend placing at least two overlooks on the downstream side and two on the upstream side, giving people a place to view the falls without interfering with pedestrians walking by. These overlooks would provide space for historical markers to help observers understand what they're looking at or info about past bridges. An almost identical project was undertaken in Marietta, Ohio with great success a few years back, replacing the Putnam Street Bridge over the Muskingum River. They could certainly offer pointers from experience. Thank you.

John Briley  
-----

If required, please respond as soon as possible.

FJW EA COMMENT #30

From: Kittredge, Joel  
Sent: Friday, April 6, 2018 10:27 AM  
To: Chamberlain, Kristen; Gardner, David; Martin, Cheryl (FHWA)  
(Cheryl.Martin@dot.gov)  
Cc: Damren, Janet  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: Shofner, Pamela  
Sent: Friday, April 06, 2018 10:23 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: adairdelamater@gmail.com [mailto:adairdelamater@gmail.com]  
Sent: Thursday, April 05, 2018 2:44 PM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Cc: Shofner, Pamela <Pamela.Shofner@maine.gov>  
Subject: MaineDOT Contact Form Submission: project

The following message was submitted from the MaineDOT contact form.

Date: Thursday, 05-Apr-2018 14:40:31 EDT  
Name: Adair DeLamater  
Phone: 2073894488  
Email: adairdelamater@gmail.com

Topic: project

-----  
Comments:

I am writing to urge you to build a replacement bridge for the out of date Frank J. Wood bridge.

I understand it will be less costly to taxpayers to build a new bridge, rather than rehabilitating the current bridge. Also, the present bridge is ugly, and is in very poor condition.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #31

From: Communications.MaineDOT@maine.gov  
Sent: Friday, April 6, 2018 6:22 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/06/2018  
Name: Richard Winter  
Organization(if applicable):  
Phone: 2073731312  
Email: wintrick@gmail.com

Topic:

-----  
Comments:

I would like to enter my strong support for replacing the green monstrosity linking Brunswick and Topsham; the design(s) for the new bridge are elegant and functional. My only concern is maintaining possible access to the fish ladder for fish. The design which curves outward downstream seems to to be the best alternative for that.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #32

From: Communications.MaineDOT@maine.gov  
Sent: Saturday, April 7, 2018 8:10 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/07/2018  
Name: Brian Thibeault  
Organization(if applicable):  
Phone: 725-9225  
Email: teebus30@hotmail.com

Topic:

-----  
Comments:

I am writing to express my support for replacing the Frank Wood bridge with a completely new bridge. The new bridge will be safer for pedestrians, drivers and bicyclists. It would also open up the views of the river on both sides. The money saved should be used for much needed road improvements in other parts of the state. Remove the rusty eyesore. Thank you for allowing me to give my comment.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #33

From: Communications.MaineDOT@maine.gov  
Sent: Saturday, April 7, 2018 7:00 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/07/2018  
Name: Phinney  
Organization(if applicable): Governor Baxter, LLC  
Phone: 207-725-2707  
Email: phin@governorbaxter.com

Topic:

-----

Comments:

I want to insure your site is accepting comments. This is a test.

-----

If required, please respond as soon as possible.

FJW EA COMMENT #34

From: Communications.MaineDOT@maine.gov  
Sent: Sunday, April 8, 2018 8:28 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/08/2018  
Name: FC Vitolo  
Organization(if applicable):  
Phone: 2074490169  
Email: f\_cureo@hotmail.com

Topic:

-----  
Comments:

Regarding the future of a bridge between Topsham & Brunswick: I am 99% behind replacement of the Frank J Wood bridge.  
I am typically a 'preservationist' but the current structure has outlived it usefulness and safety.  
I believe a local group could preserve the nostalgia through artwork, sculpture & photography.  
It's time to let it go.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #35

From: Kittredge, Joel  
Sent: Monday, April 9, 2018 7:58 AM  
To: Gardner, David; Chamberlain, Kristen; Martin, Cheryl (FHWA)  
(Cheryl.Martin@dot.gov)  
Cc: Damren, Janet  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: Shofner, Pamela  
Sent: Monday, April 09, 2018 7:07 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: bowmansc@yahoo.com [mailto:bowmansc@yahoo.com]  
Sent: Sunday, April 08, 2018 12:10 PM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Cc: Shofner, Pamela <Pamela.Shofner@maine.gov>  
Subject: MaineDOT Contact Form Submission: project

The following message was submitted from the MaineDOT contact form.

Date: Sunday, 08-Apr-2018 12:03:57 EDT  
Name: Stephen Bowman  
Phone:  
Email: bowmansc@yahoo.com

Topic: project

-----  
Comments:

I am a Brunswick resident and am in favor of replacing the Frank J. Woods bridge with the new design. I believe a wider, pedestrian-friendly bridge is what we need to help bring the beauty of the river to the forefront. Thank You.

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If required, please respond as soon as possible.



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
National Environmental Policy Act

Frank J. Wood Bridge  
Public Meeting - Environmental Assessment  
Mt Ararat High School Commons

March 28, 2018  
6:00 pm

The Federal Highway Administration (FHWA) and the Maine Department of Transportation (MaineDOT) are accepting public comments and community input regarding the National Environmental Protection Act (NEPA) Environmental Assessment through April 11, 2018. This comment sheet can be mailed to the following address:

David Gardner  
Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

I support alternative 2 - replace upstream.  
I have attended several meetings to discuss this, including the March 28 meeting. I believe MDOT did explore alternatives, considered local input, and has the best interests for a safe bridge with longevity. Although I value historic buildings and locations, the new bridge will afford a panoramic view of the mills, river, etc. in the bridge vicinity without metal structure to peer through. The bank-ups presently would be exacerbated if the bridge was rehabed - as numbers of cars per day are likely to increase in the years ahead. Painting of the structure creates close downs/bottle necks presently which would not change without a new bridge. Bike paths incorporated into a new bridge would enhance tourism and resident biking. Although some have described the present bridge as scenic, I do not share that point of view. Thank you.

Name (Please Print) Debra Wigand  
Street Address 12 Larrabee Farm Rd  
City, State, Zip Brunswick ME 04011  
Contact Info (Email or Phone) 207-729-0363

scenic, I do not share that point of view. Thank you.



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<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

I WAS BORN & RAISED IN TOPSHAM OVER 70 YRS AGO  
AND I DON'T SEE ANYTHING HISTORIC ABOUT THE FRANK WOOD  
BRIDGE I HAVE TRAVELLED OVER IT BY FOOT, BICYCLE, MOTORCYCLE,  
AND AUTOMOBILE. IT'S TIME FOR A NEW BRIDGE. THE LONGER  
THIS GOES ON THE MORE EXPENSIVE IT WILL GET.

(Use additional sheets if necessary)

Name (Please Print ) JERRY LAMARRE  
Street Address 10 MAPLE ST. EXT.  
City, State, Zip TOPSHAM, ME. 04086  
Contact Info (Email or Phone) 841-5193

FJW EA COMMENT #38

From: cheryl king <inthegarden24@yahoo.com>  
Sent: Monday, April 9, 2018 8:29 AM  
To: Gardner, David  
Subject: Subject: Public Comment Frank J Wood

To Whom It May Concern

I was present at the Public Meeting on March 28, 2018. I was expecting to hear about the Environmental Assessment, but that wasn't discussed, which I found curious.

I was raised in Brunswick. After graduating from high school I joined the military, where I had the opportunity to live in many places across the country and world. When I retired I returned to the Brunswick area because of all the towns and cities I'd lived - the Brunswick-Topsham area remained special. I appreciated the natural beauty and the quaint, small-town charm. There is a sense of yesteryear in Maine, which is part of its allure to my many relatives and friends who visit regularly.

Southern Maine is losing its quaintness to modern conveniences and Topsham will lose that if the Frank J Wood bridge is replaced with a cement overpass. There is nothing special about that in my mind.

Cheryl King  
12 Walnut St  
Topsham



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Augusta, ME 04333

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<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

I ATTENDED THE MEETING. COULD NOT HEAR SOME OF THE RESIDENTS. STAYED UNTIL THE END. THE STATE PRESENTATION WAS V. GOOD AND I COULD HEAR I HAVE ONLY LIVED IN MAINE AND USED THE BRIDGE SINCE 1990 ALTHOUGH WIFE SUMMERED HERE AND OWNED PROPERTY SINCE 1950 AT MERE PT, BRUNSWICK. - NOW LIVE AT THE HIGHLANDS IN TOPSHAM BUT SHOP MOSTLY IN BRUNSWICK + BANK IN BRUNSWICK SO USE THE RUSTY GREEN BRIDGE. - I'M IN MID 90'S AND MAY NOT BE AROUND TO SEE OR USE A NEW BRIDGE, BUT THAT IS WHAT I FAVOR. I CERTAINLY DID NOT MOVE TO MAINE OR BRUNSWICK BECAUSE OF IT. - MY ONE WORRY IS THAT I DO NOT HAVE A MENTAL PICTURE OF HOW THE APPROACHES AT EITHER END WILL BE CONSTRUCTED, HOW THEY WILL LOOK, HOW TRAFFIC WILL BE AFFECTED, FISH LADDER ENTRANCE TO FRONTIER REST. PARKING, OTHER BUSINESS PARKING etc

AND THE HEIGHT/RISE OF BRIDGE.

Name (Please Print ) MARGARET FISCHER  
Street Address 13 COBURN LANE  
City, State, Zip TOPSHAM, ME 04086  
Contact Info (Email or Phone) \_\_\_\_\_



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
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<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment: Dear Mr. Gardner;  
Please save the historic "Green" Frank J. Wood  
BRIDGE WHICH SPANS THE LOCAL RIVER CONNECTING  
TWO HISTORIC MILLS. WE CONSIDER OUR WALKS, IN ALL  
SEASONS, ACROSS THE BRIDGE SACRED. THE PEDESTRIANS,  
LIKE OURSELVES, EXPERIENCE THE INCREDIBLY LIVELY LOWER  
WATERFALLS (WHICH WOULD BE OBSCURED BY THE NEW HWY. BRIDGE  
WHICH WOULD CURVE TOWARDS THE UPPER STREAM). WE KNOW  
THE FALLS + THE BIRDS + FISH + CHERISH THEM MORE THAN WE  
CAN EXPRESS, THE LOSS OF THIS VITAL PROXIMITY TO THE  
LOWER FALLS WOULD BE HEART BREAKING FOR THOUSANDS OF  
LOCALS + TOURISTS. WE RECOMMEND OPTION #4 WHICH  
SAVES THE GREEN BRIDGE + ADDS ANOTHER WALKWAY / OR  
BIKEWAY, ON THE DOWNSTREAM SIDE - KEEPING THE METAL BARRIER  
BTWN PEDESTRIANS + TRAFFIC IS ESSENTIAL. WE FEEL SAFE WALKING  
(Use additional sheets if necessary) AND EXPERIENCING THE DYNAMISM OF THE LOWER  
ROCK FALLS NOW +

Name (Please Print) SUSAN WILLIAMS  
Street Address 14 ARBORETUM WAY  
City, State, Zip HARPSWELL, ME 04079  
Contact Info (Email or Phone) 207) 373-3995

BE YOU TO SAVE OUR  
BELOVED, SPECIAL,  
HISTORIC  
MONUMENTAL  
BRIDGE.  
WE LOVE IT!  
SO MANY OF US!  
THANKS VERY  
MUCH,  
SUSAN WILLIAMS



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<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

PLEASE KEEP PRESENT BRIDGE!

IT IS A PLACE! & MAKES THE RIVER FEEL AS  
A PLACE!

NEW NULLIFIES PLACE! JUST A SLICE OF HIWAY!

(Use additional sheets if necessary)

Name (Please Print ) DAVID COLT  
Street Address 14 ARBORETUM WAY  
City, State, Zip HARPSWELL, ME 04079  
Contact Info (Email or Phone) DAVIDCOLT@AOL.COM  
207) 373-3992



**Comment Sheet**  
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<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

I appreciated the open forum in Topsham last week.  
As a resident, supporter of local business and  
community, and a Maine taxpayer, I fully  
support the rebuild (new construction) option 2.  
I believe this is the best option for all involved  
and I appreciate the committee formed to save the  
bridge, but it's time is over.

(Use additional sheets if necessary)

Name (Please Print ) Thomas Banter  
Street Address 39 Brunswick Rd  
City, State, Zip Brunswick ME 04011  
Contact Info (Email or Phone) 207 751.0574



# MaineDOT

PROJECT NAME FRANK WOOD BRIDGE REPLACEMENT

NAME: JAMES HAMILTON

PHONE: 207-841-1388

ADDRESS: 162 COLUMBIA AVE

TOWN: BRUNSWICK

EMAIL: Jimham1@gwi.net

REPRESENTING: SELF

Do you want a MaineDOT representative to call you?

YES

NO

COMMENTS:

I FAVOR REPLACING THE BRIDGE WITH ~~THE~~ ALTERNATE-2 ~~OPTION~~

I am an avid cyclist, and crossing the current bridge is very dangerous,

I'm also concerned about the added cost and bridge shut-down  
involved with rehabilitation option.



[mainedot.gov](http://mainedot.gov)



FJW EA COMMENT #44

From: Communications.MaineDOT@maine.gov  
Sent: Monday, April 9, 2018 2:38 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/09/2018  
Name: Mark Grandonico  
Organization(if applicable): MidCoast Triathlon Club  
Phone: 2072320232  
Email: grandm@maine.rr.com

Topic:

-----  
Comments:

Good Afternoon, I see the public comment period is closing IRT the Frank J Wood bridge. The MidCoast Triathlon Club is based out of Brunswick with 100+ members in the immediate area. We fully support, in alignment with the Bicycle Coalition of Maine, REPLACEMENT of the bridge. The current design is simply not safe for bicyclists.

Thank You  
Mark Grandonico  
MidCoast Triathlon Club  
-----

If required, please respond as soon as possible.

FJW EA COMMENT #45

From: Communications.MaineDOT@maine.gov  
Sent: Monday, April 9, 2018 4:57 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/09/2018  
Name: Richard Bernasconi  
Organization(if applicable):  
Phone: 617-481-0040  
Email: rickbern@comcast.net

Topic:

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Comments:

I live in Brunswick, Maine and I wish to comment on replacement versus rehabilitation of the Frank J Wood Bridge connecting Topsham and Brunswick Maine. I consider the current bridge to be an eye sore that detracts from the natural beauty of the Androscoggin River and its wooded banks. Even when the bridge was in a much less rusted, better state of maintenance, its heavy industrial metal beam construction obstructed and detracted from an otherwise bucolic view. The proposed replacement bridge has a much lower profile that would not interfere as much with the visual enjoyment of the river. The cost of the new bridge would be less than the rehabilitation of the old structure, would require less cost of maintenance and provide a longer life time of use. In my mind it is hard to see anything that would recommend retaining the old structure but the continuation of a tired and ugly tradition. I highly recommend the replacement of the bridge with a modern constructed alternative. T hank you.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #46

From: Cynthia Howland <cbhowland@gmail.com>  
Sent: Monday, April 9, 2018 5:17 PM  
To: Gardner, David  
Subject: Frank J. Wood Bridge

I strongly favor rehabilitation of the bridge because it is part of the cultural history of the mills in Brunswick and Topsham. Also, rehabilitation will do no harm to the fishway, the rocks below the dam, or to the marine/water fowl life of the river .

Thank you.

Cynthia Howland

FJW EA COMMENT #47

From: CORNELIUS & DONNA WALSH <yanks23@comcast.net>  
Sent: Monday, April 9, 2018 6:26 PM  
To: Gardner, David  
Subject: Green bridge

I would like to see the bridge restored. I think it fits Topsham and Brunswick small town not the design of the new bridge. Donna and Cornelius Walsh 73 Bridge Street Topsham, Maine 04086 Yanks23@comcast.net

FJW EA COMMENT #48

From: Communications.MaineDOT@maine.gov  
Sent: Monday, April 9, 2018 7:35 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/09/2018  
Name: Linda L. Baker  
Organization(if applicable): Topsham Resident  
Phone: 207-729-8381  
Email: Lbakerbasket@yahoo.com

Topic:

-----  
Comments:

I strongly support Option 2 for replacement of the Frank J. Wood Bridge. It is the only fiscally responsible choice. Thank you for the many hours of public information and input you have provided. You have done an outstanding job and, in my view, very fairly presented all options.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #49

From: Hannah Judson <hjudson@hotmail.com>  
Sent: Tuesday, April 10, 2018 3:09 AM  
To: Gardner, David  
Cc: chick76@me.com  
Subject: Frank J. Wood Bridge needs to be preserved

Dear Mr. Gardner,

I wanted to let you know that I am concerned about the possible destruction of the Frank J. Wood Bridge. While I am for progress in general, I am also concerned that we take care of monuments that link present with past. This bridge has architectural merit, fits in with the landscape, speaks to the history of the river, the factory, and the towns it joins. Please do what you can to pursue restoration of the bridge and not tear it down.

Best,

Hannah Howland Judson

From: Cynthia Howland <cbhowland@gmail.com>  
Sent: Monday, April 9, 2018 4:29 PM  
To: Mary Alice Treworgy; Jane Frost; Genie Wheelwright; Louise Huntington; Kate Huntington; Katharine Watson; Wallace Pinfold; Hannah Judson; Ethan Howland; Jan&Liz Pierson  
Subject: Fwd: MDOT email

Dear Friends,

Please send in your pro-Frank J. Wood Bridge comments no later than Wednesday. You don't have to say much more than that you favor the rehabilitation of the FJW Bridge, but more is OK. Please cc Chick Carroll as per instructions from John Graham; he is a member of The Friends of the Frank J. Wood Bridge (John Graham is head of the group). Please forward the info to any friends anywhere who love bridges and keeping the character of a community intact.

Fervent thanks,

Cynthia

Begin forwarded message:

From: John Graham <John@johngrahamrealestate.com>  
Subject: MDOT email  
Date: April 9, 2018 at 12:16:56 PM EDT  
To: "cbhowland@gmail.com" <cbhowland@gmail.com>  
Cc: Ann And Chick <chick76@me.com>

Hi Cynthia,

Please send your comments to David Gardiner- David.Gardner@maine.gov and

also cc Chick Carroll, am member of our group who is going to hand deliver them to make sure they get put in the record.. Chick's email is: chick76@me.com.

Thanks,

John

John Graham  
John Graham Real Estate  
[www.johngrahamrealestate.com](http://www.johngrahamrealestate.com)  
207-491-1660  
10 Pleasant Street  
Topsham, ME 04086

FJW EA COMMENT #50

From: Kittredge, Joel  
Sent: Tuesday, April 10, 2018 10:26 AM  
To: Chamberlain, Kristen; Gardner, David; Martin, Cheryl (FHWA)  
(Cheryl.Martin@dot.gov)  
Cc: Damren, Janet  
Subject: FW: Frank J Wood bridge comment

fyi

-----Original Message-----

From: hedda steinhoff [mailto:hedda.s@gmail.com]  
Sent: Tuesday, April 10, 2018 10:11 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: Frank J Wood bridge comment

I support the upstream bridge replacement between Topsham and Brunswick. I like that the proposed bridge design is bike friendly, but from a pedestrian's perspective I would not feel safe without a guardrail. I regularly cross the bridge with my son in his stroller, and having a barrier between us and both cars and bikes is essential for us to walk across with peace of mind. I hope you will consider protecting pedestrians as well as accommodating cyclists in your plan going forward.

Thank you,

Hedda Scribner  
10 Hanson Drive  
Topsham

FJW EA COMMENT #51

From: Katharine Watson <kjwats@comcast.net>  
Sent: Tuesday, April 10, 2018 12:10 PM  
To: Gardner, David  
Cc: "Chick Carroll chick76"@me.com  
Subject: Frank J. Wood Bridge between Brunswick and Topsham

Dear David Gardner,

As a resident of Brunswick of 41 years, I am writing to plead that the decision be made to rehab rather than replace the Frank J. Wood Bridge which links the towns of Brunswick and Topsham. Human safety and vehicular convenience can be guaranteed through rehab as well as contemporary construction, but a new bridge would greatly impact if not destroy one of the major urban vistas of Maine. The new bridge would cut into the Androscoggin falls, changing the course of the water and altering the river's banks.

Please choose rehab rather than new construction.

Sincerely,

Katharine J. Watson, 10 Boody Street, Brunswick, ME 04011

FJW EA COMMENT #52

From: John McKee <jmckee@bowdoin.edu>  
Sent: Tuesday, April 10, 2018 1:00 PM  
To: Gardner, David  
Cc: John McKee  
Subject: Comment on FJ Wood Bridge proposals

Mr. Gardner and others concerned:

As a resident of Brunswick for many decades, I've long admired the FJ Wood Bridge even while putting up with the frequent traffic jams at either end of the bridge.

I strongly support the option to rehabilitate the present structure. It does the job and it has historic value. And looking beyond the structure itself, it's clear that only those options maintaining the existing alignment make sense from an environmental or historic-preservation viewpoint.

In addition, I believe that any preference based largely on considerations of traffic flow and safety must be discounted. From that viewpoint – and short of a thorough redesign of the traffic pattern near each end of the bridge – none of the options proposed is clearly superior to the others.

In short, rehabilitation of the present bridge is the best of the proposed options.

Please include this statement in the public record on this matter.

Sincerely  
John McKee  
Brunswick, Maine

FJW EA COMMENT #53

From: Communications.MaineDOT@maine.gov  
Sent: Tuesday, April 10, 2018 1:05 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/10/2018  
Name: Stephen Turner and Jo-Ann Turner  
Organization(if applicable): retired citizens of Brunswick, Maine  
Phone: 207-406-4375  
Email: turnermailbox@comcast.net

Topic:

-----  
Comments:

We would like to see the FJW demolished and a new bridge of modern design replace it. The FJW is currently an eye sore and every time we use it we feel like we are driving through a junk yard. Any expert in steel construction can tell you that the specialized care the FJW would require (replacements and repair) represents prohibitive and problematic costs to the citizens of the State of Maine. Also, the FJW actually detracts from the historical beauty of nearby structures. The new, low profile proposed bridge would shift attention away from a rust pile to the great natural beauty of the river and its environs.

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If required, please respond as soon as possible.

FJW EA COMMENT #54

From: Communications.MaineDOT@maine.gov  
Sent: Tuesday, April 10, 2018 1:52 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/10/2018  
Name: Amanda Hughes  
Organization(if applicable):  
Phone: 2074001639  
Email: atehughes@gmail.com

Topic:

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Comments:

I would like to register my support for having a new bridge built to connect Topsham and Brunswick. I use the Frank J Wood Bridge on a daily basis, both as a driver and a pedestrian. I think the a new bridge would benefit our communities- by connecting trails and giving real consideration to cyclists. Both new options appeal to me, but Alternative #2 has a much more appealing timeline.

I did not realize until I read the EA draft, that the Frank Wood Bridge is a fracture critical structure. The proposal to add strength and a new sidewalk to the existing bridge seems like a patch job that may not even satisfy the folks who hope to keep the green bridge (presumably in its original historic state) and the other repair options don't address the underlying structural concerns.

I would feel much safer with a modern bridge that is designed for modern traffic concerns.

Thank you.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #55

From: Wallace Pinfold <wgpinfold@gmail.com>  
Sent: Wednesday, April 11, 2018 8:04 AM  
To: Gardner, David  
Subject: Frank J Wood bridge

Dear Sir:

I am strongly for the rehabilitation of the metal bridge between Brunswick and Topsham. The high-handed way in which MDOT has managed this whole business is not the only thing that motivates this letter. I don't trust your figures -- I don't believe that rehabbing the present bridge will cost as much as you say, I don't believe that the new bridge will cost as little. Also, I prefer the historic structure to any design you have proposed. Richard Nemrow's letter to the Times Record yesterday, April 10, absent personal references, summarizes both my objections and preferences more articulately than I can do myself.

Sincerely,  
Wallace Pinfold  
Brunswick

FJW EA COMMENT #56

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 11, 2018 8:36 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/11/2018  
Name: Peter Huntsman  
Organization(if applicable): Self  
Phone: 207-844-3655  
Email: Peter.Huntsman@gmail.com

Topic:

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Comments:

I am a retired construction lawyer from Connecticut, and was involved in a number of catastrophic failures over my career (the Hartford Civic Center collapse; L'Amance Plaza; 2 minor commercial buildings that failed as a result of shadow loading). I strongly support MDOT selecting the safest, most cost effective bridge. Respectfully, sentimentality has little to do with the safety of the motoring public. The failures of the Mianus River and Schoharie Creek bridges, the pedestrian bridge in florida, etc., remind us that safety is job #1.

-----  
If required, please respond as soon as possible.

April 9, 18

Dear David,

Do what's right - for all of us.

Build the new Bridge.

We, the Lisbon-Durham folks, have their new Bridge and love it!! Sidewalks, views E.T.C.

It's not fair to saddle Maine taxpayers with preventable maintenance costs and needless disruption of business both in Brunswick and Topsham.

Friends of the late Frank J Wood could ~~erect~~ erect a plaque dedicated to his memory or name the New Bridge.

Frank J Wood Memorial Bridge NO2

Take care,

Do what's Right

Wise with you

18 Sunset Av. Lisbon Falls, (86 YEARS YOUNG)

NOYES Lawrence



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
National Environmental Policy Act

Frank J. Wood Bridge  
Public Meeting - Environmental Assessment  
Mt Ararat High School Commons

March 28, 2018  
6:00 pm

The Federal Highway Administration (FHWA) and the Maine Department of Transportation (MaineDOT) are accepting public comments and community input regarding the National Environmental Protection Act (NEPA) Environmental Assessment through April 11, 2018. This comment sheet can be mailed to the following address:

David Gardner  
Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

*My primary concerns are:*  
① *Safety of pedestrians: I frequently walk the bridge & appreciate the steel barrier.*  
② *Collisions: I have seen no evidence that there have been a great many accidents on the bridge.*  
③ *History: There is a reason why the Green Bridge is on the cover of Mills and Factories of New England. It's iconic!*

(Use additional sheets if necessary)

Name (Please Print ) Jane Crichton  
Street Address 733 Mere Point Road  
City, State, Zip Brunswick, ME 04011  
Contact Info (Email or Phone) 207-729-3213



**Comment Sheet**  
**Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00**  
**National Environmental Policy Act**

Frank J. Wood Bridge  
 Public Meeting - Environmental Assessment  
 Mt Ararat High School Commons

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David Gardner  
 Maine Department of Transportation  
 Environmental Office  
 16 State House Station  
 Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

Please listen to the voices that want to conserve the character of the towns of Brunswick & Topsham by rehabilitating the historic & very interesting "Green Bridge." The option #4 by MaineDOT would be a very positive choice. That way we retain the historic bridge and gain an additional pedestrian walkway. The proposed "new highway style" river crossing would destroy the cherished views of thousands of locals & tourists of the lower Rock Waterfalls! Do you realize how much we would miss the waterfalls? Also, (Use additional sheets if necessary) the new hwy provides zero protection

Name (Please Print) SUSAN BOYD WILLIAMS  
 Street Address 14 ARBORETUM WAY  
 City, State, Zip HARPSWELL, ME 04079  
 Contact Info (Email or Phone) 207) 373-3995

FOR PEDESTRIANS THE "GREEN BRIDGE" PROTECTS US PEDESTRIANS W/A METAL CAGE. YOU DON'T WANT A ROGUE DRIVER TO MAIME OR KILL PEOPLE OUT WALKING. Please OPTION #4.

Cheryl Martin  
Assistant Division Administrator  
Federal Highway Administration – Maine Division  
40 Western Ave  
Augusta, ME 04330

April, 11 2018

David Gardiner  
Maine DOT  
16 State House Station  
Augusta, ME 04333-0016

To whom it may concern,

Since early 2016 the community has been at odds with a small faction of town employees (civil servants) who are determined to destroy the Frank J Wood Bridge. The reasoning behind this is unclear.

I walk across the bridge regularly with my children and have never felt afraid, quite the opposite! The steel beams between the traffic and the sidewalk are comforting. I find there is little pedestrian traffic, has the MDOT done any research into pedestrian numbers? I doubt it.

Once the bridge's deck is replaced bicyclists can have 5 foot bike lanes. The only thing stopping this is not the bridge's deck width but MDOT's refusal to shrink lane widths! All studies show 10 foot lane widths are preferable in an urban setting as this bridge most certainly is!

I want to say that I am relieved there are Federal Laws that protect historical structures... however it appears that MDOT decides which laws it wants to apply and once they are called out on it they 'cook the books'. It is quite obvious that this is what has been done in this case. Why the misleading information and dishonesty? If there really was a need for this new bridge I don't believe there would be cause for such behaviour. I also find it quite insulting to both towns that the best alternative you could come up with was a cheap highway bridge. Could MDOT not have taken some inspiration from other states? Such as MassDOT'S Whittier Bridge project?

Mr Gardiner, you signed the 2003 Historical Bridge Plan on the FJW. How can you now draft a 4f saying the opposite? Are you not a Civil Servant? As a resident of this state I expect you to keep to your word as I am sure many others do. I do not trust those who say one thing and then attempt to deliver another. I'd be interested to hear your reasoning behind this u-turn!

If funding is an issue, why not ask? Every time a transportation bond is placed on the ballot it passes overwhelmingly. All you are doing is wasting tax payers dollars on an alternative that in absolutely NO way fits its surroundings, and goes against every single study on traffic calming and urban street design I have read.

It is not too late to choose to rehabilitate this fantastic bridge. You are guardians to these historical structures and in every instance where it is possible to do so should be

maintaining and preserving them. Please I implore you not to be short sighted in this matter. The long term benefits of the FJW Bridge in its picturesque surroundings far and above outweigh the short term gains of your proposed wide open ugly highway bridge. The reputation of the Agencies that you work for could be vastly improved by working with communities to preserve their historic structures as opposed to coming in with the demolition plan already in place. Save the Frank J Wood Bridge!

P. Asher

Top sham

FJW EA COMMENT #61

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 11, 2018 10:27 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/11/2018  
Name: Susan Z. White  
Organization(if applicable):  
Phone: 207-725-2707  
Email: phinwhite@me.com

Topic:

-----  
Comments:  
Susan Z. White  
67 Bridge Street  
Topsham, ME 04086

April 11, 2018

Mr. David Gardner  
MDOT  
Environmental Office  
Augusta, ME

Dear Mr. Gardner:

I'm a store manager for a retailer located in the town of Brunswick, at the intersection of Pleasant Street and Maine St.

In Brunswick, Maine we spell our main street M-A-I-N-E. We're the only main street in the nation to do this and it differentiates us from all other main streets.

The Frank Wood Bridge also differentiates us from any other main street. This historic steel truss bridge is the town center as we lost our historic town hall during urban renewal in 1961. At that moment in time the bridge took over as the dominant and most historic structure in the town. It's always a point of reference, it's often the meeting place—see you at Green Bridge! It's on the cover of our phone book.

I speak with thousands of people each year from all over the world. Most are tourists and families looking at colleges. A recurring comment by many is what a scenic area the Frank Wood Bridge and mill buildings create. And when I tell them it is under threat they express outrage and then offer their hope that it can be saved. That is my hope too. Please save our historic bridge.

Thank you,  
Susan

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If required, please respond as soon as possible.

FJW EA COMMENT #62

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 11, 2018 10:25 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

Categories: FJW

The following message was submitted from your MaineDOT website contact form .

Date: 04/11/2018  
Name: James Phinney Baxter White  
Organization(if applicable): Governor Baxter, LLC  
Phone: 207-725-2707  
Email: phin@governorbaxter.com

Topic:

-----  
Comments:

J. Phinney Baxter White  
67 Bridge Street  
Topsham, ME 04086

April 11, 2018

Mr. David Gardner  
MDOT  
Environmental Office  
Augusta, ME

Dear Mr. Gardner:

Throughout the 106 the Maine DOT and Federal Highway have denied the Frank Wood Bridge status of being individually eligible for National Register listing. On October 25th, 2017 the MDOT requested concurrence from the State Historic Preservation Officer, Kirk Mohny on the subject of NR eligibility. The MDOT utilized an analysis by Kleinfelder where they determined the bridge was not significant to the extent of being recognized as individually eligible for NR listing. On November 16th, 2017 the SHPO responded to the MDOT with a finding of individual eligibility for the Frank Wood Bridge under criterion A for its history. Shortly after the finding by Mr. Mohny the MDOT and Federal Highway recognized the Frank Wood Bridge as being individually eligible for listing to the National Register of Historic Places.

I believe the Frank Wood Bridge will also be found to be National Register eligible under criterion C for its construction type. It may be the earliest surviving example in Maine to exhibit the use of rolled section members that substitute the built-up members used in previous designs. The significance of this bridge is that it captures the evolution of bridge technology at the peak of the Great Depression, with its use of rolled members as well as built-up members. This bridge has both types of members – thus exhibiting the elements which have defined steel bridge evolution over the last 150 years, which in turn illustrates an important theme in the history of the nation.

This significance may qualify the Frank Wood Bridge as a National Historic Landmark status. From the

NHL guidelines: "A property with national significance helps us understand the history of the nation by illustrating the nationwide impact of events or persons associated with the property, its architectural type or style, or information potential. It must be of exceptional value in representing or illustrating an important theme in the history of the nation." The Frank Wood Bridge may be the quintessential example to illustrate this crossover technology during The Great Depression, 1929 to 1939.

This is a functioning historic bridge and already a landmark. There is no sound reasoning to replace it when it can be rehabilitated and continue to gain historic significance.

Thank you,  
Phinney

-----

If required, please respond as soon as possible.

# Comments Enclosed re: Frank J Wood Bridge

April 11,2018

From:

Summer Street.

Charles Carroll

Ann Carroll

Josie Seymour

Allison Brigham

Maynard McCorkle

Paul Seaquist

James Mixon

## Other Addresses

Steve Stern

Arlene Morris

James White

Eleanor Brown

Bronda Niese

Marilyn Hardy

John McKee

Cynthia Howland

Hannah Judson

Katharine Watson

Mary O'Brien

Ann Nemrow

Evan Duda

Frank Duda

Wallace Pinfold

*Susan White*

Mr. David Gardner,  
MDOT  
Environmental Office  
Via email

April 10, 2018

Comments re: Environmental Assessment and Draft Section 4(f) Evaluation  
Frank J. Wood Bridge Project

Dear Mr Gardner,

My name is Charles Carroll, a resident of Summer Street, #24, in Topsham. I am also a member of the Friends of the Frank J. Wood Bridge, but my comments here are submitted as an individual and a resident of Summer Street.

The Environmental Assessment states on page 18 that the Preferred Alternative #2 would not "use" the Summer Street Historic District. If you mean by "use" the "potential environmental impacts" as required by NEPA, then nothing could be further from the truth! Alternative 2 will seriously impact the Summer Street Historic District, in several highly negative ways, and in no positive ones.

#### 1. VIEWS

Presently, residents of Summer Street enjoy an extensive view down the river, and a view of the historic and handsome Penobscot Paper Mill (Bowdoin Mill Complex.) These views are made possible by the light and limited structure of the Frank J. Wood Bridge, through which viewing is very easy.

Neither the EA nor the draft 4(f) evaluation disclose the elevation information of the proposed Alternative #2 replacement bridge. Without this information we and all parties are being asked to reach conclusions based on incomplete information, or in some cases no information, information which has been intentionally withheld from public scrutiny.

Nevertheless, the Preliminary Design Report contained in Appendix 2 gives a hint of how one might calculate the ultimate height of the Alternative #2 bridge. Steel girders of at least 9 feet, or more, are called out in that Appendix. Because such girders are a solid barrier to water flow, the bottom of the girders would have to be at least at the elevation of the

bottom chord of the existing bridge in order to be above flood waters. But, because the proposed location of the new bridge is upstream of the existing bridge, to locate it above flood height would require the bottom of the girders to be above the elevation of the bottom chord of the existing bridge.

The result will be a solid wall at least nine feet high, the bottom of which would be some distance above the bottom chord of the existing bridge. As a result, the deck of the replacement bridge would be something like 10-13 feet above the deck of the present bridge. The existing views from the Summer Street Historic District would be eliminated! I should also note that the views from both the Bowdoin Mill Complex and the Fort Andross Mill Complex will be seriously constricted. In addition, the expanse of the girders will become a nuisance attraction for graffiti, visible from Summer Street. Similar defacement is seen on so many similar girder supported bridges.

If I am incorrect in any of my conclusions about bridge height, the responsibility rests with MDOT for its intentional failure to provide elevation drawings or measurements. Further, MDOT has not provided information about the approaches, how the replacement bridge would tie into them, and what property acquisition(s) would be required.

## 2. NOISE

The existing bridge is flat and level, and is straight with no turns. No acceleration or deceleration is required. As a result of these factors, vehicle noise, from engine and tire noise, is kept to a minimum. None of these mitigating factors will be present in the proposed Alternative 2 bridge. It will have a fairly sharp turn, it will require climbing and descending, and will require turning, acceleration and deceleration, all increasing tire noise and engine noise. Finally, it will be considerably closer than the present bridge to the Summer Street historic residences. It is not possible to determine to what precise degree vehicle noise will be increased with the information presently available. But it is completely evident because of all these factors that there will be more, considerably more noise affecting the livability of the Summer Street neighborhood.

## 3. LIGHT

Because of the curve upriver of the proposed Alternative 2 replacement bridge, the houses in the Summer Street Historic District will experience

**massive** intrusion from headlights of vehicles traveling north on the bridge. The intrusion will come from thousands of headlights, especially in the winter, shining into the homes in the neighborhood. I realize the Design Advisory Committee has considered this factor, and that there has been discussion of some light baffles being installed. I am familiar with such attempts at light mitigation. Again and again those are broken off, so that they become ineffective and ugly. Observe, for example, the baffles on I-295 approaching Portland. In addition, they raise the height of the bridge, further restricting views.

#### 4. THE NEIGHBORHOOD

The EA and the draft 4(f) Evaluation treat the several historic structures and complexes that cross and line the river banks as if somehow they were entirely separate. It is staggering that MDOT seems to fail to see that the various features are interdependent. In fact, the Fort Andross Mill Complex, the Frank J. Wood Bridge, the Summer Street Historic District, the Bowdoin Mill Complex, and the 250th Anniversary Park comprise a valuable and unique historic neighborhood, a neighborhood that is a teeming, thriving home for people; fish (including 3 endangered species or endangered populations); large numbers of fishermen; a huge number of shops, businesses and restaurants employing hundreds of people in the 2 mill complexes; extensive bird life including several Bald Eagles, Peregrine Falcons, Ospreys, Blue Herons, and many other species; an active fishway; a hydroelectric plant; a rare freshwater wetland; a variety of mammals, including beavers, fishers, and possums; and a historic neighborhood that contains 8 historic houses (not 6 as the EA and the 4(f) Evaluation state,) plus a converted carriage house. Please see Figure 1 on page 3 of the EA which shows the integrated nature of all these historic features of this lower Androscoggin neighborhood.

The River itself, and especially the lower falls (which would be covered from view by Alternative 2) have been the central feature of this iconic area for thousands of years of native and European settlement. Since 1932 the existing Frank J. Wood Bridge has been the uniting artery. Indeed the Frank J Wood Bridge has become a much loved and photographed icon. It shows up in many marketing pieces promoting the area; it is the featured cover photo of *Mills and Factories of New England*, copyrighted in 1988 by Dartmouth College. (In the photo, taken in the early 1980's, the bridge appears to be rust free.) The bridge is much admired by thousands of tourists who feel and often say that our state and community are so smart

to have retained the bridge, that we value our historic legacy. To destroy it will diminish the appeal of the area to tourist traffic.

The EA and 4(f) draft evaluation divide up these historic and natural features as if they were completely separate. In fact, the entirety of all these features, as pictured on page 3 of the EA constitute an integrated whole. In recent decades the river itself has been extensively cleaned up from when it was considered one of the very most polluted in the United States—so bad that it became, thanks to Sen Edmund Muskie, the poster child for the Federal Clean Water Act. The result is that as it became cleaned up, tens of millions of dollars have been invested in rehabilitation, all within a few hundred feet, at the Fort Andross Mill Complex, the Summer Street Historic District, the Bowdoin Mill Complex, the 250th Anniversary Park, the Brunswick Hydroelectric Plant. Of these investments some, especially those in the Summer Street Historic District, will be negatively affected by the Alternative 2 proposed bridge. Property values on Summer Street will suffer as the result of the impact on views, from noise, and from headlights.

There are so many disappointments and factual inaccuracies in both the EA and the draft 4(f) Evaluation that I will leave it to additional respondents to address them, restricting this focus only upon the severe impact on the Summer Street Historic District.

But I do need to speak of the disappointment I feel at the present state of affairs. To speak frankly, I am staggered that of the four alternatives focused upon, ( Alternatives 1-4) MDOT has chosen the most damaging, **the very worst of the four.** It has far greater impact upon historic and natural resources than any of the others. It has far greater impact upon the Summer Street Historic District. It's design, elevation, and alignment are radically incompatible with its surroundings.

And, sadly enough, it is highly disturbing to see an agency of the State of Maine, deliberately skew the evidence by, among others:

- Withholding elevation data that would allow the public to see the impact of the proposed bridge.
- Withholding data on connections to the bridge approaches and what changes they will necessitate, again preventing the public from seeing the full impact on their community.

- Deciding to adopt a non standard way of calculating Life Cycle Costs, in order to distort the economic conclusions.
- Choosing to present the existing FJW bridge in the worst possible light by selecting the least attractive photography of corrosion on the bridge, caused, of course, by inadequate maintenance by MDOT.( See paragraph 3 of attached email from MDOT to T.Y. Lin for clear evidence of intentional bias).

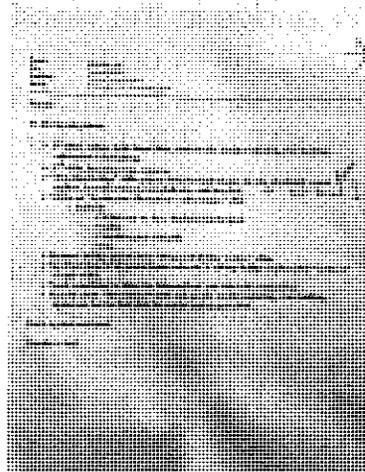
Throughout the country during the last 40 years, State Highway Departments( now called Depts. of Transportation) have become much more sensitive to the environments through which their urban arteries pass. In fact, in many states, DOT projects have often become the welcome catalysts for the preservation of local history and community integrity. In this case of the FJWB, is MDOT unwilling or unable to exhibit this same sensitivity? I sincerely hope not. It should not be too late to rethink the assumptions that resulted in this terribly misguided proposal and consequently in the present acrimonious disagreement.

Sincerely yours



Charles M. Carroll  
24 Summer Street  
Topsham, ME 04086

N.B. See email, next page, dated April 22, 2016 from Joel Kittredge (MDOT) to Norm Baker (T.Y. Lin).



From: Kristen, Joel  
To: "Norman Baker"  
Subject: Monday's presentation  
Date: Friday, April 23, 2010 11:36:51 AM



Norm:

As discussed, please

- > 1<sup>st</sup> slide: reduce font, insert date, and use the aerial rendering, view looking upstream as backdrop.
- > 2<sup>nd</sup> slide, location map, remove.
- > "Existing Bridge" slide, please look through images for the absolutely worst, ugliest, restricted most corroded, etc., and use that. → not done!
- > Make an "Upstream Alternative---Advantages" slide
  - o Include
    - Whatever we have had done in the past
    - Safety
    - Maintenance of traffic
    - Etc.
- > Remove bridge drains from "Proposed Bridge Section" slide.
- > See if getting rid of green frame color on "Existing Bridge Section slide" reduces visual width.
- > Need something to show the intersections and sidewalk connections.
- > Get rid of the "Questions?" slide and use the aerial rendering, view looking upstream for the last slide to remain during questions.

Have a great weekend.

Thanks---Joel

Frank J. Wood Bridge

Dear Mr. Gardner,

I am writing as a resident of Summer Street in Topsham in support of the preservation of our historic Frank J. Wood bridge. For the Summer Street historic neighborhood, the proposed new bridge is devastating, not only historically but environmentally. It would disturb and negatively impact the fish, the birds, including our peregrine falcons who are there because of all the pigeons who spend their days on the superstructure of the bridge, the many bald eagles who feast on the rich fish life, who gather there by the lower falls where Merrymeeting Bay meets the Androscoggin River. The lower falls would be essentially wiped out by the proposed new bridge which would be built on them and over them. This is just a fraction of the wildlife that gathers there. There are ducks breeding here every spring, blue herons constantly fishing on the lower falls. There are beavers and possums, fishers, a freshwater wetland. It is a rare natural treasure right in the midst of the two towns, which many, many people walk or jog or cycle or amble through every day of the week. They walk across the bridge, usually pausing to marvel at the dramatic water flowing over the lower falls and then round Summer St. to join up with the river walk. Several years ago, I built an extensive meditation garden and labyrinth overlooking the bridge, the river and the majestic large rock which projects out into the Androscoggin, which just happens to be part of our property. I built it for all the community and the many, many people who walk along Summer Street because the view seemed much too powerfully beautiful to belong to any one privately. I have always been sure it was originally a significant Native American site. We do know that the lower falls were a great source of fishing for Native Americans during fish runs and we know that, because fishing by European settlers is documented, and the original trading post was located there so as to trade fish and fur with the natives. The lower falls, unlike the more treacherous upper falls, was perfect fishing grounds and was abundantly plentiful with tens of thousands of fish.

There are so many people in the Topsham-Brunswick community, as well as many visitors from other parts of the country and other countries who quietly come and walk the labyrinth or sit in the meditation garden looking out at the river and the historic bridge enjoying "the urban wilderness" with historic mill buildings on either side. Many of those visitors have said how much they love the bridge and how lucky we are not to have torn it down in some rash moment of thoughtless modernization. In fact, Summer Street is the third side of a historic triangle with the iconic bridge tying them all together. Some days there have been as many as thirty young schoolchildren the teacher has brought from school, sitting there in the meditation garden quietly writing down their reflections on protecting the environment. Maybe thirty or more persons a day walk the labyrinth. Many leave me notes of thankfulness for the peaceful, natural haven in the midst of their hectic, busy lives. It is totally unthinkable to me and to the Summer St. neighborhood, that there could now be proposed such an unthinking, insensitive, aggressive 9', or greater, steel girder (an open invitation to graffiti) thrust headlong into this peaceful, extremely neighborly, valuable historic lower village.

The proposed new view would totally destroy the view Summer St. has, looking both at the handsome historic truss bridge itself, and/or being able to look through it at the architecturally stunning yellow Bowdoin Mill Complex which is visible because of the bridge's present open superstructure. We would instead be staring at solid steel beams some 830' long and 9' or more tall, and above that a bridge deck, the proposed structure now having been curved upstream so it feels as if it were invading the livability of our very homes. This isn't even taking into account the loss of the present open view down the river which would be blocked by many concrete piers. This overall loss is immeasurable and I have pointed it out personally to T.Y. Lin by bringing their architectural engineer here to see it. I have, as have many other residents of the neighborhood, brought it up adamantly to the Design Advisory Committee (at which meetings members of MDOT were always present) so it is APPALLING to me that MDOT could even say out loud or in writing that the proposed new bridge would have no adverse effect on

the historic Summer St. neighborhood. It is a blatant denial of the facts, the figures and the outspoken grievous concerns of the residents

The proposed bridge not only aggressively wipes out the view and experience of the river, the lower falls and the historic unity of mill buildings, the 1932 truss bridge, and the historic lower village, but it brings the sounds and exhaust of some 19,000 cars, trucks and motorcycles that much closer to our homes, our living rooms, our bedrooms. This is an invasion of the first order. At the distant of the present bridge, it is just far enough away so as not to be a noise problem, with the possible exception of motorcycles during summer weekends!. Plus the fact that the Frank J. Wood bridge is straight and flat so there is no acceleration or deceleration which would be created due to the necessary new height of the proposed bridge. There is also no curvature creating the constant sound of turning tire noise. PLEASE, any and all of you reading this, consider that this was invading YOUR home, YOUR family and YOUR neighborhood.....what would you be feeling?

Again and again, I have pleaded with the DAC about the horrible intrusion of vehicular lights, staccato-like piercing the dark and flashing unceasingly into our homes which is due to the proposed upstream curve of the new bridge. In the winter months it would be an unbearable burden with thousands of lights flashing into our homes starting at 4:30 in the afternoon. We would have to live behind black-out curtains like we did during the war. The DAC's proposal of baffles is ludicrous. They break; they are ugly; they are inefficient, and a poor attempt of MDOT at sidestepping an immense problematic factor of the proposed new bridge which so blatantly and negatively affects the historic Summer St. lower village neighborhood.

We beg you to reconsider this hasty proposed folly for many more reasons than I have even been able to list. We beg you to look at it from the long view and the inestimable value of such an historic and environmentally unique area to all aspects of a thriving community. What so many cities and towns would give to have such a unique feature in their landscape! How many irreplaceable structures have we foolishly torn down and replaced with generic concrete samenesses, only later to deeply regret it. We mustn't let that happen yet once again.

I cannot say adamantly enough, how DEVASTATING Alternative 2 would be for the historic neighborhood of Summer St. and our deep dismay at your not taking our grave concerns more seriously than you have so far.

Sincerely,  
Ann Carroll



27 Summer Street  
Topsham, ME 04086  
April 10, 2018

Mr. David Gardner  
MDOT  
Environmental Office  
Augusta, ME

Dear Mr. Gardner:

I am a concerned resident of Topsham writing to establish my opinion regarding the proposed construction of a new bridge to replace the Frank J. Wood Bridge. I have a clear view of this historic bridge from my home— from the windows inside and from the outside.

I have lived in the Brunswick/Topsham area for over 30 years. As a resident of Summer Street in Topsham now, my biggest concerns about new construction rather than refurbishing the bridge are the history of the bridge, the environment, and the beauty of the area. I do not see how your EA and the 106 took this into account and weighed all of the positive aspects that a local historic bridge does for the community. My understanding is that the bridge is now eligible for listing on the National Register of historic places due to the history involved. These stories will be lost forever if they are not preserved now.

Please reconsider the concerns of people who are passionate about these issues and put your energy into a solution that maintains the beauty of the river with no new construction.

Sincerely yours,

A handwritten signature in cursive script that reads "Josie L. Seymour". The signature is written in black ink and is positioned above the printed name.

Josie Seymour  
Josephine L. Seymour

MDOT

Re: Frank J. Wood Project      April 10th, 2018

My name is Allison Brigham, and my husband, daughter and I live at 17 Summer Street in Tospham Maine. I am writing this letter in response to the call for public comment regarding the fate of the Frank J Wood Bridge. I am in support of rehabilitating the Frank J. Wood Bridge, and I am passionately against the proposed upstream alternative.

Allow me to begin this letter with a question; How is it possible to say that the new proposed upstream bridge will have no negative effect on the Summer Street Historical District, if there is not only no rendering of the proposed bridge from any Summer Street viewpoint, but also no definitive plan for elevation of the new bridge? As a tax paying, permanent resident of Tospham, I find it deeply insulting that our neighborhood; being the only residential neighborhood to abut the proposed alternative bridge seems to have been completely pushed aside during the design process. The negative effects of the proposed upstream alternative for the Summer Street Historical District are as follows: increased light pollution, increased noise pollution, increased air pollution and decreased quality of life. The car lights, sounds, and exhaust will be closer to our home and the bridge lights will be closer to our home. Our home has a completely unobstructed view of both the current bridge, as well as the location of the proposed upstream alternative. We will not be able to see through 12' I-sections, such as proposed in the upstream alternative. The new proposed bridge will obstruct our view of the falls, downstream from the bridge, the Bowdoin Mill, Anniversary Park and Fort Andross. Imagine for a moment; sitting on your front lawn, and having an unobstructed view of your surroundings thanks to the unobtrusive and narrow architecture of the Frank Wood Bridge. Being able to enjoy the river, the falls, and the surrounding history. Now, imagine suddenly having a completely obstructed view of the river, the falls, Fort Andross, the Bowdoin Mill and Anniversary Park, because of the intrusive, substantial design of a new concrete bridge. We will have a view of concrete and traffic. To state that relocating the placement of the bridge closer to our home, as well as widening the overall girth of the bridge will not increase various pollutions as mentioned above as well as decrease our quality of living is preposterous, and erroneous.

The lower falls region of the Androscoggin River, is the most beautiful and tranquil view from the current bridge. I have spent many hours in my years as a Tospham Resident, watching Eagles and osprey catch fish from these falls, and watching heron gracefully and peacefully move about and sunbathe from the rocks of the lower falls. By placing a bridge over the lower falls, we will be losing the most alluring and magical portion of this section of the Androscoggin River. No longer will visitors to Tospham and Brunswick be able to stop along the bridge and admire and photograph the natural splendor of the falls, and all of the wonderful sights they have to offer.

I feel safe on the Frank J Wood bridge. I drive over this bridge twice a day on my commute to and from work. In fact, I purposefully take the Brunswick exit off of 295 instead of the Tospham exit TO drive over the Frank J. Wood Bridge. I walk my dog over this bridge. I run over this bridge every morning on my daily run. I push a stroller or pull a wagon over this bridge every day, several times a day for various

activities with our daughter. The design of the new proposed bridge not only lacks character and aesthetics, but most importantly and shockingly lacks a physical barrier between vehicle traffic, and pedestrian traffic and is completely inappropriate for pedestrian safety. Although the posted speed limit on Main Street is 25mph, the "open concept" and wider deck of the proposed bridge will certainly lead to vehicle speeding, and I will never feel safe using this bridge without a physical barrier between vehicles and the sidewalk.

We live in a historical neighborhood, surrounded by historical homes, and two historical mills. Simply put, the Frank J Wood bridge fits here. Replacing this bridge with a modern, concrete structure upstream seems wildly inappropriate and unfathomable. The proposed upstream alternative will change the entire feeling one gets when traveling between Topsham and Brunswick, when walking up Summer Street, or when glancing downstream from the Androscoggin River Walk. What the Frank J Wood Bridge lacks in upkeep and maintenance, it certainly does not lack in architectural beauty and historical wonder. We purchased our property on Summer Street 5 years ago, in part because of the Frank J Wood Bridge's history, safety, beauty, and noteworthy architecture. The Frank J. Wood bridge has become an iconic and integral contributor to the beauty, history, and splendor that all residents of Summer Street Historical District have come to appreciate and celebrate.

In summary, I am unable to support the MDOT proposed upstream alternative because of its negative effects on the Summer Street Historical District, our local environment, pedestrian safety, and our personal quality of life, and I fully support rehabilitation of the Frank J Wood Bridge.

Sincerely,

A handwritten signature in black ink, appearing to read "Allison", followed by a long horizontal line extending to the right.

Allison Bringham

# Maynard McCorkle

23 Summer Street, Topsham, ME 04086  
Phone: 207 725 5392, E-Mail: mccorkle@gwi.net



Date: April 9, 2018  
Mr. David Gardner

Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Dear Mr. Gardner:

My name is Maynard McCorkle. I live with my family at 23 Summer Street in Topsham, Maine in the Historic District that overlooks the Androscoggin River and currently has views of the Frank J. Wood Bridge, the Bowdoin Mill Complex and the Fort Andross Mill Complex. We have lived here on Summer Street for over 30 years and we love our views and our proximity to the river. I am writing as an individual, concerned resident of the area that will be impacted by the repair or replacement of the Frank J. Wood Bridge.

Regarding the Frank J. Wood Bridge, my family's preference would be to rehabilitate the existing bridge, but if that option is voted down, I would opt instead for replacing the existing bridge in the same "footprint" it occupies today. We have looked at the "Alternative 2" option that seems to be the leading option and we have some serious concerns about it. Our biggest concern with the Alternative 2 new bridge is the angle-of-entry of the Topsham-side of the new bridge as it would flow back into Maine Street in Topsham. The current angle-of-sight for drivers exiting and turning left (North) onto Main Street is *very* challenging. The cars coming over the current bridge are on top of you before you know it. If a new bridge's entry-angle is adjusted up-river at all toward the lower falls and if speeds on a wider, new bridge increase, it will be extremely dangerous for drivers exiting Summer Street and for pedestrians crossing Main Street at the Summer Street crosswalk. Turning drivers at Summer Street will not be able to see the cars coming off the new bridge at the adjusted angle and the speeding cars will be on top of turning drivers and cross-walkers in a very dangerous way.

The second concern about the Alternative 2 new bridge option is concerning how tall the bridge needs to be to deal with a 75-100-year flood. If the new bridge is built curving over the lower falls it will have to be built extremely high in the air. We have seen how high the river water can get. We witnessed the water lap the bottom of the Frank J. Wood Bridge in April of 1987 *and* flow-over the end of Summer Street. A new bridge curving over the lower falls that is tall enough to be above the water level of a 75-100-year flood will be way too tall and a real abomination when its over-tall structure is put into perspective with our small historic neighborhood and the natural beauty of the area.

The third concern is also related to our Historic neighborhood and the proposed Alternative 2 new bridge design. We are concerned about headlights from on-coming traffic in the Alternative 2 bridge option. We expect that it's exceedingly tall, curved design, rolling high over the lower falls will put shining headlights right into our front windows. We know it will be terrible for our home and we figure the headlight problem will also be terrible for almost everyone in our special little neighborhood. Thank you for your consideration in this matter.

Sincerely, Maynard McCorkle

To: Mr. David Gardner,

After seeing the photos of the extent of the corrosion of some of the steel on the FWB, I can't help but think on who's watch did all this occur?" It's no surprise to anyone salt plus steel equals rust. Any steel exposed to the elements, let alone the heavy salt load of winter, is going to require some maintenance. Yet for some reason, the painting of the bridge seems not to have been a priority for quite a number of years. Back in 2006, Wyamyn Simpson did some work on the concrete supports under the bridge, and a couple of years ago, the expansion joints were replaced, but the basic issue of the corrosive effect of winter salt seems to have been overlooked completely. How is it that a piece of our transportation infrastructure can fall into this kind of disrepair with no one being accountable? We don't need a new bridge. We need preventative maintenance, plans and people who make sure they are carried out in a timely manner.

Paul Seaquist  
9 Summer St.  
Topsham, Me.

~~So~~ AFTER SEEING THE PHOTOS OF THE EXTENT OF THE  
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ARE CARRIED OUT IN A TIMELY MANNER.

Paul G. —

295 Bunganuc Road  
Brunswick, Maine 04011  
March 26, 2018

Ms. Cheryl B. Martin  
Assistant Division Administrator  
U. S. Department of Transportation  
Federal Highway Administration, Maine Division  
40 Western Avenue, Room 614  
Augusta, Maine 04330

Re: Frank J. Wood Bridge Project

Dear Ms. Martin:

As a consulting party as well as a commercial property owner within view of the Frank J. Wood Bridge, I am concerned that the involved state and federal officials have been biased in their assessment and have failed to openly consider the views of all consulting parties and the public during the 106 and 4(f) process required if federal funding is anticipated in the project. Additionally, the recent public meeting of March 28, 2018 regarding the environmental impact of the bridge alternatives was again a 50 minute biased presentation by the MDOT describing the poor condition of the Frank J Wood bridge with multiple images of rust and a deteriorated deck but without substantial discussion of the impact of the proposed new bridge.

In the National Historic Preservation Act of 1966 Congress established a Section 106 program requiring historic preservation. The Maine Department of Transportation has a record of demolishing fifty bridges similar to the Warren through Truss bridges like the Frank J. Wood Bridge. They fail to provide appropriate maintenance and then suggest replacement for these bridges citing structural deficiency. In the case of the Frank J. Wood Bridge, the MDOT held a "stakeholders" meeting on April 24, 2016 at which they announced their intent to demolish the historic bridge and replace it with a "modern" concrete highway bridge. This was just prior to a "public meeting" on April 27, 2016 where the plan was announced to the general public. The "stakeholders" meeting was a carefully selected audience and did not include the general public nor were there consulting parties involved. It was at the public meeting that we learned the Bridge was set for demolition and not rehabilitation. If this sounds like an honest attempt at a Section 106 review with no public nor consulting party input into a historic bridge eligible for the National Register of Historic Places, then also consider the continued attempts at presenting a very biased view of the FJW bridge including but not limited to only showing an unpainted bridge, and not the potential rehabilitated historic structure in a similar scale to their proposed new concrete structure.

Throughout the 106 and 4(f) process consulting parties have had difficulty in obtaining information from the MDOT to allow individuals the opportunity to question their assumptions and actual estimates. It was only after they eventually realized they were not compliant with the 106 process, under pressure, they listed alternatives. The given alternatives continued to promote the replacement alternative with sub sequential meetings containing lengthy talks and images of a deteriorating bridge which is what would be expected based on the lack of maintenance by the MDOT.

The recent public March 28, 2018 meeting, announced as part of the 4(f) did not address environmental matters such as the Clean Water Act, the effect on endangered species including the existing fish ladder which will need replacement in a few years, nor other environmental concerns. How can the MDOT consider the possible impacts when they have an incomplete plan for the new proposed concrete bridge. During the recent public meeting they could not specify the elevation of the new bridge deck and have not been able to give specifics on the approaches to the proposed bridge which certainly are significant noting the it is possible that the new deck will have an elevation of 10 to 12 feet higher than the existing FJW bridge.

There has been restriction of public and consulting party input throughout the entire process, the last public meeting held on April 5, 2017, was at the last minute changed to the "open house format" which did not allow the public nor consulting parties to speak as a group. As a consulting party, I was almost prevented from presenting my points at a public meeting on March 28, 2018. Only after I threatened to walk out of the meeting was I offered the opportunity to speak. The format at all meetings was also biased with the MDOT facing the audience and allowed to use audiovisual aids while those with different factual information or different points of view could not use any audiovisual devices and could only talk with their backs to the audience while addressing the MDOT and Federal Highway officials.

If I were to assess the alternatives of replacement versus rehabilitation under the 106 and 4(f) process in a fair and unbiased way, I would consider historic significance which I believe is the primary mission of the Advisory Council on Historic Preservation and the 106 process. Other factors for consideration include the engineering structural and geometric functionality of the bridge in question as well as safety, bridge location, initial and life cycle costs, as well as was traffic volumes.

In considering historical significance, the Frank J. Wood Bridge is currently determined eligible for the National Register of Historic Places and provides a connecting link between the Historic Mills and downtown Historic Districts of Brunswick and Topsham. Everything possible should be done to preserve this historic asset.

From the engineering structural and geometric functionality point of view, it should be noted that the Bridge was built in conjunction with the Lewiston, Brunswick and Bath Electric Rail Line, which not only included passenger rail service but extremely heavy self propelled coal cars bringing coal from Bath to Bates College in Lewiston. The Bridge was, therefore, built wider, taller and heavier to accept the rail cars as well as vehicular traffic. The Bridge thus meets current standards for size and weight carrying capacity. The Bridge had a rating of 5 until recently downgraded, perhaps relating to the bias of the MDOT in it's attempt to remove the historic structure.

Safety, in my eyes, is not a factor. As a trained engineer, although not currently practicing, I believe that this 85 year old bridge was safe for 85 years without adequate and at times damaging maintenance. If rehabbed and maintained, this Bridge should be safe for an additional 85-100 years. In assessing needed ongoing maintenance, the State has never considered alternatives such as electronic surveillance or even a permanent catwalk allowing for easier and less costly inspection processes and maintenance. The MDOT seems to be on a track to replace all fracture critical bridges in Maine without considering the historical significance of these bridges. Historical bridges can and are being rehabilitated in other states so this is a faulty approach and seems to be in direct opposition to the Historic Preservation Act designated by the Federal Government. I am convinced that if the MDOT were fair in evaluating all alternatives and was concerned on fracture critical structures this rehabilitated bridge could have redundancy built into the deck during the rehabilitation process. This bridge could also be made safer for bicycle traffic by expanding the bike lanes to 5 feet and narrowing

the roadway to 10 foot lanes. The National Association of Transportation Officials states that lanes of 10 feet are appropriate in urban areas and have a positive impact on street safety without impacting traffic operation. Why was this not considered?

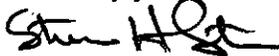
Initial and life cycle costs are really hard to evaluate based on information provided by the MDOT. Their initial cost estimates are so varied and changeable during this process that accuracy is uncertain. Through private funding, a professional engineer's report questions the initial estimates and would suggest very little cost differential between replacement and rehabilitation. Remember a local group had to arrange for the report from an outside engineering firm as no engineers from the State of Maine would comment for fear of losing contracts from the MDOT. Even the Engineering Department from the University of Maine, where I obtained a BSCE, would not involve itself in projects conflicting with the MDOT. This is enough reason to mandate the MDOT pay for an alternative cost analysis from a firm with no financial ties to the MDOT and perhaps reimburse the private citizens who had to fund a non biased professional engineer. Not included in the MDOT's estimates are the approaches to the new replacement bridge and local design committee requests for enhancements to a new bridge which may create added expenses. The approaches to a new bridge would certainly be much more expensive than for the rehabilitation not to mention the necessary costs needed in taking land and structures for the approaches for the proposed new bridge.

Regarding maintenance costs, these numbers are uncertain since our painting expert states with today's modern paints repainting every 20 years would be unnecessary. I have not seen a concrete bridge without moderate maintenance, and there have recently been two concrete bridges needing replacement with only a 60 year lifespan not the 100 year lifespan the MDOT predicts. Additionally, who knows what will be in 50 years from now, not to mention 100 years from now. Surely traffic and usage will be different in the years to come, you may build a bridge or structure to last 500 years but will it have the same use or meet the needs 25 years from now?.

Bridge location appears to be optimum as was suggested by the original farmer for whom the Bridge was named, Frank J. Wood. There would be less disruption to the adjacent towns and the environmental impacts much less with rehabilitation. There should also be concern that the proposed replacement bridge in it's upstream location may potentially conflict with the fish ladder soon needing replacement. This may require additional costs for which the MDOT may be legally responsible for. This cost is not currently included in the estimated future costs for the new proposed bridge.

In summary, the Frank J Wood Bridge, a historic structure eligible for the National Register of Historic Places and an icon joining the historic mills and districts of Brunswick Topsham can be rehabilitated at a cost not markedly different from the new proposed concrete bridge and would have no adverse effect on this historic structure nor the adjacent historic districts. Although, it seems to me ,the current environmental assessment is totally inadequate as presented by the MDOT, I cannot imagine any alternative having less impact on the environment than the rehabilitated Frank J Wood bridge when compared to other proposed alternatives. The rehabilitation of the Frank J Wood bridge is therefore prudent and feasible thus should be considered the best of all alternatives under the Section 106 and 4(f) of the Historic Preservation Act.

Sincerely yours,



Steven H. Stern

CC: David Gardner, MDOT

From: **alfred niese** [aniese@comcast.net](mailto:aniese@comcast.net)  
Subject: **Fwd: Brunswick / Topsham Frank J. Wood bridge input**  
Date: **Apr 9, 2018 at 6:13:38 PM**  
To: **Ann Carroll** [anncarroll76@gmail.com](mailto:anncarroll76@gmail.com)

**Begin forwarded message:**

**From:** Bronda Niese <[bniese04@comcast.net](mailto:bniese04@comcast.net)>  
**Date:** April 8, 2018 6:52:21 AM EDT  
**To:** chick carroll <[chickcarroll76@hotmail.com](mailto:chickcarroll76@hotmail.com)>  
**Subject:** **Fwd: Brunswick / Topsham Frank J. Wood bridge input**

**Begin forwarded message:**

**From:** Bronda Niese <[bniese04@comcast.net](mailto:bniese04@comcast.net)>  
**Date:** April 5, 2018 9:49:45 AM EDT  
**To:** Ann Carroll <[anncarroll76@gmail.com](mailto:anncarroll76@gmail.com)>  
**Subject:** **Brunswick / Topsham Frank J. Wood bridge input**

To the Maine Department of Transportation:

I write to express environmental concerns about constructing a replacement bridge connecting Brunswick and Topsham. Foremost would be my concern for the migrating fish that use the river to reach spawning grounds upriver. I would like to see every possible effort made to safeguard the fish populations as well as the birds that are drawn to this area during fish migration times.

If and only if it is deemed impossible to save the existing Frank J.

Wood bridge, could a temporary bridge carry traffic until a new bridge is constructed in the exact location as the existing bridge? This would better preserve the striking aesthetic quality of the area. I am familiar with another situation in Maine where a temporary bridge was used during the repair phase. It was removed once the project was completed.

Thank you for considering my input.

Sincerely yours,

Bronda Niese

April 5, 2016

139 Indian Rest Rd  
Harpwell, ME 04079

Mr. David Gardner,  
MDOT  
Environmental Office

Comments Re: Frank J. Wood Bridge Project

Dear Mr Gardner,

As a former resident of Topsham and present resident of Harpswell who constantly enjoys the view and use of the Green Bridge, I am appalled by the proposed plan to replace this beloved landmark structure. To destroy this historic bridge, which would have both aesthetic and environmental impacts on this precious area, would be a tragedy, especially when it is in my understanding possible to preserve it.

In our world today, where there is such blatant disregard in so many areas for environmental and wildlife preservation, I applaud our Maine community for taking a strong stand against this irresponsible and unnecessary action. May we be a model for others to follow!

Thank you for your attention.

Sincerely,  
Marilyn Hardy

**From: Marilyn Hardy**

**marilynhardy@cybermesa.com**

**Subject: Re: Draft letter to  
MDOT, 04102018**

**Date: Apr 8, 2018 at 5:44:26 PM**

**To: Charles Carroll**

**chick76@me.com**

**Hi Chick,**

**Here is a short letter to contribute to the  
cause. Thanks for all the work you are  
doing for this!!**

**Marilyn**

---

I am writing to say that as you make decisions about repairing or replacing the Green Bridge that connects Brunswick and Topsham, I feel strongly that you should consider the environmental impact of the project - particularly on the river and the fish ladder and the surrounding neighborhoods. Please assess and consider what the impact will be on the fish ladder - it is critical that that remain functioning for the health of fish populations. We must do projects in a way that respects and stewards our natural resources - so I want to hear about how this project will affect the river and the fish.

Thank you

Mary O'Brien  
7 Bowdoin St.  
Brunswick, ME 04011

### **Nature at Her Best.**

I am not going to add to the plethora of comments regarding the pros and cons of replacement, versus renewal of the Frank J. Woods bridge spanning the Androscoggin river, nor discuss the related costs, longevity and vehicular expediency that have been debated to death.

**But** have you given a moment to consider the experience of actually crossing the existing bridge and seeing raw nature in its wild and woolly state with water cascading down the dam in a furor of torrential fervor heading for the open sea; or the melt waters in Spring that provide a cascade of froth and mist that captures the sun's rays; or the more tranquil state of swirls and eddies with gulls lined up along the dam ridge waiting for their next meal; or even down stream viewing fishermen trolling in their small boats for shad and other species heading up to the place of their birth to spawn? The dam adds drama and beauty and contrast to the imposing mills on its shores and is a glimpse of Nature at her best.

**Now**, I ask you, what will you see from a bridge proposed to be sited significantly higher, twice the width of the existing bridge and curving east toward the dam? Your car is going to be 13' in from the edge of the new construction at a driving height of four feet. With the addition of a railing to protect pedestrians on the outer rim, what view can we expect to enjoy, especially with a new bridge designed to expedite traffic quickly?

It is the open structure of the existing bridge that gives drivers and walkers the real drama of crossing over a river. Isn't this experience far better than traversing the area on a 42' wide slab of concrete?

Ann Nemrow  
Landscape Designer  
April 7, 2018

Address: 14 Kent Circle,  
Topsham, ME 04086  
Tel: (207) 721-0890

**To Whom It May Concern:**

**I am in support of restoring the Frank J. Wood Bridge. It is a beautiful and integral part of Topsham and Brunswick. As a resident of Topsham, the removal of the Frank J Wood Bridge would be devastating to the town. That piece of history is all that Topsham has left. Please choose to restore the bridge!**

**Frank Duda**

To Whom It May Concern:

My name is Evan Duda and I am a Brunswick resident. I have tried adding my comment(s) to the MDOT website as directed by MDOT, but there is no place to comment. That adds further frustration that my voice is unwilling to be heard by the Maine DOT.

I am in FULL SUPPORT of having the Frank J. Wood Bridge rehabilitated. It is shameful to remove a structure that is eligible for the Maine's Register of Historic Places. That alone should be reason enough to make the decision to rehabilitate. This is an iconic bridge, visually and otherwise. The absence of it will alter the Topsham/Brunswick landscape forever. The current bridge tells the story of the two towns. Without it, the story is lost. That story is our history; the period truss bridge with mills on either side. A flat-deck bridge will dull the senses. The story and wonderment that the Frank J. Wood Bridge elicits as you spot its trusses will no longer be recognized, no longer spoke of, photographed, or fought for.

Please rehabilitate the Frank J. Wood Bridge.

Regards,

Evan Duda

to the existing fishway and  
the surrounding waterway, has  
that been taken into consideration?

It is imperative that it be considered,  
and the rebuilding of the present  
bridge should be the desired option.

Sincerely,

Eleonor Brown

7 Potter St.

Brunswick, ME

April 6, 2018

To Whom It May Concern,

I am writing in opposition  
to the building of a new bridge  
between Brunswick and Topsham  
to replace the present Frank J.  
Wood Bridge now in place. I feel  
strongly that the environmental  
impact would be enormous both

To whom it may concern: Mr. David Gardner,

I am writing in opposition to the building of a new bridge between Brunswick and Topsham to replace the present Frank J. Wood bridge now in place. I feel strongly that the environmental impact would be enormous both to the existing fishway and the surrounding waterway. Has that been taken into consideration? It is imperative that it be considered and the rebuilding of the present bridge should be the desire option.

Sincerely,

Eleanor Brown

7 Potter St.

Brunswick, Me.

J. Phinney Baxter White  
67 Bridge Street  
Topsham, ME 04086

April 11, 2018

Mr. David Gardner  
MDOT  
Environmental Office  
Augusta, ME

Dear Mr. Gardner:

Throughout the 106 the Maine DOT and Federal Highway have denied the Frank Wood Bridge status of being individually eligible for National Register listing. On October 25th, 2017 the MDOT requested concurrence from the State Historic Preservation Officer, Kirk Mohny on the subject of NR eligibility. The MDOT utilized an analysis by Kleinfelder where they determined the bridge was not significant to the extent of being recognized as individually eligible for NR listing. On November 16th, 2017 the SHPO responded to the MDOT with a finding of individual eligibility for the Frank Wood Bridge under criterion A for its history. Shortly after the finding by Mr. Mohny the MDOT and Federal Highway recognized the Frank Wood Bridge as being individually eligible for listing to the National Register of Historic Places.

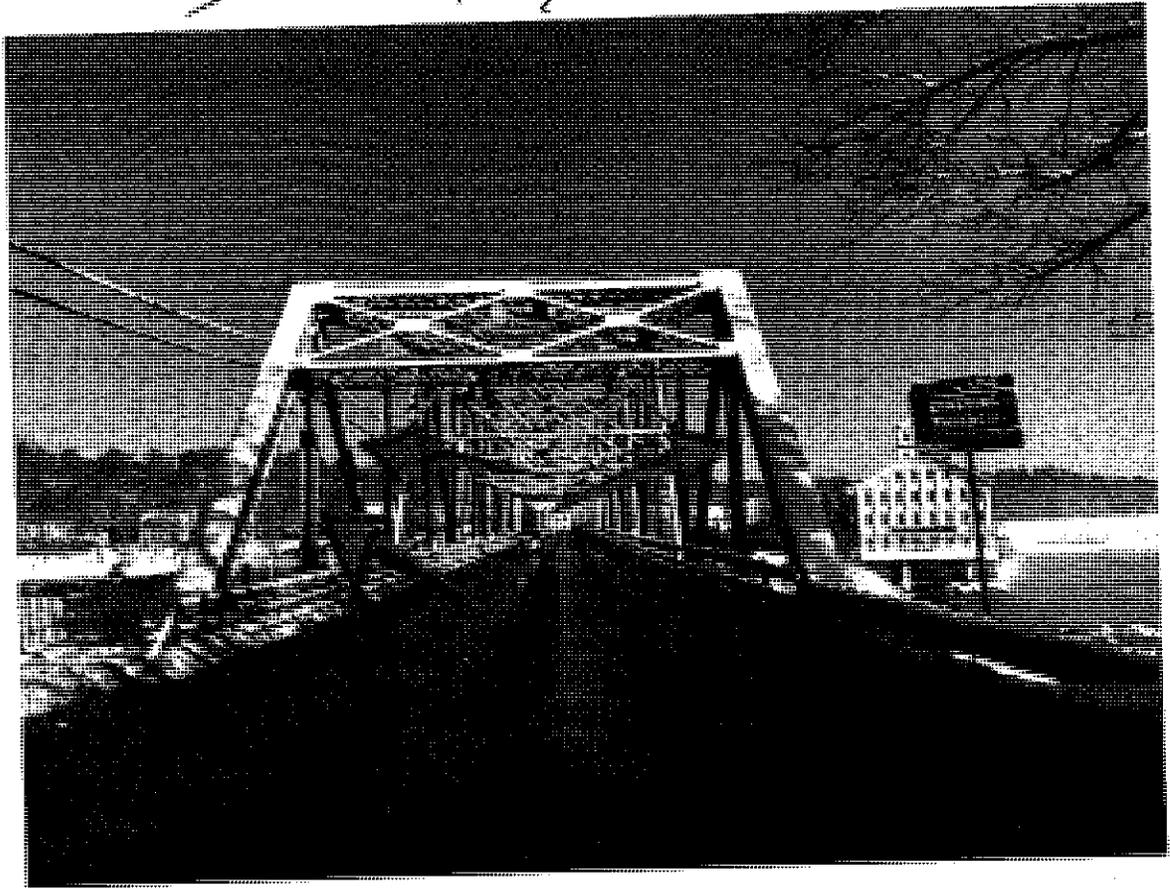
I believe the Frank Wood Bridge will also be found to be National Register eligible under criterion C for its construction type. It may be the earliest surviving example in Maine to exhibit the use of rolled section members that substitute the built-up members used in previous designs. The significance of this bridge is that it captures the **evolution** of bridge technology at the peak of the Great Depression, with its use of rolled members as well as built-up members. This bridge has both types of members – thus exhibiting the elements which have defined steel bridge evolution over the last 150 years, which in turn illustrates an important theme in the history

of the nation.

This significance may qualify the Frank Wood Bridge as a National Historic Landmark status. From the NHL guidelines: "A property with national significance helps us understand the history of the nation by illustrating the nationwide impact of events or persons associated with the property, its architectural type or style, or information potential. It must be of exceptional value in representing or illustrating an important theme in the history of the nation." The Frank Wood Bridge may be the quintessential example to illustrate this crossover technology during The Great Depression, 1929 to 1939.

This is a functioning historic bridge and already a landmark. There is no sound reasoning to replace it when it can be rehabilitated and continue to gain historic significance.

Thank you,  
Phinney



From: James Mixon mixj444@gmail.com  
Subject: bridghe  
Date: April 10, 2018 at 9:43 PM  
To: Eleanor Leo quark2183@gmail.com

---

My name is James Mixon. I am 34 years old and have been a resident of Topsham my entire life. I am writing in support of rehabilitation to the Frank J. Wood Bridge, in order that we might preserve some of the only remaining history and charm in our town.

Growing up in Topsham, I've seen a lot of change. The Topsham Fair Mall has grown from a small strip mall with surrounding lands where my mother, father and I used to walk our dogs, to a bustling place of business filled with stop lights and traffic. The quaint town offices are gone, as is the old library, replaced with modern buildings that look like they came out of a catalog.

The river walk in Topsham, once known only to residents of the area, is now a paved and accessible bike/walking path advertised to the public, with ugly signs and bollards on Summer St. and more foot traffic behind the houses of those living on Bridge St.

The "lower village" was a poorly conceived idea that has done nothing to enhance the charm of the town. None of the businesses have any foot traffic, aside from Blueberries perhaps (and the Sea Dog which was already there) yet we have a massive parking lot behind them all that is 90% empty every day. Think of what a missed opportunity this was. What if the town had understood the charm of Topsham, and created a riverside park in place of the enormous brick business building that now sits there, driving visitors and tourists from Brunswick to enjoy a river view while getting food at the businesses nearby. What if the shops in the lower village were similar to those in Downtown Brunswick, where all the foot traffic in the area now is. What if the TOWN of Topsham understood the charm of Topsham like its citizens do?

It is for this reason that I am writing you to encourage you NOT to replace the Frank J. Wood Bridge, but to rehabilitate what we have now. It is the only remaining charming piece of Topsham history we have left.

I worked in Southern Connecticut on independent films when I was fresh out of college, and the amount of care those people put into preserving their towns is admirable. The Merrit Parkway still has the original stone bridges to serve as over passes. The Parkway itself is devoid of ugly guardrails, signage and other things to spoil the beauty of the area. It's one of the most enjoyable drives (despite bumper to bumper rush our traffic) I've ever been on. I believe Topsham could take a page out of their book on how to treat our town.

The Frank J. Wood Bridge sits above the Androscoggin River, not directly above the rapids, but below them slightly, where you can see them if you peer over the edge while walking. It offers not only a great view of the islands below, the dam and the rapids, but also is a picturesque reminder of old Maine when you look at it.

I currently live on Summer St, and the bridge is viewable right out my window, and was raised on Walnut Street, so the bridge has been a large part of my life. I was photographed below it as a child while fishing with my father, a photo that made the front page of the Times Record. The FRONT PAGE! Can anyone imagine these days a simple photo of a boy fishing with his father being front page news of the Times Record?

Do not mistake this as a yearning for nostalgia. I want to save the bridge because WE want to save the bridge. The residents of this town, clearly voicing their opinions at the last meeting at Mt. Ararat, understand the historical importance of this bridge, as well as the aesthetics it adds to the town. We don't want an ugly overpass like the new Durham Bridge in Lisbon. Who wants to come look at that?

The black bridge is gone, and if the Frank J. Wood bridge goes, what will Topsham be? A re-zoned town filled with chain stores that pushed out all the local businesses, while all the tourists and summer visitors spend all their time (and money) in Brunswick, where they can actually enjoy the scenery.

visitors spend all their time (and money) in Brunswick, where they can actually enjoy the scenery.

Topsham will have nothing left. The Topsham Fair Mall isn't beautiful, the Lower Village is a place to drive through on your way to the highway, the river walk can only handle so many people, and everyone will end up going to Brunswick to walk around Bowdoin and the downtown mall.

Please, reach out to other contractors to get estimates on preserving the bridge. Sometimes everything isn't always about money. This town has been my home, and I want it to continue to be a place that people love and want to visit. I can't count how many times I've seen people standing on the bridge taking pictures in the summer, sitting down by the river taking pictures of it, or just walking on it at night when it's warm out.

Other concerns have been voiced as well, about this bridge being safer for pedestrians as they are separated from the through traffic by the girders, and I'm sure other estimates could lend themselves to a financial argument as well -- but I'd like to appeal to you to preserve what is left of our town's history and beauty, because the Frank J. Wood Bridge is really all we have left.

Thank you



--  
James Mixon

13 Main Street  
Topsham, Maine 04086  
March 18, 2018

Ms. Cheryl B. Martin  
Assistant Division Administrator  
Federal Highway Commission  
Edmund S. Muskie Federal Building  
40 Western Avenue, Room 614  
Augusta, Maine 04330

Re: The Frank J. Wood Bridge

Dear Ms. Martin:

I own a historic commercial building that abuts the Frank J. Wood Bridge in Topsham because it is in the Village near two historic mills, the historic Bridge, and the Androscoggin.. MDOT wants to significantly alter the historic quality of the Village by demolishing the Bridge and replacing it with a nondescript, concrete highway forever changing the character of the Towns of Topsham and Brunswick.

My question is why did the MDOT fail to be objective in the Section 106 process? At the first public meeting in April 2016 MDOT presented the new bridge as the only option that made sense, completely ignoring our historic Bridge. The decision had already been made. Topsham and Brunswick were forming an Advisory Committee to design the new bridge before the completion of the Section 106. Many community people left the meeting frustrated by what appeared a flawed process.

After the meeting a group of community members from Topsham and Brunswick formed a non-profit corporation (The Friends of the Frank J. Wood Bridge) and requested to be included as a party to the Section 106. The Friends have met on an almost monthly basis in an effort to be heard by the MDOT and the U. S. Highway Administration since April 2016, attended all meetings relating to the Bridge, hired an environmental lawyer, formed a Facebook page with over a 1,000 followers, signed petitions, written letters to MDOT, met with experts on historic bridges, and hired an engineering firm from Boston to do a feasibility and cost analysis of a rehabilitated Bridge. To say the least, it has been difficult for us to get answers to our many questions. An example of this is the last public meeting where the U. S. Highway Administration and MDOT changed the framework of the meeting process by breaking people into small groups so that many people were confused and upset and ended up walking away frustrated by not having a free flowing discussion that everyone could hear and participate in.

I still have questions about speed, elevation, and the position of the new bridge as it hits the abutments. Will all the concrete act as a back drop for graffiti? Won't the new bridge alter the quality of life for the historic Summer Street residents, cover up the lower falls, and forever damage that feeling one gets when crossing the Bridge...call it a sense of place?

And what about economic development? I have heard many people from across the country comment positively on the Bridge and how fortunate we are to have it in our community. Actors from the Maine State Music Theatre championed it on TV 207; the Bangor

Savings Bank proudly displays a photograph of the Bridge in its entry way; it's on the cover of the telephone book and in Bowdoin College literature; and painted and photographed by artists from around the world. Maine Preservation's 2017 List of Most Endangered Historic Structures puts it as number one. Do the research—states across the country are saving truss bridges because they have a calming affect on traffic and are good for tourism. I can guarantee most historians, artists, photographers, and Bridge enthusiasts (engineers included) will ignore the new bridge if it is ever built.

Please do the right thing and rehabilitate our Bridge so that future generations shall know what can happen when science and art come together to create an iconic structure: The Frank J. Wood Bridge.

Thank you for your consideration.

Sincerely yours,

A handwritten signature in cursive script that reads "Arlene Morris". The signature is written in black ink and is positioned above the printed name.

Arlene Morris

cc: David Gardner  
MDOT

Susan Z. White  
67 Bridge Street  
Topsham, ME 04086

April 11, 2018

Mr. David Gardner  
MDOT  
Environmental Office  
Augusta, ME

Dear Mr. Gardner:

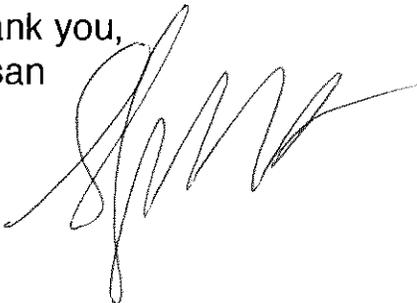
I'm a store manager for a retailer located in the town of Brunswick, at the intersection of Pleasant Street and Maine St.

In Brunswick, Maine we spell our main street M-A-I-N-E. We're the only main street in the nation to do this and it differentiates us from all other main streets.

The Frank Wood Bridge also differentiates us from any other main street. This historic steel truss bridge is the town center as we lost our historic town hall during urban renewal in 1961. At that moment in time the bridge took over as the dominant and most historic structure in the town. It's always a point of reference, it's often the meeting place—see you at Green Bridge! It's on the cover of our phone book.

I speak with thousands of people each year from all over the world. Most are tourists and families looking at colleges. A recurring comment by many is what a scenic area the Frank Wood Bridge and mill buildings create. And when I tell them it is under threat they express outrage and then offer their hope that it can be saved. That is my hope too. Please save our historic bridge.

Thank you,  
Susan

A handwritten signature in black ink, appearing to read 'Susan Z. White', written over the typed name 'Susan'.

**Fair Point**  
communications

# Bath • Brunswick Area

What's Hot in the Brunswick Market, Forecast  
and Outlook  
around February 2016

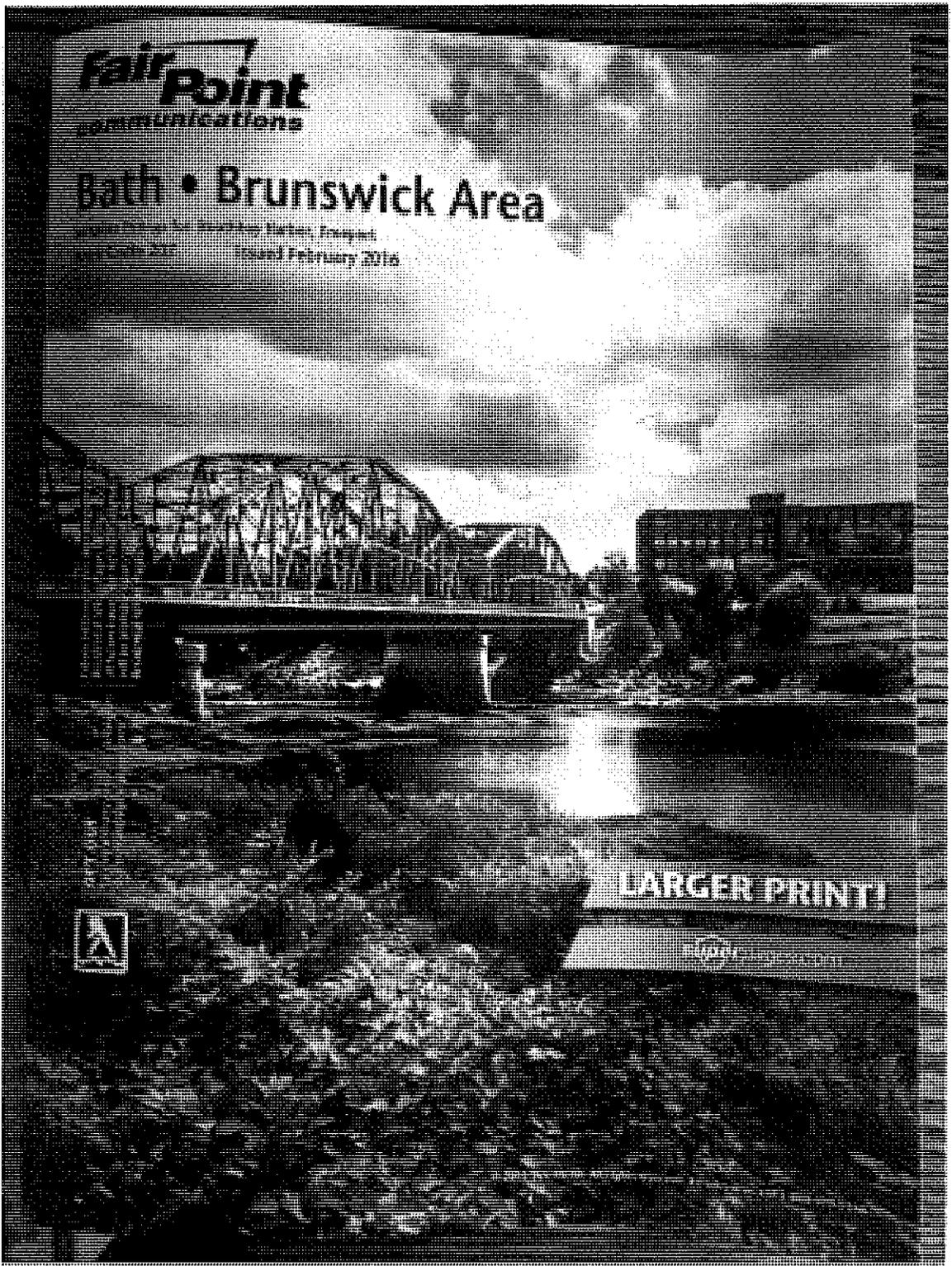
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**From: Wallace Pinfold**

wgpinfold@gmail.com

**Subject: Frank J Wood bridge**

**Date: Apr 11, 2018 at 8:03:53 AM**

**To: David.Gardner@maine.gov**

**Bcc: chick76@me.com**

**Dear Sir:**

**I am strongly for the rehabilitation of the metal bridge between Brunswick and Topsham. The high-handed way in which MDOT has managed this whole business is not the only thing that motivates this letter. I don't trust your figures -- I don't believe that rehabbing the present bridge will cost as much as you say, I don't believe that the new bridge will cost as little. Also, I prefer the historic structure to any design you have proposed. Richard Nemrow's**

**letter to the Times Record yesterday ,  
April 10, absent personal references,  
summarizes both my objections and  
preferences more articulately than I can  
do myself.**

**Sincerely,  
Wallace Pinfold  
Brunswick**

**From: John McKee**

**jmckee@bowdoin.edu**

**Subject: Comment on FJ Wood  
Bridge proposals**

**Date: Apr 10, 2018 at 1:00:12 PM**

**To: David.Gardner@maine.gov**

**Cc: John McKee**

**jmckee@bowdoin.edu**

**Mr. Gardner and others concerned:**

**As a resident of Brunswick for many decades, I've long admired the FJ Wood Bridge even while putting up with the frequent traffic jams at either end of the bridge.**

**I strongly support the option to rehabilitate the present structure. It does the job and it has historic value.**

**And looking beyond the structure itself, it's clear that only those options maintaining the existing alignment make sense from an environmental or historic-preservation viewpoint.**

**In addition, I believe that any preference based largely on considerations of traffic flow and safety must be discounted. From that viewpoint – and short of a thorough redesign of the**

**traffic pattern near each end of the bridge – none of the options proposed is clearly superior to the others.**

**In short, rehabilitation of the present bridge is the best of the proposed options.**

**Please include this statement in the public record on this matter.**

**Sincerely**  
**John McKee**  
**Brunswick, Maine**

Dear Mr. [Name],

I am pleased to hear from you and to hear that you are interested in the [Project Name] project. I am sure that you will find it a most interesting and profitable one.

I am sure that you will find it a most interesting and profitable one. I am sure that you will find it a most interesting and profitable one.

**From: Katharine Watson**

**kjwats@comcast.net**

**Subject: Copy of letter about bridge**

**Date: Apr 10, 2018 at 12:14:54 PM**

**To: chick76@me.com**

**Dear Chick,**

**In response to Cynthia Howland who reviewed the message I have sent this to David Gardiner.**

**Dear David Gardner,**

**As a resident of Brunswick for 41 years, I am writing to plead that the decision be made to rehab rather than replace the Frank J. Wood Bridge which links the towns of Brunswick and Topsham. Human safety and vehicular**

**convenience can be guaranteed through rehab as well as contemporary construction, but a new bridge would greatly impact if not destroy one of the major urban vistas of Maine. The new bridge would cut into the Androscoggin falls, changing the course of the water and altering the river's banks.**

**Please choose rehab rather than new construction.**

**Sincerely,**

**Katharine J. Watson, 10 Boody Street,  
Brunswick 04011**

**From: Cynthia Howland**

**cbhowland@gmail.com**

**Subject: Frank J. Wood Bridge**

**Date: Apr 9, 2018 at 5:16:49 PM**

**To: David.Gardner@maine.gov**

**I strongly favor rehabilitation of the bridge because it is part of the cultural history of the mills in Brunswick and Topsham. Also, rehabilitation will do no harm to the fishway, the rocks below the dam, or to the marine/water fowl life of the river .**

**Thank you.**

**Cynthia Howland**

**From: Hannah Judson**

**hjudson@hotmail.com**

**Subject: Frank J. Wood Bridge needs  
to be preserved**

**Date: Apr 10, 2018 at 3:08:56 AM**

**To: David.Gardner@maine.gov**

**Cc: chick76@me.com**

**Dear Mr. Gardner,**

**I wanted to let you know that I am concerned about the possible destruction of the Frank J. Wood Bridge. While I am for progress in general, I am also concerned that we take care of monuments that link present with past. This bridge has architectural merit, fits in with the landscape, speaks to the history of the river, the factory, and the towns it joins. Please do what you can to**

pursue restoration of the bridge and not  
tear it down.

Best,

Hannah Howland Judson

---

**From:** Cynthia Howland  
<[cbhowland@gmail.com](mailto:cbhowland@gmail.com)>

**Sent:** Monday, April 9, 2018 4:29 PM

FJW EA COMMENT #87

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 11, 2018 11:18 AM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/11/2018  
Name: Margo Knight  
Organization(if applicable): 1954  
Phone: 207-798-4600  
Email: mknight@bates.edu

Topic:

-----  
Comments:

Re: Frank J. Wood Bridge

My name is Margo Knight. I am chair of the Brunswick Downtown Master Plan Implementation Committee and, as such, I am also a member of the Bridge Design Advisory Committee.

I am write today to add my voice to those in favor replacing the Frank J. Wood Bridge.

I agree with those who believe that the figures released by MDOT regarding rebuild and replace are enough to choose the rebuild option, however, replacing the bridge would bring economic and community benefits beyond the MDOT and FHWA dollars spent.

Eighteen years ago, my husband and I chose Brunswick as our home. We were impressed with Maine Street and the downtown which had a good variety of independent businesses – no nationwide chain stores or fast-food places. We were also impressed with the neighborhoods on either side of Maine Street. After living here and participating in town affairs, we have experienced how Brunswick values its history with the Village Review Zone, the recent designation of the Historic Business District, and the zoning ordinance rewrite. It's obvious that Brunswick values its history.

There is a balance, however, to how one “values” history. The Frank Wood Bridge is a major artery between two thriving towns. The Wood bridge was built for a different age -- an age that was planning for trolleys. And we should commemorate that. But, there are no trolleys in Brunswick or Topsham's plans today.

I believe that preserving the Wood Bridge would constrict the future of our two towns. I enjoy visiting places like Williamsburg and Sturbridge Village, where history is preserved and reenacted every day, but I don't want to live in a place like that. We chose to live in a community where citizens are also actively planning for and looking to the future.

A new bridge would make it safer for cyclists, pedestrians, and drivers. Wide sidewalks on both sides with lookouts to stop and enjoy unobstructed views of the river would make it enjoyable for pedestrians -- even a destination. Cyclists would have bike lanes. And drivers would have their own lanes.

There are many ways that we can preserve the history of the Wood Bridge – and the history of the bridges that came before it – through interpretive and commemorative plaques at areas on the ends of a new bridge, like what has been done on the Penobscot Narrows bridge and others throughout the

state. The Design Advisory Committee has recommended incorporating features that evoke the architectural details of the mills and the bridge.

Perhaps we should also commemorate the bridge's namesake, Frank J. Wood (1861-1935). A Topsham farmer and papermill worker at the Bowdoin Paper Co., he was very active in local civic affairs. He convinced the State Highway Commission to change its original plans for the bridge. Rather than build the new bridge on the site of an older bridge which connected with a narrow street running through the middle of the paper mill property (the State's original plan), Mr. Wood suggested that the bridge be re-routed around the mill. The State agreed after much public discussion.

This time, the State has done its homework and offered an option that is the right one the first time around.

So, let's commemorate Frank Wood's vision, the bridge and its history. But let's build a new bridge for today and the future.

Sincerely,  
Margo Knight  
Brunswick, ME

-----

If required, please respond as soon as possible.

FJW EA COMMENT #88

From: Barbara Proko <bjproko@gmail.com>  
Sent: Wednesday, April 11, 2018 12:39 PM  
To: Gardner, David  
Subject: Frank W. Wood Bridge, Topsham

Please save our bridge! It is the centerpiece of this historic neighborhood in Topsham, and an important symbol of this Androscoggin River link between Topsham and Brunswick. Please consider all the research demonstrating that this bridge can be restored and upgraded for use for many years to come.

Thank you.

Barbara Proko  
Bath, Maine

(former Topsham resident)

FJW EA COMMENT #89

From: Beau Gros <f4phan2@gmail.com>  
Sent: Wednesday, April 11, 2018 1:05 PM  
To: Gardner, David  
Subject: Save the Frank Woods Bridge

Hello,

I just wanted to add my name to the fine people who grew up in Maine and Brunswick specifically and would like to see the Frank Woods Bridge saved and restored. It is a shame that it has been allowed to deteriorate to its current condition in order to nudge the people of Midcoast Maine into accepting a replacement bridge which will have zero character compared to the Frank Woods.

Take a look at almost any postcard taken in the Brunswick area. You'll find that the vast majority of them have the Frank Woods as a backdrop. Save it and put aside this controversy. It's in everybody's best interest.

Thank you for your time and consideration.

Beau E. Gros

FJW EA COMMENT #90

From: David Israel <disrael@bowdoin.edu>  
Sent: Wednesday, April 11, 2018 1:34 PM  
To: Gardner, David  
Subject: Please save the Frank J. Wood Bridge.

It is part of the fabric of our community.

Knocking it down and replacing it with a bland design would stake a blow to the character of the towns it connects.

Thank you.

-D. Israel  
Brunswick

FJW EA COMMENT #91

From: Bonnie <seaside1388@gmail.com>  
Sent: Wednesday, April 11, 2018 1:44 PM  
To: Gardner, David  
Subject: Save our Bridge

Let's make the news and show other states how important it is to save historic places! As goes Maine so goes the nation! The Frank Woods Bridge is a beautiful site(even with all the rust) people love driving over it and admiring the view! With a new ugly bridge there will be no viewing of the falls ! Blocked now by cement ! No view of the river on the other side! Blocked by cement!

Please don't ruin what is an area that people adore!  
Please save our Bridge for future generations to love!  
Thank you!  
Bonnie Biedrzycki

FJW EA COMMENT #92

3From: Melissa Jones <melissajoneslmt@gmail.com>  
Sent: Wednesday, April 11, 2018 1:50 PM  
To: Gardner, David  
Subject: Topsham Brunswick Bridge

Hi Mr. Gardner,  
Please save our current Bridge!  
Thank you,  
Melissa Jones

Sent from my iPhone

Cheryl Martin  
Assistant Division Administrator  
Federal Highway Administration – Maine Division  
40 Western Ave  
Augusta, ME 04330

April, 11 2018

CC: David Gardner, Maine DOT

Dear Ms. Martin:

I am directing my comments on the Frank J. Wood Bridge Project Environmental Assessment and draft 4(f) report to you, as representative of the lead federal agency on this project that is to be 80% funded by FHWA. Ultimate approval of the required environmental and historic reviews for this project rests with your agency.

I am a resident of Topsham and a board member of Friends of the Frank J. Wood Bridge. I am commenting here as a resident of Topsham. The Friends group is submitting comments separately. I could write a dozen pages on why the Frank J. Wood Bridge should be preserved, but that is unnecessary. Federal 4(f) requirements establish that the eligible historic resource should be preserved. Multiple engineers have now determined it can be effectively rehabilitated to serve another 75-100 years, or more. The Friends are submitting two such determinations from independent engineers with extensive experience in historic bridge rehabilitation as comment on this EA and draft 4(f). MDOT's own consulting engineer has determined the bridge can be rehabilitated. There is no question of the feasibility of rehabilitating the bridge.

The question that will likely determine the fate of the Frank J. Wood Bridge is whether the long-term costs of rehabilitating and maintaining the structure are of an extraordinary magnitude more than the long-term costs of building and maintaining the proposed new bridge. The difference in cost between rehabilitating the historic bridge and building a new bridge are negligible. It is the projected cost of future maintenance of either bridge that MDOT is using to make a case for demolition and replacement. Both independent engineering analysis commissioned by the Friends show vastly lower costs for maintaining the historic bridge over the next 75-100 years than MDOT's projected costs. FHWA must judge the veracity of MDOT's methodology and conclusions on these costs.

In fact, FHWA must judge the veracity of all MDOT's work on this project from the beginning. Comments being submitted by the Friends include voluminous documentation that MDOT has sought to manipulate this process to arrive at a predetermined conclusion – demolition of the historic bridge. This is in line with their established pattern of behavior. They have demolished more than 50 historic through-truss bridges since 1999, approximately half of them eligible for or list on the National Register. The documents and correspondence received by the Friends through their FOIA request show a state agency out of control, bullying their own consultants into reversing their recommendations to agree with MDOT's predetermined outcome. In this case, a predetermined outcome that destroys an individually eligible resource and an eligible National Register district. Rather than relying on the experience of their consultants, MDOT is using them as patsies, creating the impression of independent analysis and recommendations while actually using these professionals as window dressing.

A particularly troubling aspect of MDOT's behavior on this project is their apparent pattern of promising benefits to local groups in exchange for support of their preferred alternative. Since the start of the

public review process on this project, Nancy Randolph of the RiverWalk Committee has repeatedly stated in public, "We're going to get our park from this" as a reason to support the new bridge option. This occurred during DAC meetings with MDOT and TY Lin representatives present. These representatives did not dispute the claim.

On June 6, 2016, I was attending a Brunswick Town Council meeting as spokesperson for the Friends of the Frank J. Wood Bridge. The council was considering a resolution in support of a new bridge. Topsham economic development official John Shattuck asked me to step out of the room with him. Mr. Shattuck has been closely enmeshed in MDOT's efforts to suppress opposition to their plans, as the Friends' FOIA documents show. In the corridor outside the council chamber, Mr. Shattuck said, "I think we have something that will mitigate the removal of the Frank Wood Bridge for you. How about if we re-erect the disassembled old Main Street Bridge to Mill Island? Would that satisfy your group?" He was not specific about who "we" were, but it was apparent he was not speaking for the Town of Topsham – which has declined to take action to preserve that historic bridge for a number of years. My response to this offer intended to stop opposition to the demolition of the Frank J. Wood Bridge was to say we would love to see both historic bridges rehabbed.

These patterns of behavior by MDOT are not unique to the Frank J. Wood Bridge project, as recent reporting on the dispute between MDOT and the residents and Town of Wiscasset has shown clearly. There also, a FIOA request unearthed documentation of MDOT ordering the reversal of recommendations and conclusions in their own reports to arrive at a predetermined outcome. In that case, MDOT pulled federal funding from the project when it became clear it would never pass 4(f) review, after promising the Town its historic resources would be protected by that review. Unfortunately, there is mounting evidence that this is not an agency that can be trusted.

As the lead federal agency on the Frank J. Wood Bridge project, it is incumbent on FHWA to ensure applicable federal laws are followed for this project. It is your job to step in and say “no” when a state agency is out of control and manipulating the required federal reviews to arrive at a predetermined outcome. That moment is now.

Sincerely,

Scott T. Hanson

8 Pleasant Street  
Topsham, ME 04086  
s.t.hanson@comcast.net

FJW EA COMMENT #94

From: Alexis Sullivan <alexis.sullivan@gmail.com>  
Sent: Wednesday, April 11, 2018 1:57 PM  
To: Gardner, David  
Subject: The bridge

Dear David,

I feel strongly that the green bridge aka the Frank J Wood Bridge must remain standing as it is a historical landmark and quintessential part of the town. What the MDOT is proposing is absolutely hideous and will not encourage people like myself to move here from other places and continue to help topsham grow and thrive. I'm also appalled by the shady tactics of the MDOT that I have learned of from reading their actual words.

Unfortunately the townspeople have not been given the correct info. I will be outraged and sad to see the green bridge replaced by an overpass.

Alexis Sullivan  
11 Perkins Street, topsham  
Sent from my iPhone

FJW EA COMMENT #95

From: William Carr Jr. <williamacarrjr@yahoo.com>  
Sent: Wednesday, April 11, 2018 2:23 PM  
To: Gardner, David  
Subject: Bridge

"Please Save Our Bridge!" We already have a new bridge right down the river. (Rt1 196 bypass)  
Sent from Yahoo Mail on Android



233 West Main Street  
 Yarmouth, Maine 04096  
 207.847.3577  
 info@mainepreservation.org  
 mainepreservation.org

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March 28, 2018

Thank you for the opportunity to comment on the Environmental Assessment for the Frank J. Wood Bridge.

Maine Preservation is based in Yarmouth and these comments are submitted on behalf of this Statewide non-profit member-based historic preservation organization. Our mission is to promote and preserve historic places, buildings, downtowns and neighborhoods, strengthening the cultural and economic vitality of Maine communities.

Maine Preservation supports substantial MDOT investment in this important crossing connecting Brunswick and Topsham. Given the weakened structure of the deck, we understand that whether a new bridge is built, this deck will have to be repaired in the short-term and other structural issues addressed.

Maine Preservation listed the Frank J. Wood Bridge as one of Maine's Most Endangered Places this past fall. Opened in 1932 as part the Workers Protection Administration's initiative to 'upgrade' America's transportation infrastructure, the 805-foot steel-truss bridge is one of the largest active Truss bridges in the state. Spanning the Androscoggin River, the bridge is bookended at either side of the river by rehabilitated historic mill complexes which house a variety of local businesses and services. While the deck is weakened, the overall truss system of the bridge remains very strong, as the bridge was built to not only carry cars and trucks but large inter-urban trolleys and coal trains that weighed more than 10 times the current weight of cars and trucks. So, the trusses and over-designed gusset plates were built far stronger than its current use requires. If painted, it would be back to the bright appearance that made it the subject of historic postcards of the area. Fortunately, recently developed bridge paints have a much longer lifetime than prior treatments, with touch-ups lasting up to 40 years.

The publicly announced plan by MDOT in May 2016 to demolish the Frank J. Wood Bridge and build a new concrete bridge upstream, over the falls of the Androscoggin River was made prior to the commencement of any of the legally required historic and environmental reviews intended to determine whether an historic structure should be preserved. Having initially maintained and announced that the bridge was not eligible for listing in the National Register of Historic Places, in January 2018 the bridge was in fact determined individually eligible for its significant association with regional interurban trolley lines. In addition, the bridge directly connects the two sides of the National Register-eligible Brunswick-Topsham Industrial Historic District, connecting two revitalized mill complexes.

Such adaptively used mills are key drivers for Maine's economic future. With the demise of traditional mills, 14 such buildings have been adaptively used across the state as part of more than half -a-billion dollars invested in Maine since 2008 using historic tax credits.

Maine's largest industry is tourism. Communities are recognizing that rehabilitation of their historic resources is a proven economic strategy and are benefitting from increased interest in their communities from visitors, new families and business investors. This is a proven trend throughout the country.

People and businesses are locating to these communities because of their historic character. Preservation is a crucial part of the economic future not only of this area, but the entire state. With tourism as our #1 industry, it is critical that we recognize both the positive social and economic impacts our historic assets have on our community identity and on building a sustainable future. A study by the U.S. Travel Association showed that 78 percent of all U.S. leisure travelers participate in cultural and/or heritage activities. Heritage travelers typically stay 53 percent longer and spend 36 percent more money than other tourists. Thus, enhancing our historic assets brings rewards to local economies. Historic bridges are recognized as unique community assets throughout the country. And Brunswick has already lost one.

Since 1999, Maine has lost 47 historic Warren Through Truss bridges, 23 of them listed or eligible for the National Register of Historic Places. With so many bridges in Maine and a shortage of funds to repair and replace them, the question is whether Maine citizens are getting the full lifetime from our existing bridges. Vermont has found that rehabilitation is both financially feasible and advisable. Vermont assigns a 100-year expected lifetime to its existing bridges and a shorter lifetime to new bridges than Maine. If 100 years is used, this changes the economic feasibility dramatically in favor of rehabilitation.

At present, whether or not the bridge is replaced, the deck – a component of all bridges that needs to be replaced periodically - needs critical maintenance. More substantial rehabilitation will be required within the next five years to address other structural issues, namely the deterioration of essential truss bars and floor beams. Five Alternatives have been put forward to address these issues, including both replacement and repair options ranging from \$13 million to \$17 million. The relative costs of rehab vs. new construction are very close. We urge selection of Alternative 3 or 4. Since the MDOT estimate for repair was done by a firm specializing in building new bridges, an estimate by an engineering firm that specializes in rehabilitating bridges would be more accurate. And if rehab is chosen more jobs will be created locally from repair than from purchasing new materials from elsewhere.

The Frank J. Wood Bridge is also wide enough to have two 10' travel lanes, two 5' bike lanes and a 5' sidewalk; the proposed new bridge is only 2' wider – or 6' per bike lane.

We share the great general concern that this bridge be fixed in a manner that lasts a long time. Given the level of public interest and concern, the significant loss of historic bridges in Maine and a clear and financially responsible reuse option for this historic bridge it is essential that MDOT accurately and fairly considers rehabilitation of this local landmark and chooses Alternative 3 or 4.

Respectfully submitted,

A handwritten signature in black ink that reads "Greg Paxton". The signature is written in a cursive, flowing style.

Greg Paxton  
Executive Director

FJW EA COMMENT #97

From: susan cooney <suecooneyinmaine@gmail.com>  
Sent: Wednesday, April 11, 2018 3:58 PM  
To: Gardner, David  
Subject: Frank J. Wood Bridge

Save this Bridge!

FJW EA COMMENT #98

From: amyreedrobinson@gmail.com  
Sent: Wednesday, April 11, 2018 5:05 PM  
To: Gardner, David  
Subject: Bridge

Mr Gardner,

Please save the Frank J. Wood Bridge. It is such an icon for the area. There is too much “out with the old” lately. It is possible to save this beauty that connects the two towns. We already have the new by-pass and had to close the black bridge, I do not want to have to tear this one down as well.

Thank you for your consideration,

Amy Robinson  
33 Mae Ln  
Topsham



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
GREATER ATLANTIC REGIONAL FISHERIES OFFICE  
55 Great Republic Drive  
Gloucester, MA 01930-2276

**APR 11 2018**

Cheryl Martin  
Assistant Division Administrator  
Maine Division, Federal Highway Administration  
Edmund S. Muskie Federal Building  
40 Western Ave., Room 614  
Augusta, Maine 04330

David Gardner  
Coordination, Assessment and Permits Division Manager  
Environmental Office  
16 State House Station  
Augusta, Maine 04333

Re: National Marine Fisheries Service's comments on the Environmental Assessment and draft Section 4(f) Evaluation for the proposed Frank J. Wood Bridge project.

Dear Ms. Martin and Mr. Gardner:

In February 2018, you released an Environmental Assessment (EA) pursuant to requirements of the National Environmental Policy Act, which analyzed potential environmental impacts of various alternatives for improvements being considered to the Frank J. Wood Bridge that spans the Androscoggin River on the Brunswick-Topsham town line in Maine. Below, we provide our comments on your EA.

We are dedicated to managing, conserving, and rebuilding populations of marine mammals and endangered and threatened marine and diadromous species in rivers, bays, estuaries and marine waters of the United States. Through management, conservation and recovery efforts, and public outreach and education under the Endangered Species Act (ESA), we strive to ensure the survival of the protected marine species in the Northeast United States for future generations. Federally listed Atlantic salmon, shortnose sturgeon, and Atlantic sturgeon are present in the proposed action area. Additionally, the action area is designated as critical habitat for the Gulf of Maine distinct population segment (GOM DPS) of Atlantic salmon and the GOM DPS of Atlantic sturgeon.

On March 30, 2018, we issued a Biological Opinion which concluded that your preferred alternative (identified as Alternative 2, a new 835 ft. bridge on a curved alignment upstream of the existing bridge) is likely to adversely affect, but not likely to adversely modify or destroy critical habitat designated for the Gulf of Maine distinct population segment (DPS) of Atlantic sturgeon. We also concluded that the proposed action may affect, but is not likely to adversely affect, the Gulf of Maine DPS of Atlantic sturgeon, endangered shortnose sturgeon, endangered



Gulf of Maine DPS of Atlantic salmon, or critical habitat designated for the Gulf of Maine DPS of Atlantic salmon.

In addition to ESA listed species, we are responsible for other diadromous species and marine, estuarine and coastal habitat systems. Our goal is to ensure the productivity and sustainability of fisheries and fishing communities through science-based decision making. Estuary and coastal riverine habitat systems, including rivers such as the Androscoggin River, provide an integral component of significant ecological functions for the larger marine environment. Estuaries and coastal rivers support many living marine resources. Species such as alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), sea lamprey (*Petromyzon marinus*), and American eel (*Anguilla rostrata*) rely on these coastal systems for refuge, spawning, rearing and nursery habitat.

All of the species listed above depend on the safe, timely, and effective up- and downstream passage of river barriers, such as hydroelectric dams to complete their life cycle. The existing Frank J. Wood Bridge is located immediately downstream of Brookfield White Pine Hydro, LLC's (Brookfield) Brunswick Hydroelectric Project (FERC License No. P-2284). Upstream fish passage at the Brunswick Hydroelectric Project (Brunswick Project) is provided via a vertical slot fishway, located adjacent to the project powerhouse on river left, looking upstream. On December 13, 2013, after formal consultation with us under the Endangered Species Act, the Federal Energy Regulatory Commission amended the license for the Brunswick Hydroelectric Project to include an Interim Species Protection Plan (ISPP). The ISPP included conditions that require Brookfield to study and adaptively manage up- and downstream passage at the Brunswick Project, in consultation with us, to protect migrating Atlantic salmon. The Brunswick Project is the first barrier to fish migration on the Androscoggin River. Given the scale of the Androscoggin upstream of the Brunswick Project (165 miles long, and a watershed of approximately 3,500 square miles), the importance of its fish passage efficacy on diadromous species and the ecosystems on which they depend cannot be understated.

We continue to have concerns related to both the effects of the preferred alternative on the efficacy of the existing fishway as well as the preferred alternative's close proximity to the Brunswick Project. On page 14 of your EA, you provide a brief analysis of the anticipated environmental effects of the preferred alternative on the Brunswick Project and fishway, wherein you state that the preferred alternative could potentially affect the fishway from shadowing and the location of the southerly piers, however, you provide no additional information describing those potential impacts. You indicate that you are continuing to conduct additional evaluation of potential effects to the fishway.

Your preferred alternative will include the placement of a bridge pier within 32 feet of the existing fishway and within the existing FERC project boundary. As described above, the ISPP included in the FERC license for the Brunswick Project dictates an adaptive approach to optimizing the safe, timely, and effective up- and downstream passage for Atlantic salmon. At other hydroelectric facilities in Maine, similar adaptive approaches have resulted in the civil modification of project facilities, including, but not limited to, the design and construction of new or alternate fish passage structures and facilities. Within the next six years, FERC will initiate relicensing proceedings for the Brunswick facility. Those proceedings could also result

in the modification of structures at the Brunswick Project to increase passage efficacy for diadromous species other than Atlantic salmon. The placement of the bridge pier in close proximity to the Brunswick Project could considerably limit the type, scope, and scale of any potential future fishway modifications within the most promising location for such modifications, based upon our current understanding river flow and channel configuration at the site. These factors should be considered as you make a decision on bridge design and location.

Our Opinion concluded that the effects of sound, vibration, and shadows associated with the preferred alternative would not affect Atlantic salmon use of the upstream fishway. We note that our Opinion was developed using the best available information. On page 128 of the Opinion, we clearly indicate that there is no published literature on shadow effects as related to successful passage via an upstream fishway. Further, our Opinion only evaluated these potential project effects on the fishway efficacy for Atlantic salmon. Other species, such as American shad, are known to exhibit more particular behavioral avoidance characteristics to variables such as noise. The scarcity of available scientific literature makes it difficult to evaluate the magnitude of potential effects of the bridge on the behavior of a suite of diadromous species, and in turn, the effects on the efficacy of the fishway with any certainty. However, given the close proximity of the preferred alternative to the existing fishway, effects of the new bridge on use and efficacy of the fishway by all species (i.e., including river herring and American shad) should be carefully considered.

Given the uncertainty associated with the effects of your preferred alternative on the success of diadromous fish passage at the Brunswick Project, we are concerned about the potential results of implementing Alternative 2 including: the limitations that the preferred alternative would impose upon any future improvements to fish passage at that facility, and the importance of the availability of efficient fish passage at the Brunswick Project to the overall health and productivity of diadromous fish populations in the Androscoggin River. We believe that selection of one of the remaining alternatives would avoid these conflicts; however, should you proceed with your current preferred alternative, we recommend that you include provisions to monitor pre- and post- project passage effectiveness in order to determine the magnitude of the proposed project's effect on the diadromous fish community and the ecosystems to which they are associated and develop a plan to mitigate any documented impacts.

Thank you for the opportunity to comment. If you have any questions or need additional information, please contact Matt Buhyoff ([Matt.Buhyoff@noaa.gov](mailto:Matt.Buhyoff@noaa.gov)) or 207-866-4238.

Sincerely,



Julia E. Crocker  
Endangered Fish Recovery Branch Chief  
Protected Resources Division

FJW EA COMMENT #100

From: edda thiele <briggsthiele@yahoo.com>  
Sent: Wednesday, April 11, 2018 5:28 PM  
To: Gardner, David  
Subject: the bridge

I am enthusiastically supportive of keeping and renovating the bridge in Topsham. I think it is vital to do so. Thank you, Edda

FJW EA COMMENT #101

From: Nicole LePera <paxvolupia@icloud.com>  
Sent: Wednesday, April 11, 2018 7:16 PM  
To: Gardner, David  
Subject: Save our bridge!

When I first came to Brunswick and Topsham, I can still remember my first ride across the bridge. I loved it so much, that I turned around and went back across. Then again. I loved it on first sight.

I found myself coming back to the area again and again, and I always found an excuse to go across it.

Several years later, in 2008, I moved here. I have been a happy resident of the area for ten years now, and I'm positive a lot of it has to do with that lovely green bridge.

Through the years, I have spent a lot of money (and my semi-wealthy boyfriend's money!) at the many restaurants and shops in the area.

If that bridge had not had such an effect on me, I probably would not be here. Those businesses would not have gotten my business. Multiply that times the hundreds, if not thousands, of folks whose stories are similar to mine. That's money lost.

Moreover, the new bridge design looks like an ugly overpass--a cheap construction--and putting such a monstrosity would put an ugly scar on the face of our towns. Do we really want to look like every other dull and boring small town in America? Or do we want to hold onto our character, our history, the things that make us unique, the things that make us beautiful?

Should you decide to tear it down--and I think I speak for others in the town--I might just have to move away. Watching it fall is just gonna be too damn heartbreaking.

Sincerely,

Nicole LePera, Topsham resident

Sent from my iPhone

FJW EA COMMENT #102

From: Charles Carroll <chick76@me.com>  
Sent: Wednesday, April 11, 2018 8:23 PM  
To: Gardner, David  
Subject: Fwd: Green bridge

Chick

Begin forwarded message:

From: lynzie millard <lynziemillard@hotmail.com>  
Date: April 11, 2018 at 7:50:59 PM EDT  
To: "chick76@me.com" <chick76@me.com>  
Subject: Green bridge

I grew up here in topsham. My children are growing up here, this is home. We live near the bypass and cant see the green bridge fitting in with a bypass look. We love the historical look and hope it stays that way. We want what is the best for the towns , however I cant see living here without the historic look of the bridge. It would be nice to have it restored and figure out a way for the paint not to wear so fast.

Thank you

Lynzie millard.

Get Outlook for Android

To Whom It May Concern,

I am writing on behalf of myself. I am writing on behalf of my children. I am writing on behalf of my town, and those who are desperately urging you to rescind your plan to tear down the historic Frank J. Wood Bridge. It is a part of our town's identity. Take that away and it just becomes another bridge. Another project. Another number on a spreadsheet. A tragic loss of community.

This bridge to me, means home. Its significance isn't merely a means of getting from point A to point B. It symbolizes the connection of two towns. Its image is used in sporting events, t-shirts, postcards. Google "Topsham, ME," or "Brunswick, ME," guess what comes up? Without this bridge, the towns lose a piece of their identity. These towns are so much more than a blip on a map, and that is what they will become if a new bridge is put in place. Main street would become a runway.

The construction of a new bridge would disrupt the wildlife that currently inhabits the area. Right on the Brunswick town line is the fish way, how would this impact fish migration? Though I imagine fish migration may be easily explained away, but is your conscious so easily explained away? What does that say of our leaders in Augusta, when the voices of the community are ignored by people who are elected by the people but with this demonstration of ignorance, certainly not for the people?

You do not know how I am and you do not know my children or my community, but seem to think you know what's better for me. I am telling you, you are incorrect.

If you are truly working in my best interest, then please take a moment to read this, close your eyes and imagine what my life is like and what I am asking of you are elected leaders.

The bridge is a monument of our community. It brings people, schools, and towns together. It has meaning and value. It is historical and it is ours, not yours.

If, again, as elected leaders you would like to also support fiscal responsibility, please do not ignore the economic benefit of rehabilitation versus new construction. As you are aware, it is fiscally more responsible to repair the Frank J. Wood Bridge than build something new.

So, this is your moment. As a leader, as an elected official and as a supporter, I ask that you do the right thing. It is on you to make the right decision and choice. If you ignore us, you are making a conscious choice to communicate that we are not important or what we say is not important enough.

Respectfully,  
Jill, Bailey and Ben  
Summer Street  
Topsham, Maine

FJW EA COMMENT #104

From: Cathy Hanscom <stjohngirl98@gmail.com>  
Sent: Wednesday, April 11, 2018 10:30 PM  
To: Gardner, David

As a resident of topsham for most of my life I passionately support keeping and repairing the existing Frank Woods Bridge. My mom walked across the bridge pregnant with me during a hurricane. I marched across it in girl scouts memorial days past and my daughter in marching band. It holds historical as well as sentimental value for many residents of Brunswick and Topsham. Too many pieces of Maine's history have been eliminated. Please save our bridge!  
Sincerely, Cathleen Hanscom

FJW EA COMMENT #105

From: Dale Dorr <dkdorr@gmail.com>  
Sent: Wednesday, April 11, 2018 11:01 PM  
To: Cheryl.martin@dot.gov; Gardner, David  
Subject: Frank J. Wood bridge

Ms. Martin/Mr. Gardner:

This is one more late and perhaps the last public comment on the fate of the Frank J. Wood bridge in Brunswick. In short, I and nearly all of my friends/acquaintances in Brunswick and Topsham fully support the upstream replacement option for a new bridge. As with many development/construction projects, the naysayers tend to make a lot more public noise than supporters because of their passion for a small consideration - in this case, the historical value of that old rusted, hulk of a bridge. As a practical matter (which hopefully controls the decision), there are abundant solid reasons for full replacement over repair - initial costs, on-going maintenance costs, business disruption costs and major safety and functionality improvements.

This is all measured against the very questionable historical value of saving the existing bridge. I traveled the current bridge twice a day for 25 years for my job and am all too familiar with its shortcomings. I also am a bicyclist who sometimes crosses that bridge and I guarantee you that it is always an adventure for both the biker and the vehicle drivers. I realize that you have many hoops to jump through as part of any transportation project but hope that ultimately the new, upstream bridge will be constructed. Good luck and let's hope that there will be no legal challenges to the correct decision.

Sincerely,  
Dale Dorr

Sent from my iPad

FJW EA COMMENT #106

From: Communications.MaineDOT@maine.gov  
Sent: Wednesday, April 11, 2018 11:12 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

The following message was submitted from your MaineDOT website contact form .

Date: 04/11/2018  
Name: Douglas C. Bennett  
Organization(if applicable): Mr.  
Phone: 2077219575  
Email: Dougb@earlham.edu

Topic:

-----  
Comments:

Comments on the Frank J. Wood Project  
Submitted by Douglas Bennett, 53 Elm Street, Topsham ME April 11, 2018

I have appreciated the patient, thorough, and fair process that MDOT and FHWA have used in weighing the various options for the current Frank J. Wood Bridge.

With all the evidence and supporting material in view, I believe reasonable people can only conclude the following:

1. The bridge is and must be a vital connection between the town centers of Brunswick and Topsham. It needs to serve all users well: motorists, cyclists, and pedestrians. Whatever is done with regard to the bridge (repair or replacement) must be done with the least possible disruption now and in the future to those seeking to cross the river.
2. Replacement on the upstream alignment has been shown to be the least expensive option in terms of construction costs. It is also the least expensive option in terms of ongoing maintenance costs.
3. Replacement on the upstream alignment is the one that would cause the least disruption during construction. It is also the option that will cause the least disruption in terms of ongoing maintenance because it will require much less maintenance.
3. Replacement on the upstream alignment would produce a bridge that serves equally well the needs of motorists, cyclists and pedestrians. A new bridge will especially serve better the needs of cyclists and also pedestrians. A new bridge will be safer for cyclists and pedestrians.
4. There is no appreciable difference among the options in terms of harm to the natural environment.
5. While the current bridge is eligible for listing on the national historic register, neither town has sought to have it so listed, even though both have created historic districts at either end of the bridge. The bridge is not appropriately historic with regard to either of those historic districts: not with regard to the mills at either end nor with regard to the houses at either end, especially the historic houses on the Topsham end.
6. Replacement on the upstream alignment will allow beautiful views of the river at either bridge end

and from the bridge itself, views much superior to what would be possible with a renovation of the current bridge. A replacement bridge will also connect better with current and prospective walking trails.

7. While there are supporters of both renovation and replacement, the weight and number of supporters is greater on the replacement option. Cyclists strongly prefer it. Business groups strongly support it. The 'Friends of the Frank J. Wood Bridge' are simply not truthful in posturing that there is greater popular support for renovation.

In sum, there is simply no reason to prefer a renovation option to a replacement.

In choosing to build a new bridge on the upstream alignment, I hope and expect MDOT and FHWA will follow the advice and guidance of the Design Advisory Committee created by the two towns, whose report has already been submitted.

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If required, please respond as soon as possible.

FJW EA COMMENT #107

From: Renee Badershall <serendipity128@hotmail.com>  
Sent: Thursday, April 12, 2018 4:14 AM  
To: Gardner, David  
Subject: Bridge

Please save our bridge! Thanks. ??

Sent from my Verizon LG Smartphone

April 11, 2018

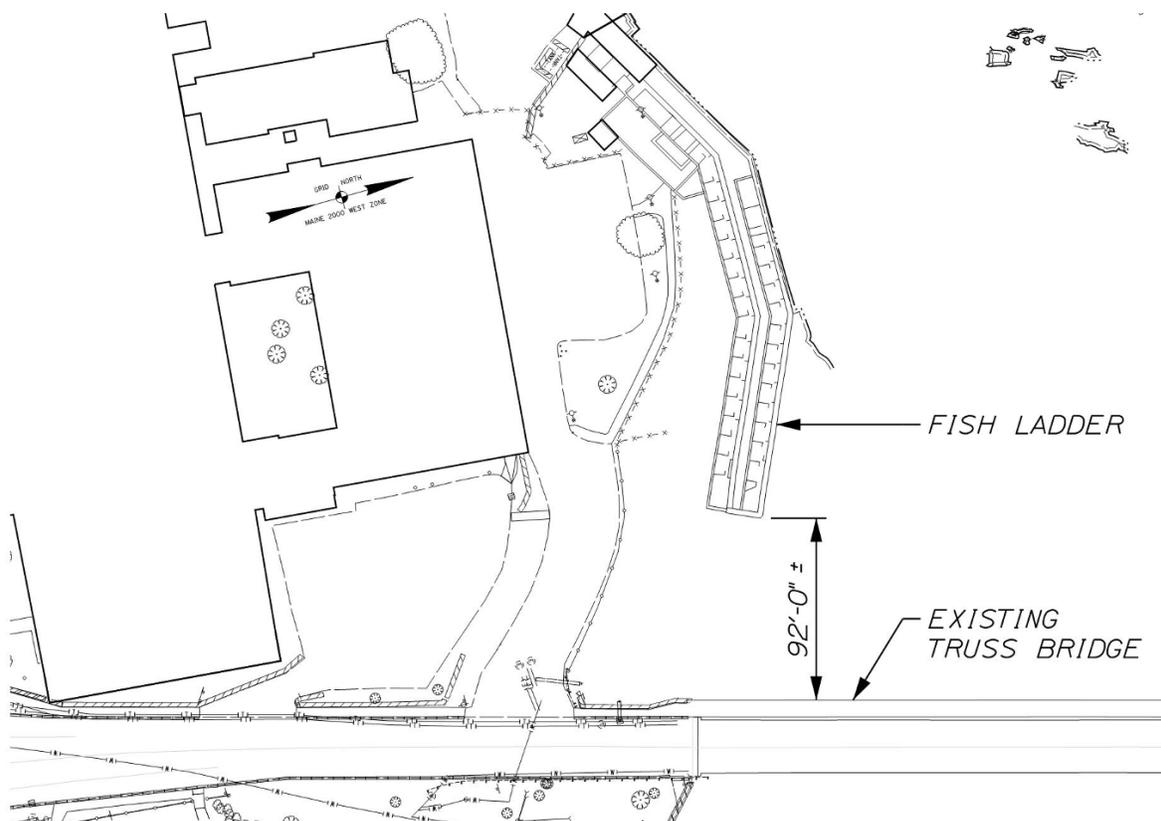
David Gardner  
Coordination, Assessment and Permits Division Manager  
Maine DOT Environmental Office**RE: Environmental Assessment for the Frank J. Wood Bridge (#2016)**

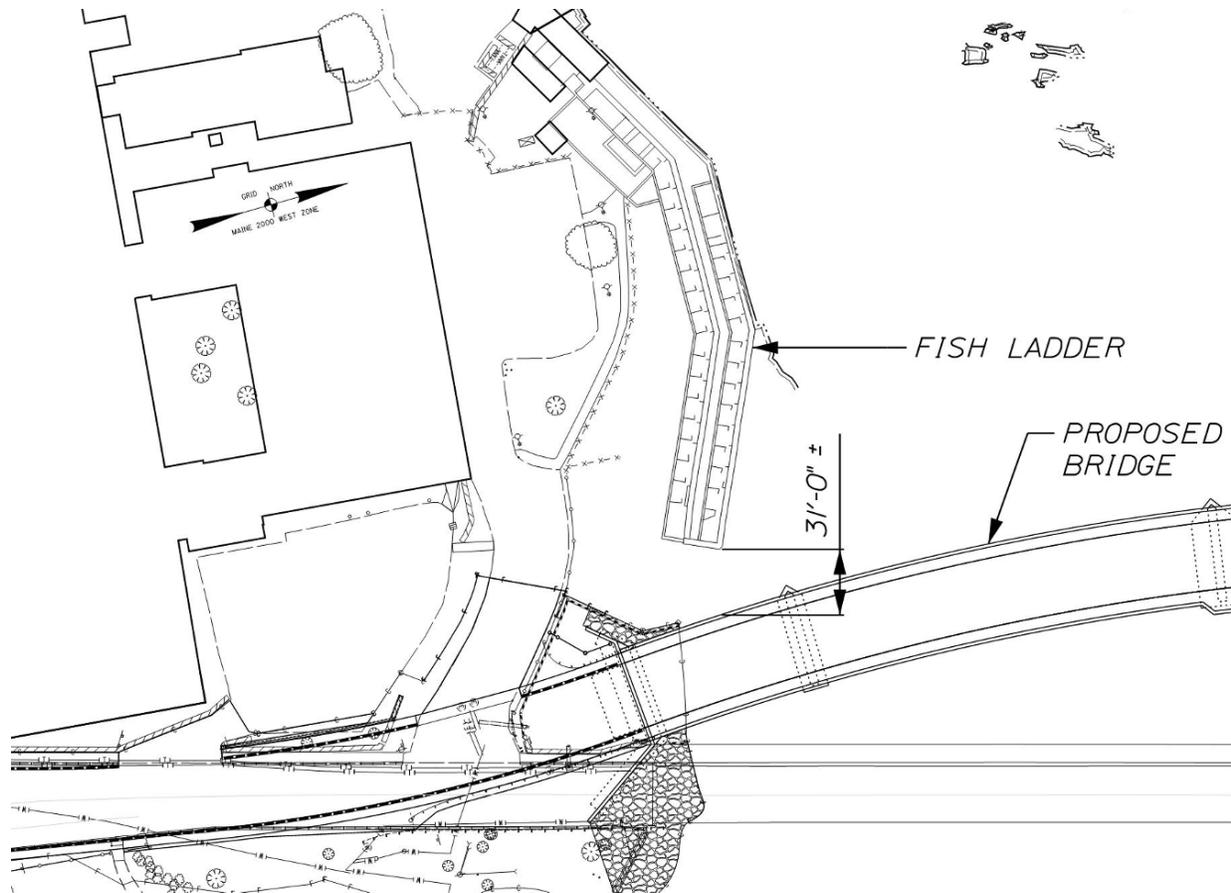
Dear Mr. Gardner

On April 3, 2018, The Federal Highway Administration, Maine Division (FHWA) and the Maine Department of Transportation (Maine DOT) distributed the Frank J. Wood Bridge Environmental Assessment (EA) for public inspection and agency comment in accordance with 23 CFR §771.

Brookfield White Pine Hydro (BWPH), owner and operator of the Brunswick Project (FERC No. 2284), comments follow.

The Frank J. Wood Bridge replacement preferred alternative (Alternative 2), as proposed, is located immediately adjacent to BWPH's Brunswick Dam, which includes a fish passage facility (Fishway). Currently, the Frank J. Wood Bridge passes just over 90 feet to the south of the Facility. The proposed bridge reconstruction and realignment would bring the bridge to within just over 30 feet of the Fishway.





**BWPH's concerns**

BWPH is very concerned that the noise, vibration, and shadowing from the realigned bridge will, given its proximity to the Fishway, have negative lasting effects on upstream fish passage for American shad, Alewife, and blueback herring into the future. Each of these is discussed below.

**EA status**

Throughout the scoping process of the EA, BWPH raised the above noted concerns as well as potential impacts to the hydraulics of the tailrace channel. To that end, Maine DOT conducted a shadow modeling study and moved a pier in the conceptual design of Alternative 2.

While BWPH appreciates the efforts of Maine DOT to address our concerns, the EA only includes an analysis of construction activity effects on endangered Atlantic salmon, Atlantic sturgeon, and shortnose sturgeon and the presence of bridge structures in critical habitat for Atlantic salmon and sturgeon.

BWPH is, in addition to the foregoing, concerned about the impact of the bridge structures on the performance of the existing fishway, as well as impacts to American shad and river

herring migration, which are not considered in the EA. In fact, the EAs analysis of impacts to the fishway (other than construction) is essentially limited to the following paragraph:

*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.*

While Maine DOT acknowledges that the shadow study revealed a potential permanent effect on the Fishway, that effect is not adequately analyzed for the breadth of species that utilize the fishway. As well, BWPH's other concerns regarding the long-term effects on the Fishway given the increases in noise and vibration that will result with the relocation of the bridge are notably absent.

Maine DOT states in the above paragraph that additional evaluation of potential effects is being conducted, but does not otherwise specify what these effects are.

The National Marine Fisheries Service (NMFS) Biological Opinion (BiOp) does analyze the effects of noise and vibration on Atlantic salmon passage however that analysis does not consider American shad or river herring.

## **Issue analysis**

### Noise/Vibrations

The EA makes no assessment of noise or vibration of Alternative 2 on the performance of the Fishway. Although the NMFS BiOp does include an analysis of noise and vibration, this analysis is brief, does not rely on the collection of baseline or comparative data, references Alternative 2 as being only "slightly closer to the fishway than the existing abutment", and only considers possible effects to Atlantic salmon.

Although advancements in construction technology over the past several years have created a quieter, less impacted sub-surface environment, the new bridge will be a mere 32 feet from the Fishway, compared to over 90 feet in its current alignment. Considering the vehicle traffic and activity taking place on the new bridge, and the American shad's sensitivity to such factors, it will likely impact the American shad's upstream migration through the Fishway. BWPH requests a comparative evaluation of noise and vibration be conducted to determine the impact of Alternative 2.

## Shadowing

The shadow study conducted by Maine DOT indicated an increase of approximately 1 hour of additional shadowing on the turning pool of the Fishway and an increase in the overall prevalence of dynamic shadows (moving, flickered shadowing caused by traffic movement) from approximately 1.5 hours per day to approximately 3 hours per day. This information, while provided to Brookfield under separate cover, is absent the EA. However, Section 7.7.2 of the NMFS BiOp provides the following discussion:

*Although it is understood that the presence of shadows can affect fish behavior (Schilt 2007), there is no published literature on shadow effects as related to successful passage via an upstream fishway.*

*Maine DOT's design consultant estimated the duration of shadowing from the existing structure at approximately 1 hour per day of static shadow (resulting from the bridge superstructure) and a few minutes per day of dynamic shadowing (resulting from passing traffic). Dependent on the model month the shadows from the existing structure are present between the hours of approximately 0700 to 0945. Maine DOT's design consultant predicted shadowing from the new bridge alignment would increase the duration of static shadowing to 2.25 hours per day and of dynamic shadowing to 1.5-2 hours per day. The timing of shadowing predicted for the proposed alignment was between 0645 and 0945.*

As with the assessment of noise and vibration, Maine DOT does not provide quantification or discussion of the effects of shadow on the Fishway, only acknowledging the potential. Although not fully understood to what extent the increase in dynamic shadowing may have on American shad ascending the Brunswick fishway after completion of the proposed new bridge, it will likely negatively impact fish behavior in and around the Fishway.

We appreciate the opportunity to comment on Maine DOT's EA for the Frank J. Wood Bridge and trust our comments will be considered. If you have any additional questions, please contact me at 207-755-5606 or by email at: [Kelly.maloney@brookfieldrenewable.com](mailto:Kelly.maloney@brookfieldrenewable.com).

Sincerely,



Kelly Maloney  
Manager, Compliance - Northeast

FJW EA COMMENT #109

From: Kittredge, Joel  
Sent: Thursday, April 12, 2018 10:20 AM  
To: Chamberlain, Kristen; Gardner, David; Martin, Cheryl (FHWA)  
(Cheryl.Martin@dot.gov)  
Cc: Damren, Janet  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: Shofner, Pamela  
Sent: Thursday, April 12, 2018 10:16 AM  
To: Kittredge, Joel <Joel.C.Kittredge@maine.gov>  
Subject: FW: MaineDOT Contact Form Submission: project

-----Original Message-----

From: bmeggison@comcast.net [mailto:bmeggison@comcast.net]  
Sent: Wednesday, April 11, 2018 7:55 PM  
To: MaineDOT, Communications <Communications.MaineDOT@maine.gov>  
Cc: Shofner, Pamela <Pamela.Shofner@maine.gov>  
Subject: MaineDOT Contact Form Submission: project

The following message was submitted from the MaineDOT contact form.

Date: Wednesday, 11-Apr-2018 19:47:50 EDT  
Name: John Merryman  
Phone:  
Email: bmeggison@comcast.net

Topic: project

-----  
Comments:

I think it's ridiculous to try and maintain the old bridge as unique as it is. The new one will have a much more open feel for the area and will be much easier to maintain in the long run.

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #110

From: Communications.MaineDOT@maine.gov  
Sent: Thursday, April 12, 2018 3:38 PM  
To: Gardner, David  
Subject: Frank J. Wood Project Comment

Categories: FJW

The following message was submitted from your MaineDOT website contact form .

Date: 04/12/2018  
Name: Linda & Harold Christensen  
Organization(if applicable):  
Phone: 207-798-3964  
Email: lindaw.christensen@gmail.com

Topic:

-----  
Comments:

Based on our delayed look at the Forecaster, we've apparently missed your yesterday deadline. But, just in case, this older (and somewhat ailing) Brunswick couple would be very happy to see you replace the "Erector Set" bridge with the artist's rendition that would allow a view of the beautiful buildings & water when approaching & driving over it!!! Our fingers are crossed! -Linda Christensen, 13 Locust Ln, Brunswick

-----  
If required, please respond as soon as possible.

FJW EA COMMENT #111

From: A Weymouth <aweymo@yahoo.com>  
Sent: Thursday, April 12, 2018 11:17 AM  
To: Gardner, David  
Subject: Topsham

Categories: FJW

Save our bridge !

Please

Sent from my iPhone

FJW EA COMMENT #112

From: Louise Rosen <mainerosen@gmail.com>  
Sent: Thursday, April 12, 2018 8:57 AM  
To: Gardner, David  
Subject: Frank Wood Bridge

Hello Mr. Gardner

This bridge is an important feature of the Brunswick-Topsham cityscape that deserves preservation. It makes a vital contribution to the important sense of place widely recognized by economic development specialists as key to successful ongoing invigoration of post-industrial downtowns. It is part of local history. It is attractive - featured in nearly all the pr photos that represent the two towns!

And, it is possible to make modifications that will bring the bridge successfully into the 21st century.

Please consider these points.

Thank you.

Louise Rosen  
16 High Street  
Brunswick, ME 04011



Comment Sheet  
Brunswick-Topsham, Frank J. Wood Bridge, MaineDOT WIN 22603.00  
National Environmental Policy Act

Frank J. Wood Bridge  
Public Meeting - Environmental Assessment  
Mt Ararat High School Commons

March 28, 2018  
6:00 pm

The Federal Highway Administration (FHWA) and the Maine Department of Transportation (MaineDOT) are accepting public comments and community input regarding the National Environmental Protection Act (NEPA) Environmental Assessment through April 11, 2018. This comment sheet can be mailed to the following address:

David Gardner  
Maine Department of Transportation  
Environmental Office  
16 State House Station  
Augusta, ME 04333

Public comment can also be submitted via MaineDOT's web page at:  
<http://www.maine.gov/mdot/env/frankjwood/> or directly to David Gardner at [david.gardner@maine.gov](mailto:david.gardner@maine.gov).

Comment:

I'm glad I went to the meeting at Topsham High School! ~~I was~~ I completely support taking down the old bridge and building new. Cost is the biggest factor in my decision but when I saw details of the erosion on the current bridge... it's time for it to go.

I support an "open" bridge where we can enjoy the views of the river, and the lower cost of construction.

I would like to see some kind of decorative element to the new bridge. ~~A~~

Name (Please Print) DonnaLee LaRose  
Street Address 162 Columbia Ave  
City, State, Zip Brunswick ME 04011  
Contact Info (Email or Phone) donnalee.larose@gmail.com

Cheryl Martin  
Assistant Division Administrator  
Federal Highway Administration – Maine Division  
40 Western Ave  
Augusta, ME 04330

April 11, 2018

David Gardiner  
Maine DOT  
16 State House Station  
Augusta, ME 04333-0016

RE: Comments of EA and Draft 4f

Dear Ms. Martin and Mr. Gardiner,

The Friends of the Frank J. Wood Bridge (Friends) would like to formally submit our questions, comments, and concerns on the Frank J Wood Bridge Environmental Assessment and 4f Draft. We also request that all our comments and supporting documentation be included in the formal record for review by FHWA and it be included with the review that is sent to the National Park Service.

We are deeply concerned that the following issues have not been adequately examined or answered during the Section 106 consultation or the Environmental Assessment (EA).

The elevation of the preferred Alternative 2 (new bridge) has not been made public, including clear renderings of the view from each of the adjoining historic neighborhoods to clearly illustrate the visual impact of the proposed bridge. This includes approach renderings that show just how much higher each new approach will be, particularly the Topsham side where photos of the 1936 flood show the water flowing over the existing roadway. It is not possible to fully assess the visual impact the proposed new bridge would have on the multiple historic resources and districts in the immediate vicinity without clearly defining the bottom and top elevations of the new bridge and providing renderings from all sides. Depending on the outcome, this could adversely impact the eligible Summer Street historic district which is less than fifty feet from recent MDOT core borings for the approach to the proposed new bridge. The Friends have requested answers to questions about the proposed elevation multiple times during the Section 106 consultation but have yet to receive any answers.

The methodology used in arriving at the estimated costs and future costs of the Alternatives considered are also of grave concern to us. The use of service life costs for estimating future costs rather than the industry standard of life cycle costs, the using of worst-case scenarios for rehabilitation and best-case scenarios for the new bridge combined with the rounding up of figures for rehabilitation and down for the new bridge, create a strong appearance of favoring the new bridge alternative.

We also feel that all reasonable alternatives were not adequately studied. There are other rehab options that were not included, and ways to reduce future maintenance and inspection costs

## Friends of the Frank J. Wood Bridge

that were not considered. The Friends have attached an independent engineering report commissioned and paid for by our group that outlines several different options. Importantly one of which makes the bridge non-fracture-critical. The report was independently peer reviewed by a second engineer with extensive bridge rehabilitation experience who has also outlined several inconsistencies and questionable assumptions in the work by MDOT and TY Lin (attached).

The EA appears to be premature. There are several sections that are not complete, including Section 7 and Section 404. The absence of Section 7 is of grave concern to us because it deals with endangered fish species, of which three are known to travel and spawn beneath the bridge. It is one of the last known places Wild Atlantic Salmon enter the rivers of Maine. The existing fish ladder upstream of the historic bridge is known to not function properly and concerns were raised by NOAA about the proposed new bridge's shadowing effect on the ladder and encroachment on the ability to remedy the issues. The EA does not address this major concern. A negative impact on the already malfunctioning fish ladder (a likely outcome of a new bridge) could add millions or tens of millions to the cost of the bridge and could permanently impact the future of the endangered species in the whole Androscoggin River watershed.

The Friends contend the process has been biased from the beginning. To truly understand the extent of this we submitted a Freedom of Information Request to MDOT for related documents and correspondence. These documents have made the scope and breath of the bias very clear and is supported by attached documents. The list is long. To better lay out the scope and give an understanding to parties reviewing this project at the Federal level, we believe that a timeline of events may be most beneficial to comprehending and have attached the same.

Please see the following attachments:

- Timeline of Events
- 4f Response/Rider
- Friends' Independent Engineering Report
- Supporting Documentation

We sincerely thank you for your consideration and time. We feel it is not too late to reverse course and chose one of the alternatives that rehabilitates our community's historic landmark bridge and allows it to continue serving its intended purpose for another century or more. Lastly we request that the public comment period be extended till the questions raised are answered, and made available for further comment, in the intended nature of an EA.

Sincerely,

John Graham  
President  
Friends of the Frank J. Wood Bridge  
10 Pleasant Street  
Topsham, ME 04086  
207-491-1660

## Friends of the Frank J Wood Bridge

### Section 4f Rider- Friends of the Frank J Wood Bridge (Friends)<sup>1</sup>

In 2003 Members of MDOT and the State Historic Preservation Officer signed a Historic Bridge Management Plan which stated that it was “ prudent and feasible to preserve the [Frank J. Wood] bridge in its current usage and that it has preservation potential.” (emphasis added)<sup>2</sup>

“...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.” (emphasis added).<sup>3</sup>

### THE QUESTION

Does Section 4f preclude FHWA from approving the destruction of not one but two protected 4f protected properties, (the bridge itself and the Brunswick Topsham Industrial District), in order to reduce the “ anticipated” future budget short falls of a State Agency?<sup>4</sup> Future monetary short falls that are out of the Agencies control as they are set by future legislative bodies. Further, speculative judgements are not permissible, as transportation benefits have not been substantiated to outweigh protecting the historic bridge and district.

### FRIENDS' CONTENTION

As rehabilitating the bridge is Feasible, Prudent and preserves the bridge and industrial district FHWA, MAY NOT approve another alternative that destroys them.

FHWA may not approve MDOT's request if there is a feasible and prudent alternative to preserve the bridge and the eligible historic industrial district.<sup>5</sup> In determining whether such an alternative exists, FHWA is instructed by law to decide in favor of

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<sup>1</sup> The Friends of the Frank J Wood Bridge(Friends), State of Maine 501c Not for Profit-advocating to preserve the bridge-and a recognized Consulting Party to Section 106

<sup>2</sup> The MDOT employee who wrote the 4f Draft is David Gardiner, a signer of the 2003 Document See attachment 1.

<sup>3</sup> Quoted in Draft 4f from Keeping Our Bridges Safe (KOBS) 2007, updated 2014 Maine MDOT

<sup>4</sup> Maine Department of Transportation(MDOT)

<sup>5</sup> 23 CFR 774.3(a)

## Friends of the Frank J Wood Bridge

preserving the 4f properties<sup>6</sup> and search for alternatives that avoid using them.<sup>7</sup> In addition FHWA is instructed to accept an alternative to preserve the 4f property as long as that alternative does not cause other severe problems of a magnitude that substantially outweighs the importance of protecting the Section 4f property(ies).<sup>8</sup>

An alternative is “feasible” if it can be built as a matter of sound engineering judgement<sup>9</sup>. The fact that MDOT, TY Lin’s and the Friends’ Engineering Report, all state that the bridge can be rehabilitated without difficulty establishes rehabilitation is feasible. To quote TY Lin’s Preliminary Design Report on the bridge: *“Once all of the listed repairs are completed, the structure will meet all current design strength requirements. All repairs would be completed using modern design standards and construction practices to help them last as long as possible”*<sup>10</sup> The question is whether it is prudent.

The regulations list six ways that an alternative may not be “prudent” Only one of these is argued to apply in this case. It is: “it results in additional construction, maintenance, or operational costs of extraordinary magnitude” .<sup>11</sup>

According to MDOT’s analysis of alternatives, as agreed by the Section 106 Consulting Parties and listed in the Summary of Alternatives,<sup>12</sup> all the alternatives, including the two rehabilitation alternatives meet the Purpose and Need Statement. Thus, there is no benefit to destroying the 4f properties for transportation, community bicycle or pedestrian needs.

The rehabilitation alternatives are only ruled out by MDOT’s method of calculating future costs, not by rehab/construction costs, and not by generally accepted methods of calculating life cycle costs. Using MDOT and Ty Lin’s estimates their matrix show:

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<sup>6</sup> “The Federal Registry at column 3/Vol.73, No.49/Wednesday, March 12, 2008/ Rules and Regulations 13391

<sup>7</sup> 23 CFR 774.3(a)

<sup>8</sup> Federal Registry at column 3/Vol. 73 No. 49/Wednesday, March 12, 2008/ Rules and Regulations 13391

<sup>9</sup> 23 CFR 774.17 (Definitions; Feasible and prudent avoidance alternatives (2))

<sup>10</sup> Preliminary Design Report/ Frank J. Wood #2016, STP-2260(300)x WIN 22603.00 MDOT-Bridge Program. August 4, 2017. Page 19.

<sup>11</sup> 23 CFR 774.17 (Definitions; Feasible and prudent avoidance alternatives (3-iv))

<sup>12</sup> Frank J. Wood Bridge/Summary of Alternatives, T.Y. Lin International(TY Lin), March 10, 2017

## Friends of the Frank J Wood Bridge

the preferred Alternative 2 is estimated to cost 13 million dollars<sup>13</sup>. Alternative 3 Rehabilitation is estimated to be 11 Million dollars.

### FISH LADDER

The preferred Alternative 2 encroaches into the approach to a fish ladder and increases shadowing as NOAA points out in a letter to MDOT. Brookfield, the owner of the dam and the party responsible for maintaining and replacing the fish ladder, has stated that they will not be responsible for correcting the problem if MDOT moves the bridge to its Alternative 2 location. It is not known to the Friends if the space will even exist to properly fix or replace the fish ladder if Alternative 2 is chosen. This liability has not been fully explored, and no cost for it has been estimated or included in the Alternative 2 estimate. This has the very real potential of adding millions of dollars to the actual cost of Alternative 2.

### COST COMPARISONS

The costs associated with Alternative 2 and Alternative 4 are 11 and 13 Million with an additional 4 Million tacked on to both 3 and 4 for a temporary bridge,<sup>14</sup> bringing the totals up to 15 Million and 17 Million. The cost once traffic control is subtracted from the total cost are 2 Million less than Alternative 2 for Alternative 3 and Equal for Alternative 4. Neither of the rehabilitation alternatives rise even close to a reasonable definition of "extraordinary magnitude," one being less expensive.

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<sup>13</sup> Alternative 2's price estimate is for a very basic "low cost" bridge. MDOT has met over a dozen times with a committee of local supporters of the new bridge appointed by the two towns. The Design Advisory Committee (DAC) which has made recommendations that have not been included in the cost of comparable alternatives. The suggestions include widening the bridge and other ad ons that will increase the 13 Million estimate by over a million, shrinking the percentage gap to less than seven percent, compared with rehabilitation, with the temporary bridge included.

The preferred alternative 2 encroaches a fish ladder and increases shadowing as NOAA points out in a letter to MDOT. Brookfield, the party responsible for maintaining and replacing the fish ladder, has stated that they will not be responsible for correcting the problem if MDOT moves the bridge any closer. It is not known if the space will even exist to properly fix or replace the fish ladder if alternative 2 is chosen. This liability has not been fully explored and no cost is associated with it. This has the very real potential of adding millions, if not tens of millions, on to the real cost of Alternative 2. See attachment 2

<sup>14</sup> Initial estimates had no temporary bridge included as there is a bypass bridge less than a mile upstream. The temporary bridge was added in a continued attempt to balloon the cost of rehabilitation. MDOT recently built the Sarah Long Bridge in Kittery which carries Route 1 and has an estimated daily traffic count of 16,000 and did not provide a temporary bridge even though it was shut down for over two years. The towns of Brunswick and Topsham also showed willingness to have a complete shut down early in the planning. See attachment 3.

## Friends of the Frank J Wood Bridge

Therefore, these must be considered prudent. Including the temporary bridge Alternative 3 is less than 15% more expensive than the preferred Alternative 2.<sup>15</sup> The value of preserving the two 4f properties vastly outweighs this increase and does not meet the mandated description of "extraordinary magnitude." MDOT does not argue or try to make the case that the initial construction or rehabilitation costs outweigh the importance of protecting the 4f properties.

### REASONING OUT OF AGENCIES CONTROL

The foundation of MDOT's argument for destroying the 4f properties and choosing Alternative 2 is its claim that future inspections and maintenance costs of maintaining the 4f property are vastly greater for the historic bridge than maintaining a new bridge. No one is arguing that maintaining a historic structure will be less expensive than a new structure. However, if MDOT's argument held water, nearly all 4f properties would be destroyed. MDOT has no control over the size of its budget years from now but is making permanent decisions about historic properties based on guesses about future funding availability.

To assume it will not have enough money is simply speculative. and should be rejected out of hand. As stated in the draft 4f "MaineDOT does not anticipate adequate funding (State and Federal assistance) to maintain the current condition of the bridge network." "Does not anticipate" is not a sufficient reason to destroy a 4f property, let alone two such properties. The Maine Legislature and the Federal government set future budgets. Furthermore, MDOT has done no research or proven that there are no alternatives to reduce the cost of future inspections as suggested in writing by the Friends<sup>16</sup> during Section 106 and also recommended in the KOBBS report. It is fact that future funding is out of MDOT's control. There are strong possibilities that other means of funding future maintenance costs through new legislation may become available. Other states have charged their Turnpike Authorities with the fiscal responsibility of preserving their Historic Bridges.

In addition, the engineering firm (Ty Lin) hired has not shown in its promotional material that it has the experience required to adequately examine all the rehab options that would limit the need for costly future maintenance, including the possibility of an alternative that would make the bridge non-fracture-critical. TY Lin also lacked experience in the Section 106 Process.<sup>17</sup>

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<sup>15</sup> Original TY Lin estimates showed rehabilitating the bridge was the most cost-effective option in November of 2015, estimating an additional 30 years of life for less than 8 million. See attachment 4.

<sup>16</sup> See Attachment 5- Letter from the Friends to FHWA

<sup>17</sup> See Attachment 6.

## Friends of the Frank J Wood Bridge

Most importantly, the maintenance plan and schedule of maintenance used to compute the costs are wildly out of line with MDOT's past maintenance record.<sup>18</sup> The reasoning given to destroy the 4f properties is the assumed cost of future maintenance. If the amount of future maintenance included in the Life Cycle Cost Analysis<sup>19</sup>, had been in place for the last 50 years the bridge would not be structure deficient. There is no reason to believe MDOT's projected excellent maintenance of the bridge, however desirable such care would be, is anything by a means to justify demolition of the bridge. Maintenance over the last 50 years shows a more realistic glimpse of what MDOT would do. The fact is that MDOT cannot confirm when the Frank J. Wood Bridge was last fully painted. A work sheet that goes back to 1972 show that it has not been completely painted in 50 years. Yet MDOT would have us believe they will paint it two and half times over the next 50 years. The same with the deck replacement, according to the promised future maintenance cycle the deck should have been replaced in 2012. This represents roughly 36% of the future predicted maintenance costs. It is easy for the responsible agency to rule out preserving a 4f property by claiming a "Cadillac" plan of future maintenance will cost more than its future budgets will allow. The fact remains that the past maintenance records show vastly less money has been spent on the bridge and thus the current conditions of the bridge. A balance needs to be addressed to preserve the 4f property. The agency in charge of the 4f property cannot be allowed to neglect it and then use that neglect as a reason to destroy it.<sup>20</sup>

The majority of the "proof" MDOT relies on comes from Keeping Our Bridges Safe (KOBBS), published on November 26, 2007. The much-quoted report that is used to justify the lack of funding, if read independently comes to a drastically different conclusion. It clearly states that preserving bridges is less expensive then replacing them. At the time the decision was made to replace the FJW the bridge was rated in the category of Fair to Good which the report calls for rehabilitation. To quote the conclusion of the report (emphasis added):

"In summary, there are only two ways to protect public safety over the long term: Repair/replace poor bridges and *preserve fair bridges before they become poor*, OR continue to close bridges when their condition results in an unacceptable factor of safety. With over 2,000 bridges in fair or poor condition, Maine's economy cannot afford to have the highway network become unconnected, nor can we allow unsafe bridges to stay open. Without a *balanced, sustainable bridge work plan*, load postings and closures will be the only "safety net" left.

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<sup>18</sup> See- Attachment 7- Maintenance Record Frank J Wood Bridge #2016

<sup>19</sup> Estimated total cost over the service life of bridge-<http://www.maine.gov/mdot/env/documents/fjwepr/FJWoodCostoverServiceLifeMatrix3Alts.pdf>

<sup>20</sup> Ibid-Footnote #12

## Friends of the Frank J Wood Bridge

### Recommendations:

- Increase capital bridge funding by \$50 to \$60 million per year (from approximately \$70 million per year today), to between \$120 to \$130 million per year
- Continue reviewing MaineDOT's current bridge-related programming to ensure that bridge safety remains adequately considered.
- *Enhance bridge preservation actions to increase average bridge service life."*

It continues with a list of recommendations titled: Section 8 Summary of Recommendations, in which it further discusses the potential of improved safety and *reduction of costs for future inspections:*

"9) Monitor and evaluate the research into new technologies and techniques for inspection and evaluation of connectors and fracture critical members and implement them, if appropriate."<sup>21</sup>

The Draft 4f and the Preliminary Design Report (PDR) continually emphasize the high cost of inspections and the need to lease special equipment. This cost is already a part of MDOT's budget and is not disappearing if MDOT no longer inspect the FJWB biannually. The past and current budgets also do not correlate with what the future inspection costs are projected to be. The report further explains in Appendix D: "The Bridge Inspection Program has five full-time and two part-time bridge inspectors, a full-time manager of the underwater dive team, 20 part-time underwater inspectors, and an under-bridge crane to gain access to difficult-to-reach components. The inspection program is managed by a professional engineer."<sup>22</sup>

To take this a step further, the 2018 Budget for Bridge Inspections State-wide is 4.5 million dollars. The report says MDOT is responsible for 2,722 bridges in the State. If half of those get inspected every year the average cost of inspecting a bridge is \$3,307. If you just take the 1260 bridges that are older than 50 years and divide half of them (biannually inspected) into the 4.5 million dollars you get \$7,258. This does not even count for the other 731 bridges that are newer than 50 years that need to be inspected this year. The future inspection costs quoted in the draft 4f do not even remotely correlate with the actual MDOT bridge inspection budget.<sup>23</sup>

To further stress the point of the practicality of rehabilitation the KOBS report includes two appendices. Appendix E states that it costs half as much per square foot

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<sup>21</sup> Ibid-Footnote #1 KOBS Report 2009

<sup>22</sup> Ibid-Footnote #1 KOBS Report 2009 Appendix D

<sup>23</sup> Maine DOT Work Plan/ Calendar Years 2018-2019-2020-[http://maine.gov/mdot/projects/workplan/docs/2018/MaineDOTWork\\_Plan\\_2018\\_2019\\_2020.pdf](http://maine.gov/mdot/projects/workplan/docs/2018/MaineDOTWork_Plan_2018_2019_2020.pdf)

## Friends of the Frank J Wood Bridge

as to preserve a bridge as it does to replace a bridge (\$300 vs \$600 per square foot). Appendix G lists the maintenance that will keep a bridge in good service condition, all of which apply to the FJW Bridge. MDOT seems to be hand picking information out of the Keep Our Bridges Safe Report and not following its suggestions and conclusions. MDOT fails to follow what the report suggests is actually in its control and instead uses the report as an excuse for why they won't have the funding in the future: funding which is not in their control but up to future Legislatures.

### LIFE CYCLE COSTS

As stated on page 24 of the Environmental Assessment, MDOT has used a method known as Service Life Costs for calculating costs for the next 75 years for Alternatives 3 and 4 and 100 years for Alternative 2. This method is not the method mandated by FHWA, known as Life Cycle Costs. The two different methods arrive at radically different results and conclusions. The method used by MDOT is chosen to support its preference for Alternative 2, despite the requirement of FHWA to utilize Life Cycle Cost.

There is a naive assumption that unless an agency has extra cash reserves to invest and therefore experience growth of the reserves, the use of Life Cycle Costs is inapplicable. This is completely inaccurate. Life Cycle Costing has been used by State and federal agencies for over 50 years. Few, if any such agencies have, or are allowed by law to have substantial cash reserves for long term investments. In fact, the underlying assumption is that since the source of future revenues is federal and state taxes, the effects of inflation will increase those tax revenues in the same way that investing a sum of cash reserves would do. Inasmuch, for example, as the principal source for Federal Highway funds is the sales tax on gasoline and other fuels, and inasmuch as the price of fuel generally reflects or even exceeds inflation, the funds available in the future for Highway and bridge construction reflect approximately the same growth as invested funds might.

The Life Cycle Cost method reduces all future costs and revenues to present day dollars so that comparisons between uses and projects may be made on a comparable and consistent basis. MDOT has chosen to use a different system on this project to favor the Alternative 2 it prefers, instead of the method required by FHWA. When the required costing system, Life Cycle Cost, is used the cost differences between alternatives cited by MDOT virtually disappear.

### CONCLUSION

The applicable regulations provide that FHWA may approve the use of 4f property only by going through a two step process: finding that there is no feasible and prudent alternative to doing so, and then choosing the alternative that does the least overall harm. In this matter there is a feasible and prudent alternative- both Alternative 3 and 4, and FHWA may not therefore approve the removal of the bridge. If FHWA were

## Friends of the Frank J Wood Bridge

to conclude otherwise, the requirement that it approve only the alternative that does the least over all harm would still require it to select one of the alternative(s) that preserves the bridge and the district in its entirety.

## Frank J. Wood Bridge Timeline 2015-present (April 2018).

2003

Members MDOT and the State Historic Preservation Officer concluded in a Historic Bridge Management Plan that it was “prudent and feasible to preserve the [Frank J. Wood] bridge in its current usage and that it has preservation potential.” The report outlines steps that needed to take place in order to maintain the bridge. Several of these steps were subsequently completed while several others were not, leading to its continued deterioration 15 years later. David Gardiner, MDOT’s current Environmental Office signed this document. (Attachment 1)<sup>1</sup>

February 25, 2015

MDOT holds a project kick off meeting at Topsham’s Library where members of the public attend and express support for preserving the bridge. “As I said, the PDR [Preliminary Design Report], we’re thinking we’d have recommendations about fall. At that point DOT will be back with T.Y. Lin and we will present those recommendations in a forum just like this” (page 33 lines 17-21 Joel Kittredge taken from public minutes. page 9, line 14-20 Public Meeting 2/25/2015).

November 15, 2015

Email between Joel Kitteridge and Norman Baker, TY Lin’s project lead, in which Baker states that “a 30-year rehab is the most cost effective alternative” and includes a Fatigue Analysis that concludes fatigue is not a concern. (Attachment 1)

March 21, 2016

Bruce Van Note (former MDOT employee and Topsham resident) to Joel Kittredge, email discussing how to suppress public comment and participation. (Attachment 1)

April 20, 2016

John Shattuck (Topsham economic development official) to Kittredge, email “... is a bit odd, as reporter seems to think that the various options are still being actively considered...”

April 21, 2016

Email forwarded from Rich Rodner, Topsham Town Manager, to Ted Talbot, Jeff Folsom and Wayne Frankhauser (all of MDOT) about the recently started Friends of the Frank J Wood Bridge Facebook page, “To correct the record it was started by Penninah Graham not Scott Hanson.” This was the beginning of MDOT surveilling the Friends’ Facebook page, even assigning an employee the task. The purpose of this was not to be helpful to the group of concerned citizens and try to anticipate their questions and

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<sup>1</sup> Attachments are organized by Month(s) and contain pertinent information

concerns, but to actively dispute those concerns and brainstorm ways to discourage the public expressions of pro-rehab opinions.

April 22, 2016

John Shattuck to Joel Kitteridge, email complaining about an email from John Graham asking that the Topsham Historic District Review Committee be named as a 106 Consulting Party.

April 22, 2016

Email between Joel Kittredge and Norman Baker clearly outlining how to present the bridge in the worst possible light and the new bridge in the best. Falsifying both alternatives to meet their objective. (Attachment 1)

Late April, 2016

MDOT held a series of public meetings at which they declared that the decision had been made to build a new bridge, before the Preliminary Design Report draft was completed or historic and environmental reviews begun. Instead of information, analysis, and recommendations, a sales pitch for a new bridge was presented. The slideshow lacked details, real numbers, and was a broad overview of their conclusion. A projected two-year road closure and rusty pictures of the historic bridge were used to rule out the preservation options. Ty Lin publicly raised fatigue concerns that they had concluded were not a concern in an analysis discussed in the November 25, 2015 email cited above. Norm Baker, TY Lin, project manager also falsely stated that the bridge's superstructure was a 4, when in fact at the time it was a 5. FWHA policy calls for rehabilitation of a 5 and replacement of a 4.

Late April, 2016

The April 25, 2016 Public Meeting did not go as MDOT planned. The majority of the feedback was in favor of rehabilitation, and there was very little support for the proposed new design, even among those who preferred a new bridge. The primary support for the new bridge came from a small group of town officials and a former MDOT employee who had been in direct communication with MDOT for months prior to the meetings and were involved in planning the roll out and suppression of any opposing view.

Late April, 2016

The project's Purpose and Need Statement stated: "Brunswick 22603.00 - Preliminary Engineering for Future Improvement: Frank J. Wood Bridge #2016 on the Brunswick-Topsham town line, carrying Rte 201 over the Androscoggin River." This was sent to tribal leaders and other agencies asking for their input at the start of the Section 106 consultation process.

Late April, 2016

The Bridge is NOT functional obsolete and was NOT structural deficient at this time while there were 205 other bridges in Maine that were structurally deficient. The Frank J. Wood Bridge had a Federal Sufficiency of 51.4.

Late April, 2016

Friends of the Frank J. Wood Bridge was organized shortly after the last Public Meeting by residents of Topsham and Brunswick who felt rehabilitation has not been seriously considered as an option and believed it should be. Registered as a non-profit organization in the state of Maine, we have continued in our efforts to have rehabilitation seriously considered for nearly two years. Our Facebook page has close to 1200 followers who support rehabilitation of the bridge, nearly all local residents.

May 02, 2016

Joel Kittredge to John Shattuck, stating Upper Management of MDOT has approved Kittredge to be point of contact to Towns and asking for list of 15 members of a Design Advisory Committee to propose aesthetic "enhancements" for the proposed new bridge and naming Bruce Van Note (former MDOT employee) as chair. MDOT also asks to review draft resolution language a full month before the towns' governing bodies see it. This is well before either the Brunswick Town Council or Topsham Selectman had been informed of the plan (Attachment 1).

June 2, 2016

Town of Topsham Selectman vote in favor support of the new bridge and for forming a committee to help in its design, based on questionable information from the town's economic development officer, John Shattuck. From Town of Topsham selectmen's meeting Minutes, emphasis added, "John Shattuck noted that MDOT has clearly communicated that it has completed its engineering and safety assessment of the Frank J. Wood Bridge and that it intends to proceed with its recommendation to replace the existing bridge. They have presented renderings of the preliminary bridge design recommendations but have indicated that these design recommendations are not final. *They have informed the Towns of Topsham and Brunswick that it would be helpful for them to work with a joint Design Advisory Committee (DAC) which would be appointed by both towns and that they (MDOT) would be receptive to input and suggestions from that committee. Brunswick will act on their resolutions at a meeting on June 6.*" Although MDOT later publicly claimed to have had no role in setting up the DAC, it was presented to the Selectman of Topsham as a request from MDOT. Joel Kittredge was in attendance and did not correct the record. Nine people spoke in favor of rehab and three in favor of the new bridge.

August 2016

In early August Brunswick Council hears comments from both sides and takes no action. Mid August, without notice the DAC committee is submitted to the agenda last minute and passes. All individuals appointed to the DAC were community members supporting a new bridge. The chair of the committee was a former MDOT employee and was chosen to chair the committee before the committee was even approved by the towns. MDOT stated in Section 106 Meetings that this committee was not "their" committee and they did not create it, "the towns" did. Documents obtained through a FOIA request show otherwise, as does the language presented in the Town's minutes to each board.

July 11, 2016- 1st of three 106 Meetings- MDOT's consultant laid out the alternatives and their historic consultant described the Area of Potential Effect (APE) she had determined and her initial determinations of eligibility. The Friends pointed out that there was no mention of the existing National Register historic districts beyond the mills on each side of the river and the fact that the bridge links these districts and the mills into a continuous historic context that extends for several miles from one town into the other. The Friends requested that the APE be expanded to include these existing NR districts, as removal of the bridge would likely have an adverse effect on them. MDOT subsequently rejected this request. It was stated by MDOT and FHWA that they intended to use a Categorical Exclusion for dealing with the 4(f) and environmental reviews, which the Friends challenged.

August 3, 2016

MDOT announce latest bridge inspection requires them to Post the bridge for 25 tons and prepares a report that says the deck needs work and outlines a five-year fix estimated at eight hundred thousand dollars.

August 15, 2016

Letter from Friends Attorney Steve Hinchman to FHWA and MDOT outlaying concerns about Alternatives and Categorical Exclusion. (Public Record)

August 17, 2016

Second Section 106 review meeting in Brunswick. Key points from the meeting:

- This meeting saw the attendance of more, and higher ranking, officials from the Maine Department of Transportation (MDOT), as well as the Director of the Maine SHPO.
- MaryAnn Naber, of the Advisory Council on Historic Preservation (ACHP) in Washington, DC, called in and participated in the meeting.
- Representatives from MDOT reported on the recent bridge inspection and 25 ton posting of the bridge the same week.

- The take-away is that the bridge deck needs replacing as already called for in the Rehabilitation Plans.
- MDOT's historic consultant reports that the bridge is part of an eligible historic district including the mills on either side of the river (Cabot/For Andros and Pejepscot/Bowdoin).
- It is possible the loss of the bridge would affect this determination of eligibility.
- The Friends express that it is important that any question of individual eligibility for Cabot Mill be studied and answered prior to a decision being made on possible demolition of the bridge as eligibility for listing on the National Register is a requirement for the use of state and federal historic tax credits for rehabilitation. The Bowdoin/Pejepscot mill is already individually listed on the National Register and would be unaffected for use of historic tax credits by demolition of the bridge.
- Friends pointed out that the proposed industrial district could not include the hydroelectric dam as the existing structure was built in 1980. The district was therefore, three parts, two mills with the bridge being the sole connector. Making the adverse effect greater if the bridge is removed.

It is notable that in this meeting and in the press release and public statements from MDOT related to the posting of the bridge, they are no longer stating that MDOT is recommending a new bridge be built and are being careful to state that no decision has been made. They are now saying that a decision won't be made until 2018, when all of the reviews are completed, and all of the alternatives have been considered. MDOT Bridge Engineers publicly state it is feasible to replace the Frank J. Wood Bridge's deck and add 75 more years of life to bridge.

August 17, 2016

After the Section 106 meeting, Cheryl Martin (FHWA), verbally tells several members of Friends it is "premature" for MDOT to participate in DAC. A statement from MDOT's attorney clearly says MDOT had no involvement in the DAC formation, but emails obtained through a Freedom of Information request show the contrary. A "Federal definitions to Final Design and Preliminary Design" also obtained from the Freedom of Information Request shows a copy highlighted by MDOT, in which it states that FHWA has the power to say certain activities should not proceed until the NEPA is complete. Of the six reasons given to not proceed, five of them directly relate to the DAC formation and attendance. For the record, these meetings were widely reported on with photos showing both MDOT and representatives of TY Lin in attendance. Over the following year, MDOT staff and their consulting engineer from TY Lin attended all meetings of the DAC and provided numerous renderings of possible bridge "enhancements" considered by the committee and other materials. Clearly, thousands of dollars and countless hours were spent by MDOT in support of this effort to

focus public attention on a new bridge long before the required historic and environmental reviews were completed, or even started in most cases.

September 1, 2016

Friends Receive Response from MDOT to Attorney Steve Hinchman's August 3rd, letter (Attachment 1). Note- see May 2, 2015 emails showing MDOT did participate in the DAC formation in direct contrast to letter claiming they did not.

October 27, 2016

Third 106 Consulting Meeting. In the November 2016 meeting MDOT introduced the revised Purpose and Need Statement. The revised statement was drafted in an unsuccessful attempt to disqualify one or both of the rehabilitation alternatives. In the end all alternatives were deemed to meet the Purpose and Need. Even so, in the PDR and EA MDOT tried to characterize the rehab alternatives as "partially meets" but Federal Highway ruled that all the alternatives met the requirements. No evidence has been provided to show otherwise. Repeated requests for a proper pedestrian study were made by the Friends. None has been undertaken. The latest numbers MDOT has are from 2006, where in a 12-hour period on a sunny June day 197 people crossed Cabot Street, the nearest side street to the bridge. The Fort Andros (Cabot) Mill complex, which contains professional offices, retail stores, a flea market, artist studios, and several restaurants is between Cabot Street and the bridge. There is no documentation for how many people were walking to or from the Mill Building and not to or from the bridge (Appendix 1).

November 2016

Repairs done to deck to gain five more years of posted life. The cost came in at just under \$200,000 compared to the quoted \$800,000, or 25% of MDOT's estimate.

November 23, 2016

The Friends and John Graham, as an individual, submit comments and concerns to the Determination of Effects. (See EA Appendix 6)

**December 05, 2016**

Email from Mary Ann Naber (ACHP) to Cassie Chase(FHWA) outlining concerns with the 106 Process and the lack of a qualified engineer's report to look into rehabilitation options and true costs.

January 20, 2017

Meeting Minutes with Brookfield/FERC concerns. "Brookfield [owner of adjacent hydro-electric dam] will not assume the high risk level (\$\$\$) associated with having to do future improvements to fishway as a result of our bridge..."

February 2017

MDOT submitted their Findings of Effect Report to SHPO seeking concurrence on their determinations of eligibility and conclusions about adverse effects. The report included fourteen letters in support of replacement and omitted nearly 150 letters they had received in support of rehabilitation. These letters were only entered into the record because the Friends had copies and submitted them to SHPO with their comments on the report, along with 180 signatures on a petition circulated locally in support of rehabilitation.

February 23, 2017

Bernard Lown Peace Bridge, Lewiston- Kick off meeting and power point. Please note this bridge had the same Federal Efficiency rating as the FJW did at time of kick off, but is treated drastically different, with renderings of the bridge rehabilitated and no scare tactics about its fracture critical nature, even though the bridge had a severe failing. Also attached is the Final PDR for this bridge. The initial 30-year costs that favor rehabilitating this bridge were very similar to the conclusions made by TY Lin initially on the FJW. See November 15th 2015 above. Rehabilitation work started on this bridge March 2018!

February 27, 2017

The Friends submit their comments to SHPO and identified numerous errors and omissions regarding historical fact in MDOT's report and challenged several of the conclusions. SHPO subsequently required MDOT to do additional research and revise their report to address concerns raised by the Friends.

March 03, 2017

MATRIX OF ALTERNATIVES INVESTIGATED. Note all alternatives meet Purpose and Need Statement.

March 29, 2017

Maine Historic Preservation Commission (SHPO) issues letter of Concurrence, finding an eligible industrial historic district that includes the bridge and two mill complexes as contributing resources and an eligible residential historic district along Summer Street in Topsham (the Findings of Effect were revised in January 2018, when the bridge was determined to be individually eligible).

April 5, 2017

Public "Open House" on project hosted by FHWA at which MDOT outlines alternatives but does not allow the Public to speak or correct many of the misconceptions from previous misstatements that remain in the public's mind as fact. Clear bias was again shown in the powerpoint presentation by presenting the worst case for the existing bridge and the best case for a replacement. The public was shown gloomy pictures of

the rusty portions of the existing bridge and glorious visions of a sunny sky with happy bikers and walkers of the new bridge with an eagle soaring above.

Over protests by both supporters of rehabilitation and new construction, no verbal public comment was allowed. Instead, "information booths" on various aspects of the project, attended by MDOT employees who lacked information and often knowledge about the project, were spread out so only a few of the hundreds of people present could hear questions and answers. There was no booth addressing rehabilitation options. The format of this meeting was an obvious attempt to silence the voices of opposition and to keep the record from being corrected.

At this public meeting and in statements to the press, MDOT repeatedly made a point of stating that the historic bridge was "not individually eligible for the National Register." They never explained that under Section 106 and 4(f) an eligible resource in a potential NR district is to be treated the same as an individually eligible resource. This led members of the public to conclude that the bridge was "not historic."

June 2, 2017

Letter from NOAA- expressing concerns about fish ladder and new bridge.  
(Attachment 1)

June 27, 2017

MDOT Press release- Preferred alternative is UpStream replacement Alternative 2.

August 04, 2017

Preliminary Design Report Released. A full month after the preferred alternative is announced (again).

September 7, 2017

MDOT receives letter from Army Corps of Engineers, outlining required permits and reminding them that only the least harmful alternative may be approved. (EA Appendix 4).

September 8, 2017

Maine Preservation names The Frank J. Wood Bridge to their yearly list of Maine's Most Endangered Historical Places List.

January 16, 2018

Addendum to Supplemental Supporting Information for a Finding of Effect, released stating the bridge is individually eligible for the National Register. This occurred after SHPO determined on the basis of additional information provided by a member of the Friends that the bridge is individually eligible for its association with the interurban rail system that once served Maine. FHWA concurred with this determination and MDOT reluctantly accepted it, without any public mention of the determination.

February 15, 2018

Friends Letter responding to Finding of Individual Eligibility sent to Cheryl Martin and placed in the record

March 6, 2018

EA Released with draft 4f.

March 28, 2018

The EA Public Meeting continued the pattern of presenting incomplete information with a clear bias toward new construction. A moderator was hired and the advertised "brief presentation" by MDOT dragged on for more than 45 minutes with very little information about environmental impacts but numerous pictures of the rusty portions of the bridge. This was the latest example of MDOT following through on what was directed in the April 22, 2016 email between Joel Kittredge and Norman Baker, outlining how to present the historic bridge in the worst possible light and the proposed new bridge in the best (above under that date).

There are several environmentally sensitive aspects to the setting and siting of the proposed new bridge. The existing bridge is a short distance downstream of a FERC licensed hydro-electric dam with associated fishway for several endangered species of fish. The proposed new bridge would be located between the existing bridge and the dam, curving outward toward the dam and covering the last exposed area of natural falls. Several species of endangered fish spawn in the area to be covered as well.

No mention was made of the likely fish ladder shading and potential MDOT liability from resulting impact to endangered species of fish caused by moving the bridge closer to the dam. No mention was made about the fill required in the wet lands for a new bridge approach and no mention was made about the historic bridge's newly identified individual eligibility during the presentation. The public comment period was opened up at 7:15 and people spoke in support of both rehabilitation and new construction. At 8 o'clock, with multiple people in line to speak, the moderator tried to shut the meeting down and only after loud protests from the audience was it allowed to continue for more than an hour of additional comment.

April 4, 2018

Email from Robert Shulock (Engineer) to John Graham-Friends with attached letter, outlining biases and assumptions made in TY Lin's engineering analysis. (Addendum 1)

April 9, 2018

Engineering Report from JDB Consulting Engineers, Inc., commissioned by the Friends outlining three alternatives and two recommendations, including Life Cycle Costs. All are within the range of TY Lin's quote for the new upstream bridge, including life cycle costs. The report's Alternative 3 is an alternative that should be studied further as it looks promising for solving MDOT's fracture critical concern while still retaining the existing bridge's structure and appearance. (See attached) It also highlights and

addresses several of the "scare" tactics MDOT used with Fracture Critical and the "Cadillac" future maintenance plan. (Attached)

April 9, 2018

Robert Shulock, Engineer provides a peer review of JDB Consulting Engineers' Report. (Attached)

## Historic Frank J. Wood Bridge Study

Bridge # 2016 Frank J. Wood Bridge US 201 & Rt. 24 Over the  
Androscoggin River Brunswick, Cumberland County  
Maine DOT Region 1 (Southern)



REHABILITATION



RESTORATION



CONSTRUCTION

### **Prepared for:**

Friends of the Frank J. Wood Bridge  
10 Pleasant St.  
Topsham, ME 04086

### **Prepared by:**

JDB Consulting Engineers, Inc.  
835 Samoset Rd.  
Eastham, MA 02642

April 9, 2018

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April 9, 2018

**Historic Frank J. Wood Bridge Study  
Bridge # 2016 Frank J. Wood Bridge US 201 & Rt. 24 Over the  
Androscoggin River Brunswick, Cumberland County  
Maine DOT Region 1 (Southern)**

## DESCRIPTION OF BRIDGE

The Frank J. Wood Bridge, was originally built as two lane highway with a single railway line centered between the present two lane roadway in 1931, to provide access across the Androscoggin River for the towns of Topsham and points west to Brunswick. The superstructure consists of a three span 805-foot long northerly-positioned truss opposite to a southerly three span 803-foot long truss. The structural framework comprises of three parallel riveted steel Warren trusses with verticals. The bridge truss consists of three steel through spans approximately 310 ft. - 310 ft. - 175 ft. in length and each of three truss spans are simply supported.

The bridge deck consists of a 30-foot wide roadway and one 5-foot wide raised bracketed cantilever sidewalk.

The substructure consists of two concrete gravity abutments each side of two reinforced concrete interior monolithic river piers founded on ledge.

Information provided indicated that this crossing was repaired in 1985, 2006, and 2015. The bridge is a “fracture critical” structure, indicating it is vulnerable to sudden collapse if certain components fail, in this case associated to specific truss diagonals and verticals and the entire bottom chord elements and connections including the floorbeams.

Such a designation requires more detailed inspections. The bridge is now is presently posted for 25 tons. There is corrosion and section loss in the steel floor system supporting the deck, transverse cross beams, longitudinal stringers, and transverse floor beams. The floor system, bottom chords, and the concrete deck are currently in poor condition, and the bridge has a FHWA Sufficiency Rating of 25.4.

## PAST INFORMATION USED IN INVESTIGATIVE EVALUATION

- TY Lin International Preliminary Design Report – Date: 08.04.17
- MaineDOT Inspection Report – Date: 08.01.16
- FHWA Letter Response – Date: 09.07.17
- Alternative Summary TY Lin International – Date: 03.10.17
- 106 Historic Finding – Date: 02.01.17
- Posting Limit and Detour DOT – Date: Not Dated
- Original Bridge Plans Partial Set Existing Cross Sections – Date: 1931
- Original Bridge Plans Partial Set Existing Substructure Plans – Date: 1931
- Original Bridge Plans Partial Set Existing Superstructure Plans – Date: 1931

**Historic Frank J. Wood Bridge Study  
Bridge # 2016 Frank J. Wood Bridge US 201 & Rt. 24 Over the  
Androscoggin River Brunswick, Cumberland County  
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- Parsons Bridge Rating Rating – Date: 03.01.13
- Parsons Bridge Rating Rating Appendix – Date: 03.01.13

## VEHICLE LOAD RATING, CRITERIA AND RESULTS

The inventory load rating capacity along the newly proposed replacement and rehabilitated main truss and load carrying undercarriage members was determined in accordance with the most recent edition of the provisions found in "AASHTO LRFD Bridge Design Specifications," published by the American Association of State Highway and Transportation Officials (AASHTO).

The inventory load rating is the superimposed load capacity of which can safely be utilized on an existing structure for an indefinite period of time.

The live load used in establishing this evaluation, rating and proposed repairs were two standard AASHTO HL-93 (36 ton) truck lane load configurations.

The truck loading used in this investigation was used to produce the maximum stress.

All data (member sizes, effective member after corrosion losses etc.) required to rate and structurally evaluate this bridge, were obtained by others that can be found in the past information cited in the referenced section noted above and during several field visits completed by this office.

Results from TRAP (Truss Rating Analysis Program) output and model was used to provide forces along various critical truss members for the bridge rating computations completed March 2013 by Parsons were used in conjunction and verified with VA (Virtual Analysis) computer models when determining the various bridge rehabilitation options presented in this investigation.

Critical connections, members and truss gusset plates elements along this bridge crossing that control the present live load rating for the truss spans 2 and 3 total 31. A rating evaluation for truss span 3 was not evaluated in the rating report completed by Parsons since span 1 is structurally similar to truss span 3. A summary and breakdown of the load ratings pertaining to these specific critical areas can be found in the preceding "Bridge Rating Breakdown: Controlling Truss Elements of Concern" section of this investigative evaluation.

**Historic Frank J. Wood Bridge Study  
Bridge # 2016 Frank J. Wood Bridge US 201 & Rt. 24 Over the  
Androscoggin River Brunswick, Cumberland County  
Maine DOT Region 1 (Southern)**

## REHABILITATION OPTIONS

Approximately 50 percent of the main undercarriage load carrying stringer and floorbeam members along the trusses previously analyzed and rated were determined to be insufficient to receive HL-93 truck 36-ton load. The small transverse needle beams originally installed atop the stringers would need to be removed to rehabilitate these supporting stringer and floorbeam members. Also, all rehabilitation options would need to endure 75 years of use. Therefore, the most cost effective manner of repairs for these members would be the removal and replacement of all these members throughout the bridge.

The critical structural truss components investigated pertaining to the three options noted below would be required to receive and conform to or exceed the inventory load capacity for two HL-93 truck (36-ton) lane load truck configurations.

### OPTION 1:

#### BETTERMENT REPAIRS EXODERMIC DECK REPLACEMENT WITH POLYMER EPOXY MEMBRANE WATERPROOF WEARING SURFACE

Since all truss spans are spatially stable and the present undercarriage support system is structurally obsolete one recommended rehabilitation scheme proposed is to remove the entire deck, stringers, needle beams and individually replace all the floorbeams and bottom chord bracing after necessary repairs are completed to all the trusses.

After the removal of all pack and surface rust along all three trusses: all fracture critical truss pins located at the piers and abutments including all existing welds found along fracture critical diagonals, verticals and lower chords would be ultrasonically tested for internal inclusions or flaws.

Any welds found and containing detrimental internal inclusions or flaws after ultrasonic testing and any members or gusset and connection plates found to have excessive cross sectional loss due to corrosion would either be replaced or splice repaired and the post-tensioning of truss elements would be implemented as needed. If any main support pins were found to contain internal flaws etc. the location, size and orientation would be assessed with respect to structural adequacy and the pin would be replaced or left in place and monitored from time to time in the future. Refer Sheet 1 (Appendix A Photographs and Illustrations - Truss Betterment Repairs) for additional information.

All the trusses would be painted and then new floorbeams and stringer beams would be individually installed followed by the installation of new precast exodermic steel grid and concrete deck panels.

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The exodermic deck would consist of a non-composite precast concrete 5 inch overlay with a 2 inch concrete overfill above the top of the steel bearing bars with a concrete cast in place in-filled stringer haunch atop and attached to preinstalled welded top flange stud connectors. Refer Sheet 2 (Appendix A Photographs and Illustrations - Exodermic Concrete Filled Steel Grid Deck) for additional information.

The bridge would need to remain closed until all construction was completed. Estimated cost of this option is: \$13,500,000. This estimate includes a  $\pm 15\%$  contingency for unforeseen conditions that may arise during the period of construction and painting all existing steel truss members.

The service life-cycle cost for this bridge project over a 100 year period is anticipated to be \$17,500,000. This includes the construction cost, replacement of the proposed wearing surface and painting the steel trusses and undercarriage every 20 years.

A breakdown summary of all the costs for this option can be found at the end of this section.

Refer to Appendix B Construction Betterment Computations and Appendix C Construction Cost Estimates for Rehabilitation Option for a breakdown of items, computations and the unit cost of each item used in arriving in this estimate.

<b>OPTION 1: COST ESTIMATE AND QUANTITIES</b> <b>FRANK J. WOOD BRIDGE</b>						
PROJECT: REHABILITATION PRESERVATION Bridge # 2016 LOCATION: US 201 & Rt. 24 over Androscoggin River Feb. 8, 2018						
ESTIMATE OF QUANTITIES AND COST - BRIDGE BETTERMENTS						ESTIMATE
REF. No.	DESCRIPTION	QTY.	UNIT	UNIT PRICE	AMOUNT	
1	DEMOLITION SUPERSTRUCTURE	29750	SF	40 \$	1,190,000.00	
2	NEW EXODERMIC BRIDGE DECK	28350	SF	91 \$	2,579,850.00	
3	HOT MIX ASPHALT FOR MISCELLANEOUS BRIDGE WORK	144	TON	250 \$	36,000.00	
4	SAFETY CONTROLS FOR CONSTRUCTION OPERATIONS	820	UD	80 \$	65,600.00	
5	SAFETY SIGNING FOR CONSTRUCTION OPERATIONS	1600	SF	25 \$	40,000.00	
6	TEMPORARY CONCRETE BARRIER REMOVED & RESET	810	FT	20 \$	16,200.00	
7	REFLECTORIZED DRUM	34000	UD	0.6 \$	20,400.00	
8	4000 PSI CEMENT CONCRETE ABUTMENT REPAIRS	12	CY	1000 \$	12,000.00	
9	STRUCTURAL STEEL NEW STRINGERS COATED STEEL	501840	LBS	6 \$	3,011,040.00	
10	STRUCTURAL STEEL FLOORBEAM COATED STEEL	250920	LBS	7 \$	1,756,440.00	
11	STRUCTURAL STEEL NEW SPLICE CONNECTION & GUSSET PLATES	32500	LS	16 \$	520,000.00	
12	TEMPORARY SUPPORTS FOR ALL UTILITIES I.E. PIPES ETC.	1	LS	200000 \$	200,000.00	
13	PAINTING TRUSS	1	LS	200000 \$	200,000.00	
14	CONTINGENCY COST ESTIMATE 15 PERCENT				\$ 1,447,129.50	
15	ENGINEERING AND CONSTRUCTION INSPECTION				\$2,400,000	
<b>TOTAL PROJECT COST:</b>						<b>\$ 13,494,659.50</b>
<b>* LIFE CYCLE SERVE COSTS OF 100 YEARS:</b>						<b>\$ 4,000,000.00</b>
<b>TOTAL PROJECT COST OVER A LIFE CYCLE SERVICE OF 100 YEARS:</b>						<b>\$ 17,494,659.50</b>

\*Note Includes preventive long-term bridge maintenance costs: deck resurfacing twice over 100 years@\$1,000,000 and the cost of painting steel superstructure using a chemical bonded/neutralizing paint film every 20 years over 100 years@\$3,000,000

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**OPTION 2:**

**BETTERMENT REPAIRS EXODERMIC DECK REPLACEMENT WITH  
 BITUMINOUS CONCRETE WEARING SURFACE**

Similar to option one above the same exodermic deck would consist of a non-composite precast concrete 5 inch overlay with a 2 inch concrete overfill above the steel bearing bars and a concrete cast in place in-filled stringer haunch atop and attached to preinstalled welded steel stud connectors was investigated. A 2½ inch bituminous concrete wearing surface over a rubberized waterproof membrane atop the concrete surface along the new exodermic deck would replace the polymer epoxy system proposed in option 1 above.

The bituminous concrete wearing traffic surface would provide more resistance to wear due to long-term traffic thus reducing required periodic maintenance intervals. However, the overall load resistance of existing truss members did not comply with inventory HL-93 truck loading requirements. Therefore since the degree of needed structural truss repairs and member replacement and reinforcement needed to accommodate this option is not cost effective this option was not explored and is not recommended.

**OPTION 3:**

**NON-FRACTURE CRITICAL TRUSS RESTORATION: INDEPENDENT  
 NEW PLATE GIRDER UNDERCARRIAGE SUPERSTRUCTURE**

Due to the structural configuration of the sway portal and top chord bracing frames along all three truss spans along the Frank J. Bridge all truss spans are spatially stable. Additionally, the present undercarriage support system is structurally obsolete, therefore another alternate to the rehabilitation scheme discussed in Option 1 would similarly remove the entire existing undercarriage (deck, stringers, needle beams, lower chord bracing and floorbeams) under the roadway and replace this system with a steel plate girder superstructure with a fiber reinforced polymer deck and roadway surface after additional reinforcement is added, if needed, to all the top chord bracing and end portal sway frames to resist anticipated lateral seismic and wind forces as per AASHTO specifications.

The lateral bottom chord bracing elements were originally used and installed in the past to true up and align and maintain the truss-framing members during assembly and to resist crosswinds at the time of erection of this bridge.

However, to reduce possible wind vibrations after erection of the new steel girders, each outer fascia girder each side of the bridge would be connected to translate horizontal wind load forces from the lower bottom truss chords to these new members via a non-

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**Androscoggin River Brunswick, Cumberland County**  
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fracture critical vertical slip connection connected along the web at each cross diaphragm location along each girder.

Once the lateral truss bracing and trusses were structurally reinforced and existing structural undercarriage was removed two or three 80 ft. to 150 ft. long steel plate girder beam sections would be preassembled and would be positioned from the Tomsham end of this crossing and continuously spliced and bolted together longitudinally and rolled towards the opposite end of this river crossing. All steel plate girders would be supported and guided on temporary preinstalled heavy duty Hillman rollers until they reach the opposite end of the riverbank and abutment.

Intermediate temporary shores would be placed along the present existing ledge profile found along the riverbed as needed to support the steel girders and rollers as they are guided into their final seated position on the opposite existing abutment.

The steel plate girders would likely be simply supported and uncoupled over each pier once all sections were fully secured and erected in place.

Prior to the erection of the new steel girder spans mentioned above and similar to Option 1 all pack and surface rust would be removed along all three trusses and painted. After construction the present existing truss spans would act in a structurally non-functional manner independent of the new girder span with respect to anticipated live truck loads from the upper roadway and would remain in-place on each side of the newly installed steel plate girder spans.

Finally, the present day LRFD resistance rating factor, i.e. factor of safety with respect to the present critical member recently rated (Sidewalk Truss Span 2-Gusset Plate L0) with respect to the dead weight of this truss including all sway braces and top chord bracing after construction of the new girder bridge span is completed is expected to be more than 7 to 1.

Refer Sheet 3 (Appendix A Photographs and Illustrations - Preliminary Evaluation: Replacement of Existing Structural Undercarriage) for additional information.

The bridge would need to remain closed until all construction was completed. Estimated cost, service life-cycle cost and time frame to complete needed construction of this option is anticipated and would be similar to Option 1.

#### BRIDGE BETTERMENT RECOMMENDATIONS:

##### Option 1:

Option 1 is recommended based on the cost effectiveness and past long-term performance record that is inherent and can be expected with this deck system. This

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option should be completed in a construction period of 18 to 24 months if the present crossing is closed during this time period and a temporary detour is provided. The present sidewalk could remain open for pedestrians during construction with a few daily or weekly closures needed during critical construction operations at this bridge site.

Additionally, if the workday construction schedule is extended to an additional 4 hours so a crew of workmen are able to work along two continuous rotating shifts throughout the construction period the time required to complete this project could be expected to be reduced to 16 to 18 months. Also, if night work were allowed thus permitting two full work crew shifts on site during construction this additional extended workday would significantly reduce the bridge closure period.

This office does not recommend that the existing roadway crossing be completed in manner of phase construction when executing and completing the needed repairs outlined in option 1. Since construction costs would be significantly greater and any unforeseen structural condition that may arise when replacing or repairing various critical bridge and truss elements may prove unsafe to vehicles and pedestrians.

#### Option 3:

Option 3 similar to Option 1 is also recommended. This option is being mentioned and recommended based on the present age and past inherent fracture critical nature of this truss bridge.

Although construction betterment repairs outlined for Option 1 would provide an economically viable and safe bridge crossing and is recommended the rehabilitated bridge structure would remain a fracture critical bridge type and continue to require a greater degree of attention related to present day AASHTO design standards. Additionally, design standards with respect to such fracture critical bridge elements may change and newer technology presently not available could reveal that future problematic structural areas of concern that would need to be addressed at that time may adversely affect the anticipated long-term life and costs needed to remedy this truss bridge.

Therefore, Option 3 addresses and eliminates any and all future concerns related to the fracture critical design of the existing main trusses along this bridge crossing while maintaining the present crossing location and the overall historic nature and significance of this structure along the present site.

#### OTHER CONSIDERATIONS

As previously mentioned the Frank J. Wood Bridge is a fracture critical structure, i.e. if certain a member fails the bridge may collapse. However, its original

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design has and will still be able to maintain loads mandated and required by AASHTO if either bridge rehabilitation option as outlined above is selected.

The original design of the Frank J. Wood Bridge accommodated the load configuration for two 15 ton, trucks (AASHTO H-15 truck) and also included one 103 ton electric train loading. Design for these loads exceeds present required statutory loads by more than 20 percent of which makes it less susceptible to the fatigue failure of fracture critical members than a bridge designed for today's loadings.

The robustness of the design is clearly shown in the "Breakdown of Bridge Rating" where the Operating LRFR Rating Factors for critical bridge components for the rehabilitated bridge are well above 1.0, ranging from 1.4 to 2.8 with a mean value of 1.6.

The Frank J. Wood Bridge when compared to two similar steel truss bridges, one that suffered collapse from the failure of critical members, and one that has not. The Interstate 35 highway bridge crossing the Mississippi River in Minneapolis, Minnesota collapsed on August 1, 2007. This collapse was brought about by inadequacies associated with the original design and extreme overloading on the day of the collapse.

National Transportation Safety Board (NTSB) and others determined that the partial removal of the concrete deck which restrained the top compression chord of the truss which led to the buckling failure of critical gusset plates included: the placement of 150 tons of sand and aggregate positioned and permitted during construction over inappropriately undersized gussets plates this load prompted the ultimate collapse and failure of this bridge. Additionally, all the primary gusset plates which failed and buckled causing this bridge collapse were under sized by a factor of two and were found to be ½ inch in thickness (Ref: Highway Accident Report – Collapse of I-35W Highway Bridge, Minneapolis, Minnesota, August 1, 2007; Page 128; Dated: November 14, 2008).

In contrast the gusset plates along the two main spans of the Frank J. Wood Bridge were designed and contain ¾ inch thick gusset plates, the main spans of Frank J. Wood Bridge is one third smaller than the 456 ft. main span I-35 bridge in Minnesota. Also, the Frank J. Wood Bridge has two travel lanes verses 8 travel lanes which the Minnesota bridge I-35 Bridge carried prior to its collapse.

One final comparative example, pertaining to the structural gusset plate performance and the inherent safety as related to the Frank J. Wood Bridge. The Gill-Montague truss bridge, in the towns of the same name that crosses the Connecticut River in Massachusetts presently in service contains a single 202 ft. truss span truss span that adjoins a three span truss is approximately 1,250 ft. long. The gusset plates along main

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center span of this truss bridge is 450 ft. long and were also designed with  $\frac{3}{4}$  in. thick gusset plates in 1937 when this bridge was erected and built. Also, the single 202 ft. span along the Gill-Montague bridge were made up with  $\frac{3}{8}$ " thick gussets plates while the steel gusset plates along the shorter 175 ft. long truss span Frank J. Wood Bridge span are  $\frac{1}{2}$  in. thick.

The preeminent test for any bridge is to safely accommodate all the loads it will be subjected to. The longevity and resistance of the Frank J. Wood Bridge design is proven based on its past accommodation as both a train and highway crossing and the overall performance it has exhibited over the last 87 years. If either option 1 or 3 were implemented and selected for construction along this crossing each are an economical correct transportation solution for the local and regional community while maintaining a historic structure from our past for the next 100 years.

## BREAKDOWN OF BRIDGE RATING

TOWN / CITY: Brunswick-Topsham

BRIDGE NO.: #2016

CARRIES: U.S. 201 &amp; Rt. 24

OVER: Androscoggin River

STRUCTURE NO: Proposed Bridge Rehabilitation

BIN NO:

BRIDGE COMPONENT	INVENTORY LRFR RATING FACTORS		OPERATING LRFR RATING FACTORS	
	PRESENT HL-93 (36 TONS)	REHABILITATED HL-93 (36 TONS)	PRESENT HL-93 (36 TONS)	REHABILITATED HL-93 (36 TONS)
Span 2 Roadway				
Truss Members:				
U1-U2 Axial Compression	0.92	2.15	1.19	2.78
U2-U3 Axial Compression	0.94	1.46	1.22	1.90
U3-U5 Axial Compression	0.87	1.38	1.13	1.79
U5-U7 Axial Compression	0.90	1.41	1.17	1.82
U7-U9 Axial Compression	0.97	1.48	1.26	1.91
U7-L8 Axial Compression	0.85	1.13	1.10	1.46
Gusset Plates:				
L1 Bottom Chord	0.92	1.17	1.20	1.51
L2 Bottom Chord	0.99	1.41	1.28	1.83
L5 Bottom Chord	0.95	1.16	1.23	1.50
L9 Bottom Chord	0.99	1.21	1.29	1.57
L10 Bottom Chord	0.94	1.45	1.22	1.88
U1 Upper Chord	0.86	1.29	1.11	1.67

comments

HL-93 load rating factors less than 1 (36 tons) as reported in Maine DOT - Bridge Load Rating completed March 2013 by Parsons Brinckerhoff were reevaluated with respect proposed bridge rehabilitation.

## BREAKDOWN OF BRIDGE RATING

TOWN / CITY: Brunswick-Topsham

BRIDGE NO.: #2016

CARRIES: U.S. 201 &amp; Rt. 24

OVER: Androscoggin River

STRUCTURE NO: Test

BIN NO:

BRIDGE COMPONENT	INVENTORY LRFR RATING FACTORS		OPERATING LRFR RATING FACTORS	
	PRESENT HL-93 (36 TONS)	REHABILITATED HL-93 (36 TONS)	PRESENT HL-93 (36 TONS)	REHABILITATED HL-93 (36 TONS)
Span 2 Sidewalk				
Truss Members:				
L2-U3 Axial Compression	0.59	1.31	0.77	1.70
U7-L8 Axial Compression	0.86	1.08	1.12	1.40
L8-U9 Axial Tension	0.92	1.32	1.19	1.71
U9-L10 Axial Compression	0.96	1.43	1.25	1.85
Gusset Plates:				
L0 Bottom Chord	0.67	1.15	0.87	1.50
L10 Bottom Chord	0.71	1.17	0.92	1.51
U3 Upper Chord	0.94	1.14	1.22	1.47
U5 Upper Chord	0.93	1.10	1.21	1.42
U7 Upper Chord	0.94	1.10	1.21	1.42
U9 Upper Chord	0.98	1.15	1.27	1.50

comments

HL-93 load rating factors less than 1 (36 tons) as reported in Maine DOT - Bridge Load Rating completed March 2013 by Parsons Brinckerhoff were reevaluated with respect proposed bridge rehabilitation.

## BREAKDOWN OF BRIDGE RATING

TOWN / CITY: Brunswick-Topsham

BRIDGE NO.: #2016

CARRIES: U.S. 201 &amp; Rt. 24

OVER: Androscoggin River

STRUCTURE NO: Test

BIN NO:

BRIDGE COMPONENT	INVENTORY LRFR RATING FACTORS		OPERATING LRFR RATING FACTORS	
	PRESENT HL-93 (36 TONS)	REHABILITATED HL-93 (36 TONS)	PRESENT HL-93 (36 TONS)	REHABILITATED HL-93 (36 TONS)
Span 3 Roadway				
Truss Members:				
U3-L3 Axial Tension	0.89	1.07	1.15	1.38
Gusset Plates:				
L0 Bottom Chord	0.91	1.24	1.18	1.61
L1 Bottom Chord	0.88	1.05	1.14	1.36
L3 Bottom Chord	0.85	1.04	1.11	1.34
Span 3 Sidewalk				
Truss Members:				
U1-U3 Axial Compression	0.95	1.29	1.24	1.68
Gusset Plates:				
L0 Bottom Chord	0.72	1.06	0.94	1.38
U1 Upper Chord	0.94	1.23	1.22	1.59
U3 Upper Chord	0.99	1.17	1.28	1.52
ME Legal L3 Bottom Chord	0.98	1.19		

comments

HL-93 load rating factors less than 1 (36 tons) as reported in Maine DOT - Bridge Load Rating completed March 2013 by Parsons Brinckerhoff were reevaluated with respect proposed bridge rehabilitation.

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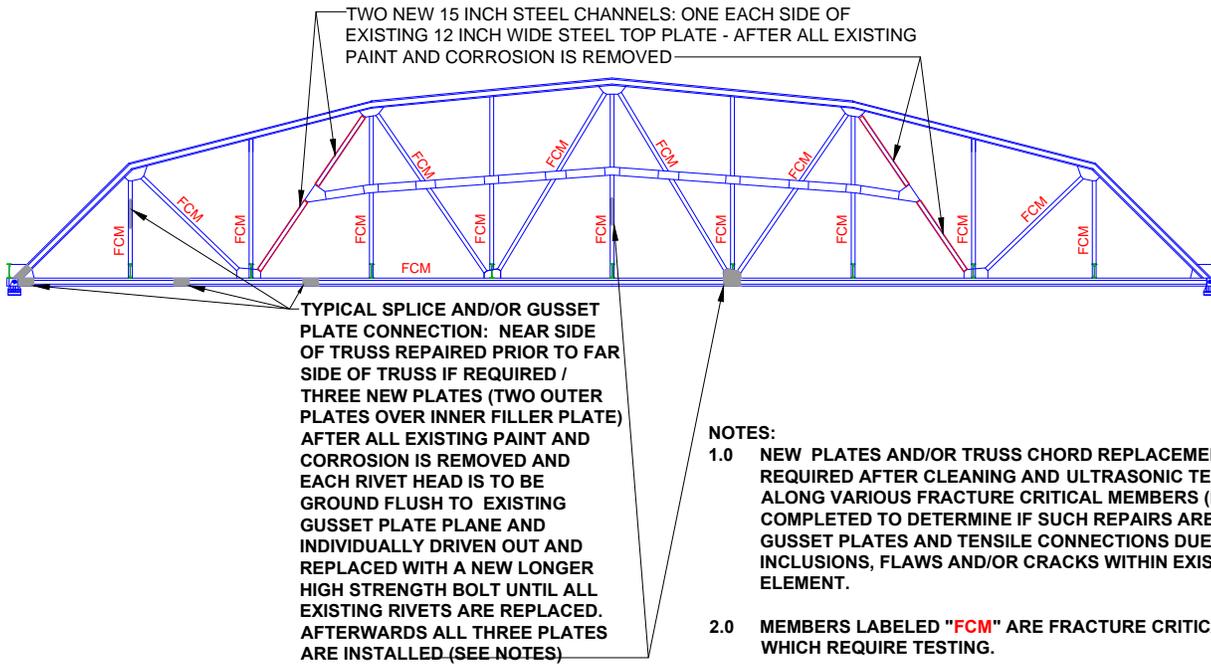
## LIMITATIONS OF INVESTIGATION

The recommended structural repairs outlined above are conceptual in nature. The evaluation contained herein was based on observed measurements and conditions found when a field reconnaissance, tactile inspection was completed by others and the engineer and existing engineering data, plans and tests performed by the provided by others.

If additional engineering data, plans and tests are brought to the engineer's attention in the future the analyses, results, recommendations and restoration repairs presented herein may be altered as determined by the engineer.

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**APPENDIX A Photographs and Illustrations**



**TYPICAL STRUCTURAL TRUSS BETTERMENT  
ELEVATION - SPAN 1  
(SIMILAR ALL THREE TRUSS SPANS)**



**TRUSS GUSSET PLATE REPLACEMENT**  
53 YEAR OLD - BRAGA BRIDGE Somerset, Massachusetts

**PARTIAL TRUSS CHORD REPLACEMENT AND SPLICE CONNECTION REPAIR**  
110 YEAR OLD - LOWER LEVEL BRIDGE Edmonton, Canada

**STEEL TRUSS BETTERMENT REPAIRS COMPLETED FOR VARIOUS  
MAJOR BRIDGE CROSSINGS IN THE PAST**

**FRANK J. WOOD BRIDGE**  
PROPOSED BRIDGE BETTERMENTS  
Brunswick-Topsham, ME

**JDB Consulting Engineers Inc.**  
835 Samoset Rd., Eastham, MA 02642

**OPTION 1**  
**PRELIMINARY EVALUATION**  
**TRUSS REPAIRS - FOR HL-93**  
**TRUCK LOAD**

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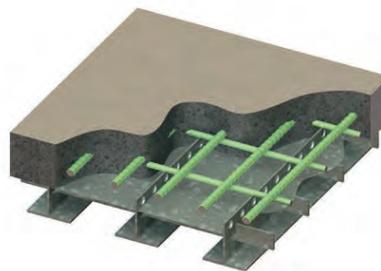
## Exodermic® Deck

An Exodermic® bridge deck is comprised of a reinforced concrete slab on top of, and composite with an unfilled steel grid. This hybrid system was developed in the mid-1980's to maximize the compressive strength of the concrete and tensile strength of the steel. Horizontal shear transfer between the reinforced slab and WT members is developed through the partial embedment in the concrete of the top portion of the main bars, which are punched with 3/4" diameter holes to provide the composite action.

Under negative moment, the rebar in the reinforced concrete slab takes the tensile forces just as it would in a conventional deck, and the WT main bars handle the compressive forces. In positive moment regions the WT main bars are in tension, while the concrete is in compression.

Assuming 2" of cover over the rebar, the overall thickness of the system using standard components ranges from 6-1/4" to 9-1/4". Total deck weights range from 61-71 pounds per square foot (assuming normal weight concrete). Exodermic® decks have the best strength to weight ratio of the grid deck systems making it the most structurally efficient grid, which in return yields one of the most cost efficient lightweight deck systems available.

When required, a larger WT section can be used to achieve span capacities greater than what is shown in the design tables.

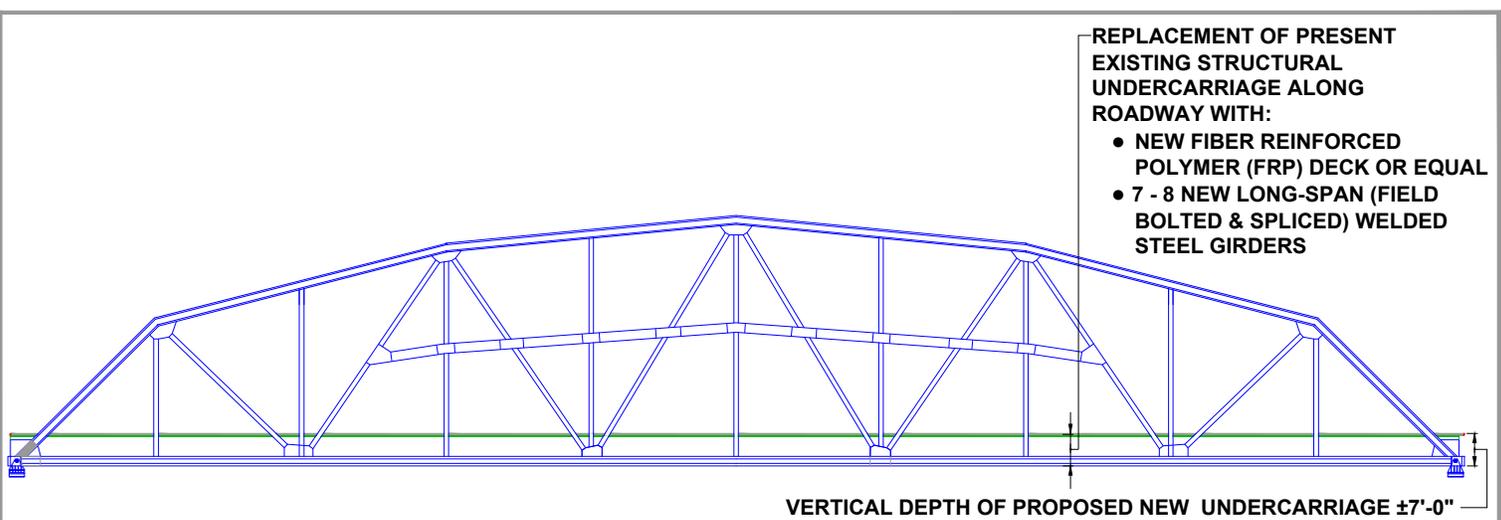


### Case Study: Grand Island Bridge

The Grand Island Bridges on Interstate 190 over the Niagara River between Tonawanda, Grand Island and Niagara Falls are a great example how grid deck systems help bridge owners follow through on FHWA's initiative to use prefabricated bridge technology to accelerate construction. The contractor on the northbound, South Grand Island Bridge replaced nearly 2,000 square feet of deteriorated bridge deck with new precast Exodermic® deck panels during every 7-8 hour nighttime closure. This construction schedule allowed the New York State Thruway Authority (NYSTA) to have all lanes open for morning and afternoon rush hour traffic and facilitated the early completion of this roughly 90,000 square foot redecking project.

> Grid Deck Advantage – Speed of Construction





REPLACEMENT OF PRESENT EXISTING STRUCTURAL UNDERCARRIAGE ALONG ROADWAY WITH:

- NEW FIBER REINFORCED POLYMER (FRP) DECK OR EQUAL
- 7 - 8 NEW LONG-SPAN (FIELD BOLTED & SPLICED) WELDED STEEL GIRDERS

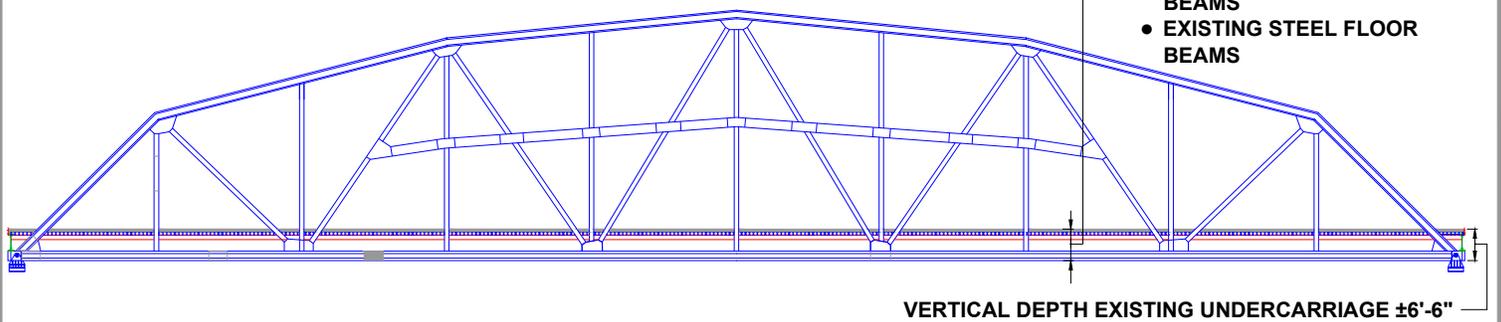
VERTICAL DEPTH OF PROPOSED NEW UNDERCARRIAGE ±7'-0"

**STRUCTURALLY RETROFITTED NON-FRACTURE CRITICAL TRUSS ELEVATION TRUSS SPAN 1 (SIMILAR ALL THREE TRUSS SPANS)**

**NOTE:**  
 ALL EXISTING EXISTING TRUSSES, SWAY FRAMES AND TOP LATERAL CROSS BRACING FRAMES ARE TO BE STRUCTURALLY UPGRADED AS REQUIRED TO MEET OR EXCEED AASHTO LATERAL SEISMIC, WIND FORCE AND DISPLACEMENT REQUIREMENTS PRIOR TO INSTALLATION OF NEWLY PROPOSED ROADWAY UNDERCARRIAGE MEMBERS.

REMOVAL OF PRESENT EXISTING STRUCTURAL UNDERCARRIAGE ALONG ROADWAY CONSISTING OF:

- EXISTING CONCRETE FILLED STEEL DECK
- EXISTING STEEL NEEDLE BEAMS
- EXISTING STEEL STRINGER BEAMS
- EXISTING STEEL FLOOR BEAMS



VERTICAL DEPTH EXISTING UNDERCARRIAGE ±6'-6"

**EXISTING TRUSS ELEVATION TRUSS SPAN 1 (SIMILAR ALL THREE TRUSS SPANS)**

**FRANK J. WOOD BRIDGE**  
 PROPOSED BRIDGE BETTERMENTS  
 Brunswick-Topsham, ME

**JDB Consulting Engineers Inc.**  
 835 Samoset Rd., Eastham, MA 02642

**OPTION 3**  
**PRELIMINARY EVALUATION**  
**REPLACEMENT OF EXISTING STRUCTURAL UNDERCARRIAGE - FOR HL-93 TRUCK LOAD**

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**APPENDIX B Construction Betterment Computations**

## Interior Non-composite bridge beam design and rating W-section or plate girder :

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Frank J. Wood bridge interior stringer beams

### ■ INPUT DATA:

Beam span -  $S_s$  (ft.);

Centerline to centerline girders -  $C_b$  (ft.);

Dead load moment: exodermic steel grid deck with 2 in. concrete overfill 68 psf- + stringers beams 14 psf  
 $M_{D1}$  (ft. k);

Superimposed dead load moment: superimposed dead weight from polymer epoxy wearing surface 5 psf -  
 $M_{D2}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading (maximum between Axle loadings) -  $M_{LL}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading (maximum between Tandem loadings) -  $M_{LLTL}$  (ft. k);

Live load moment distribution factor for H-20, Type 3 and Type 3S2 truck loadings based on steel grid deck (Used only if level rule distribution factor:  $g_{1ext}$  as computed below is less than DF) - DF (ft. k);

Live load moment for H-20, Type 3 and Type 3S2 truck loadings -  $M_{LLH20}$  ,  $M_{LL3}$  &  $M_{LL3S2}$  (ft. k);

Number of lanes (for deflection use appropriate number of lanes) -  $N_L$  (unitless);

Number of beams -  $N_b$  (unitless);

Multiple presence factor for deflection using maximum number of lanes loaded / 1.2 for 1 lane; 1.0 for 2 lanes; 0.85 for 3 lanes; 0.65 for 4 lanes or more -  $m$  (unitless);

$$S_s = 31.21$$

$$31.21$$

$$C_b = 5.5$$

$$5.5$$

$$M_{DC} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 89 \frac{\text{lbs}}{\text{ft}^2}) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) (S_s)^2 \left( \frac{1}{\text{kips}} \right)$$

$$59.6005$$

$$M_{DW} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 5 \frac{\text{lbs}}{\text{ft}^2}) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) (S_s)^2 \left( \frac{1}{\text{kips}} \right)$$

$$3.34835$$

$$M_{LL} = 1.33 \left( \frac{150}{wl} \right) (2wl) + \left( 0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8} \right) \left( \frac{1}{\text{ft kips}} \right)$$

476.925

$$M_{LLTL} = 1.33 \left( (25 \text{ kips} \times \frac{(S_s \text{ ft})}{2} - 25 \text{ kips} \times (2 \text{ ft})) \right) \left( \frac{1}{\text{ft kips}} \right) + \left( 0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8} \right) \left( \frac{1}{\text{ft kips}} \right)$$

556.007

$$DF = \frac{C_b}{5}$$

1.1

$$M_{LLH20} = \left( \frac{133}{wl} \right) ((1.33)) (wl) (DF)$$

194.579

$$M_{LL3} = \left( \frac{125}{wl} \right) (1.33) (wl) (DF)$$

182.875

$$M_{LL3S2} = \left( \frac{121}{wl} \right) (1.33) (wl) (DF)$$

177.023

$$N_L = 2$$

2

$$N_b = 6$$

6

$$m = 1.0$$

1.

#### Beam section: W24x76

Dimensions of beam:  $d$ ,  $b_f$  (in.);

Area of beam supporting concrete slab -  $A_{sh}$  (in.<sup>2</sup>);

Moment of inertia of beam supporting concrete slab or deck -  $I_{sh}$  (in.<sup>4</sup>);

Yield strength of beam -  $F_y$  (ksi);

Modulus of elasticity of structural steel beam -  $E_b$  (ksi);

Modulus of elasticity of deck -  $E_c$  (ksi);

Depth of concrete deck in exodermic steel grid deck with 2 in. concrete overfill -  $t_s$  (in);

Over all depth of concrete deck in exodermic steel grid deck with 2 in. concrete overfill -  $t_{se}$  (in);

$$b_f = 8.99$$

$$8.99$$

$$d = 23.9$$

$$23.9$$

$$A_{sh} = 22.4$$

$$22.4$$

$$I_{sh} = 2100$$

$$2100$$

$$F_y = 50$$

$$50$$

$$E_b = 29000$$

$$29000$$

$$E_c = 3800$$

$$3800$$

$$t_s = 5$$

$$5$$

$$t_{se} = 7$$

$$7$$

$$S_x = \frac{I_{sh}}{\frac{d}{2}}$$

$$175.732$$

Determine longitudinal stiffness parameter  $K_g$

$$n = N\left[\left(\frac{E_b}{E_c}\right)\right]$$

$$7.63158$$

$$e_g = N\left[\frac{d}{2} + \left(t_{se} - \frac{t_s}{2}\right)\right]$$

$$16.45$$

$$K_g = n (I_{sh} + A_{sh} e_g^2)$$

$$62285.1$$

Determine interior distribution factors one lane loaded  $g_{1int}$

$$g_{1int} = 0.06 + \left(\frac{C_b}{14}\right)^{0.4} \left(\frac{C_b}{S_s}\right)^{0.3} \left(\frac{K_g}{12 S_s t_s^3}\right)^{0.1}$$

$$0.480644$$

Determine interior distribution factors for two or more lanes loaded  $g_{2int}$

$$g_{2int} = 0.075 + \left(\frac{C_b}{9.5}\right)^{0.6} \left(\frac{C_b}{S_s}\right)^{0.2} \left(\frac{K_g}{12 S_s t_s^3}\right)^{0.1}$$

$$0.598838$$

Determine maximum interior distribution factor based on one lane or two or more lanes loaded  $g_{int}$

$$g_{int} = \text{If}[g_{1int} > g_{2int}, g_{1int}, g_{2int}]$$

$$0.598838$$

Determine maximum live load truck and tandem load moment as a function of controlling interior distribution factor  $g_{ext}$

$$M_{LLg} = g_{int} \times M_{LL}$$

$$285.601$$

$$M_{LLgTL} = g_{int} \times M_{LLTL}$$

$$332.958$$

Maximum live load deflection - HL-93 truck or 25% of HL-93 plus Design Lane Load - Two truck configurations are investigated (1) one center 32 kip axle of HL-93 truck is placed at centerline of span ( $\Delta_{11}$  and  $\Delta_{12}$ ) and the other (2) two main 32 kip axles equally straddling centerline of span ( $\Delta_{21}$  and  $\Delta_{22}$ ):

$$\Delta_{11} = N \left[ \left( \frac{32 S_s^3 12^3}{48 E_b I_{sh}} \right) + \left( \frac{(8) \left( \frac{S_s}{2} - 14 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 14 \right)^2 \right) + \right. \\ \left. \left( \frac{24 \left( \frac{S_s}{2} - 14 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} + 14 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.26865

$$\Delta_{12} = N \left[ \left( (0.25 \times \Delta_{11}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) \times m \left( \frac{N_L}{N_b} \right) \right]$$

0.0983383

$$\Delta_{21} = N \left[ \left( \frac{(32) \left( \frac{S_s}{2} - 7 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 7 \right)^2 \right) + \left( \frac{8 \left( \frac{S_s}{2} - 21 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} - 21 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] \\ 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.347267

$$\Delta_{22} = N \left[ \left( (0.25 \times \Delta_{21}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) m \left( \frac{N_L}{N_b} \right) \right]$$

0.10489

$$\Delta_1 = \text{lf} [\Delta_{11} > \Delta_{12}, \Delta_{11}, \Delta_{12}]$$

0.26865

$$\Delta_2 = \text{lf} [\Delta_{21} > \Delta_{22}, \Delta_{21}, \Delta_{22}]$$

0.347267

$$\Delta = \text{If } [\Delta_1 > \Delta_2, \Delta_1, \Delta_2]$$

0.347267

#### ■ SUMMARY:

#### STRESSES AT POINT OF APPLIED MOMENT

##### Stresses as a function of deck:

Maximum top and bottom flange fiber stress in beam -  $f_{bw}$  (ksi);

$$f_{bw} = \frac{M_{DC} 12}{S_x}$$

4.06987

##### Stresses as a function of superimposed dead load:

Maximum top and bottom flange fiber stress support beam -  $f_{bd}$  (ksi);

$$f_{bd} = \frac{M_{DW} 12}{S_x}$$

0.228644

##### Stresses as a function of live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLg} 12}{S_x}$$

19.5025

##### Stresses as a function of deck, superimposed dead load and live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bs} = f_{bw} + f_{bd} + f_{bl}$$

23.801

##### Stresses as a function of live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{bITL} = \frac{M_{LLgTL}}{S_x} \cdot 12$$

22.7363

Stresses as a function of deck, superimposed dead load and live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bsTL} = f_{bw} + f_{bd} + f_{bITL}$$

27.0348

Allowable stresses:

Allowable steel stress -  $f_b$  (ksi);

$$f_b = F_y$$

50

Applied live HL-93 load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$$\Delta$$

0.347267

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.46815

## INVENTORY HL-93 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{LLInventory} = 1.75$$

1.75

### Service II Load Factors

$$Y_{DCII} = 1.00$$

1.

$$Y_{LLInventoryII} = 1.30$$

1.3

### Inventory Rating Factor for Strength I Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{bl}}$$

1.30758

### Inventory Rating Factor for Service II Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{bl}}$$

1.80259

### INVENTORY HL-93 TANDEM RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Inventory Rating Factor for Strength I Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{blTL}}$$

1.1216

### Inventory Rating Factor for Service II Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{blTL}}$$

1.54621

### INVENTORY H-20 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLH20} 12}{S_x}$$

13.287

### Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl}} (20 \text{ tons})$$

42.7609 tons

### Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl}} (20 \text{ tons})$$

57.6289 tons

### INVENTORY Type 3 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3} = \frac{M_{LL3} 12}{S_x}$$

12.4878

### Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3}} (25 \text{ tons})$$

56.872 tons

### Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3}} (25 \text{ tons})$$

76.6464 tons

### INVENTORY Type 3S2 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$ ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3S2} = \frac{M_{LL3S2} 12}{S_x}$$

12.0881

Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3S2}} (36 \text{ tons})$$

84.6029 tons

Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3S2}} (36 \text{ tons})$$

114.019 tons

Applied live load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$\Delta$

0.347267

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.46815

## Exterior Non-composite bridge beam design and rating W-section or plate girder :

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Frank J. Wood bridge exterior stringer beams

### ■ INPUT DATA:

Beam span -  $S_s$  (ft.);

Centerline to centerline girders -  $C_b$  (ft.);

Dead load moment: exodermic steel grid deck with 2 in. concrete overfill 68 psf- + stringers beams 14 psf

$M_{D1}$  (ft. k);

Superimposed dead load moment: superimposed dead weight from polymer epoxy wearing surface 5 psf -

$M_{D2}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading (maximum between Axle loadings) -  $M_{LL}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading (maximum between Tandem loadings) -  $M_{LLTL}$  (ft. k);

Live load moment distribution factor for H-20, Type 3 and Type 3S2 truck loadings based on steel grid deck (Used only if level rule distribution factor:  $g_{1\text{ext}}$  as computed below is less than DF) - DF (ft. k);

Live load moment for H-20, Type 3 and Type 3S2 truck loadings -  $M_{LLH20}$ ,  $M_{LL3}$  &  $M_{LL3S2}$  (ft. k);

Ratio: modulus of elasticity of beam to concrete composite deck -  $n$  (unitless);

$k$  - factor: modulus of elasticity of beam to concrete composite deck at the time the superimposed dead load moment is applied -  $k$  (unitless);

Compressive strength of concrete deck -  $f_c$  (psi);

Number of lanes (for deflection use appropriate number of lanes) -  $N_{LL}$  (unitless);

Number of beams -  $N_{bb}$  (unitless);

Multiple presence factor for deflection using maximum number of lanes loaded / 1.2 for 1 lane; 1.0 for 2 lanes; 0.85 for 3 lanes; 0.65 for 4 lanes or more -  $m$  (unitless);

$$S_s = 31.21$$

$$31.21$$

$$C_b = 5.5$$

$$5.5$$

$$M_{DC} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 89 \frac{\text{lbs}}{\text{ft}^2}) (\frac{\text{kips}}{1000 \text{ lbs}}) (S_s)^2 (\frac{1}{\text{kips}})$$

$$59.6005$$

$$M_{DW} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 5 \frac{\text{lbs}}{\text{ft}^2}) (\frac{\text{kips}}{1000 \text{ lbs}}) (S_s)^2 (\frac{1}{\text{kips}})$$

3.34835

$$M_{LL} = 1.33 (\frac{150}{wl}) (2 \text{ wl}) + (0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8}) (\frac{1}{\text{ft kips}})$$

476.925

$$M_{LLTL} = 1.33 ((25 \text{ kips} \times \frac{(S_s \text{ ft})}{2} - 25 \text{ kips} \times (2 \text{ ft})) (\frac{1}{\text{ft kips}}) + (0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8}) (\frac{1}{\text{ft kips}}))$$

556.007

$$DF = \frac{C_b}{5}$$

1.1

$$M_{LLH20} = (\frac{133}{wl} ((1.33) (wl) (DF)))$$

194.579

$$M_{LL3} = (\frac{125}{wl} (1.33) (wl) (DF))$$

182.875

$$M_{LL3S2} = (\frac{121}{wl} (1.33) (wl) (DF))$$

177.023

$$N_L = 2$$

2

$$N_b = 6$$

6

$$m = 1.0$$

1.

Beam section: W24x84

Dimensions of beam: d, b<sub>f</sub> (in.);

Area of beam supporting concrete slab - A<sub>sh</sub> (in.<sup>2</sup>);

Moment of inertia of beam supporting concrete slab or deck - I<sub>sh</sub> (in.<sup>4</sup>);

Yield strength of beam - F<sub>y</sub> (ksi);

Modulus of elasticity of structural steel beam -  $E_b$  (ksi);

Modulus of elasticity of deck -  $E_c$  (ksi);

Depth of deck -  $t_s$  (in);

$$b_f = 8.99$$

$$8.99$$

$$d = 24.1$$

$$24.1$$

$$A_{sh} = 24.7$$

$$24.7$$

$$I_{sh} = 2370$$

$$2370$$

$$F_y = 50$$

$$50$$

$$E_b = 29000$$

$$29000$$

$$E_c = 3800$$

$$3800$$

$$t_s = 5$$

$$5$$

$$S_x = \frac{I_{sh}}{\frac{d}{2}}$$

$$196.68$$

#### ■ SOLUTION:

Determine exterior distribution factors one lane loaded using lever rule with multiple presence factor  $m=1.2$  one lane loaded- for steel grid deck  $g_{1\text{ ext}}$

$$g_{1\text{ ext}} = 1.2 (\text{DF wl}) \left( \frac{\text{lane}}{2 \text{wl}} \right) \left( \frac{1}{\text{lane}} \right)$$

$$0.66$$

Two lanes loaded:

$$m_2 = 1$$

$$1$$

$$N_{L2} = 2$$

$$2$$

$$X_{\text{ext}} = 13.75$$

$$13.75$$

$$g_{2\text{ext}} = m_2 \left( \left( \frac{N_{L2}}{N_b} \right) + \left( \frac{X_{\text{ext}} (11 + 3)}{2 (13.75^2 + 8.25^2 + 2.75^2)} \right) \right)$$

$$0.69697$$

One lane loaded:

$$m_1 = 1.2$$

$$1.2$$

$$N_{L1} = 1$$

$$1$$

$$g_{3\text{ext}} = m_1 \left( \left( \frac{N_{L1}}{N_b} \right) + \left( \frac{X_{\text{ext}} (11)}{2 (13.75^2 + 8.25^2 + 2.75^2)} \right) \right)$$

$$0.542857$$

Determine maximum interior distribution factor based on one lane or two or more lanes loaded  $g_{\text{ext}}$

$$g_{11} = \text{If}[g_{1\text{ext}} > g_{2\text{ext}}, g_{1\text{ext}}, g_{2\text{ext}}]$$

$$0.69697$$

$$g_{\text{ext}} = \text{If}[g_{11} > g_{3\text{ext}}, g_{11}, g_{3\text{ext}}]$$

$$0.69697$$

Determine maximum live load truck and tandem load moment as a function of controlling interior distribution factor  $g_{\text{int}}$

$$M_{LLg} = g_{\text{ext}} \times M_{LL}$$

$$332.402$$

$$M_{LLgTL} = g_{\text{ext}} \times M_{LLTL}$$

$$387.52$$

Maximum live load deflection - HL-93 truck or 25% of HL-93 plus Design Lane Load - Two truck configurations are investigated (1) one center 32 kip axle of HL-93 truck is placed at

centerline of span ( $\Delta_{11}$  and  $\Delta_{12}$ ) and the other (2) two main 32 kip axles equally straddling centerline of span ( $\Delta_{21}$  and  $\Delta_{22}$ ):

$$N_{L2} = 2$$

2

$$\Delta_{11} = N \left[ \left( \frac{32 S_s^3 12^3}{48 E_b I_{sh}} \right) + \left( \frac{(8) \left( \frac{S_s}{2} - 14 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 14 \right)^2 \right) + \left( \frac{24 \left( \frac{S_s}{2} - 14 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} + 14 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.238045

$$\Delta_{12} = N \left[ \left( (0.25 \times \Delta_{11}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) \times m \left( \frac{N_L}{N_b} \right) \right]$$

0.0871352

$$\Delta_{21} = N \left[ \left( \frac{(32) \left( \frac{S_s}{2} - 7 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 7 \right)^2 \right) + \left( \frac{8 \left( \frac{S_s}{2} - 21 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} - 21 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.307705

$$\Delta_{22} = N \left[ \left( (0.25 \times \Delta_{21}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) m \left( \frac{N_L}{N_b} \right) \right]$$

0.0929403

$$\Delta_1 = \text{If} [\Delta_{11} > \Delta_{12}, \Delta_{11}, \Delta_{12}]$$

0.238045

$$\Delta_2 = \text{If} [\Delta_{21} > \Delta_{22}, \Delta_{21}, \Delta_{22}]$$

0.307705

$$\Delta = \text{If} [\Delta_1 > \Delta_2, \Delta_1, \Delta_2]$$

0.307705

#### ■ SUMMARY:

#### STRESSES AT POINT OF APPLIED MOMENT

##### Stresses as a function of deck:

Maximum top and bottom flange fiber stress in beam -  $f_{bw}$  (ksi);

$$f_{bw} = \frac{M_{DC} 12}{S_x}$$

3.63639

##### Stresses as a function of superimposed dead load:

Maximum top and bottom flange fiber stress support beam -  $f_{bd}$  (ksi);

$$f_{bd} = \frac{M_{DW} 12}{S_x}$$

0.204291

##### Stresses as a function of live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLg} 12}{S_x}$$

20.2808

##### Stresses as a function of deck, superimposed dead load and live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bs} = f_{bw} + f_{bd} + f_{bl}$$

24.1214

##### Stresses as a function of live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{blTL} = \frac{M_{LLgTL}}{S_x} \cdot 12$$

23.6436

Stresses as a function of deck, superimposed dead load and live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bsTL} = f_{bw} + f_{bd} + f_{blTL}$$

27.4843

Allowable stresses:

Allowable steel stress -  $f_b$  (ksi);

$$f_b = F_y$$

50

Applied live HL-93 load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$$\Delta$$

0.307705

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.46815

## INVENTORY HL-93 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{LLInventory} = 1.75$$

1.75

### Service II Load Factors

$$Y_{DCII} = 1.00$$

1.

$$Y_{LLInventoryII} = 1.30$$

1.3

### Inventory Rating Factor for Strength I Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{bl}}$$

1.27353

### Inventory Rating Factor for Service II Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{bl}}$$

1.75078

### INVENTORY HL-93 TANDEM RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Inventory Rating Factor for Strength I Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{blTL}}$$

1.09239

### Inventory Rating Factor for Service II Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{blTL}}$$

1.50177

### INVENTORY H-20 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLH20} 12}{S_x}$$

11.8718

## Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl}} (20 \text{ tons})$$

47.8875 tons

## Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl}} (20 \text{ tons})$$

64.5301 tons

## INVENTORY Type 3 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3} = \frac{M_{LL3} 12}{S_x}$$

11.1577

## Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3}} (25 \text{ tons})$$

63.6904 tons

## Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3}} (25 \text{ tons})$$

85.8251 tons

## INVENTORY Type 3S2 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3S2} = \frac{M_{LL3S2} 12}{S_x}$$

10.8006

Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3S2}} (36 \text{ tons})$$

94.746 tons

Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3S2}} (36 \text{ tons})$$

127.674 tons

Applied live load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$\Delta$

0.307705

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.46815

## ASD bridge two lane non-composite floorbeam - stress check for HS-20 truck load and bridge load rating for HS-20, H-20, Type 3 and Type 3S2 Trucks and LRFR HL-93 Truck rating:

Note: Live load moments are based on a 9 foot travel lane width and one HL93 truck.

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Frank J. Wood bridge Spans 1 and 2 floorbeams

### ■ INPUT DATA:

Beam span -  $S_b$  (ft.);

Centerline to centerline floorbeams -  $C_b$  (ft.);

Distance of unsupported compression flange between lateral connections -  $L_u$  (in.);

Dead load moment: exodermic steel grid deck with 2 in. concrete overfill 68 psf + stringers beams 14 psf + floorbeam (194 lbs./ft.) 7 psf -  $M_{D1}$  (ft. k);

Superimposed dead load moment: superimposed dead weight from polymer epoxy wearing surface 5 psf -  $M_{D2}$  (ft. k);

Maximum live load reaction of HS-20 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_{LL}$  (k);

Maximum live load reaction of H-20 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_{H20}$  (k);

Maximum live load reaction of Type 3 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_3$  (k);

Maximum live load reaction of Type 3S2 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_{3S2}$  (k);

Live load moment including impact for HS-20 truck loading -  $M_{LL}$  (ft. k);

Live load moment including impact for H-20 truck loading -  $M_{H20}$  (ft. k);

Live load moment including impact for Type 3 truck loading -  $M_3$  (ft. k);

Live load moment including impact for Type 3S2 truck loading -  $M_{3S2}$  (ft. k);

Live load moment for HL-93 truck loading -  $M_{HL3}$  (ft. k);

Live load moment for HL-93 tandem truck loading -  $M_{HL3T}$  (ft. k);

$$S_b = 32.22$$

$$32.22$$

$$C_b = 31.21$$

$$31.21$$

$$L_u = 1$$

1

$$R_{LL} = 28$$

28

$$R_{H20} = 19$$

19

$$R_3 = 21$$

21

$$R_{3S2} = 20$$

20

$$R_{HL3} = 28$$

28

$$R_{HL3T} = 23.5$$

23.5

$$M_{D1} = N \left[ \left( C_b \text{ ft} \times \left( 89 \frac{\text{lbs}}{\text{ft}^2} \right) \right) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) \left( \frac{\text{ft}}{\text{kips}} \right) \frac{(S_b)^2}{8} \right]$$

360.45

$$M_{D2} = N \left[ \left( C_b \text{ ft} \times 1 \text{ ft} \times \frac{0.375 \text{ in}}{\left( \frac{12 \text{ in}}{\text{ft}} \right)} \times 150 \frac{\text{lbs}}{\text{ft}^3} \right) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) \left( \frac{1}{\text{ft}} \right) \left( \frac{\text{ft}}{\text{kips}} \right) \frac{(S_b)^2}{8} \right]$$

18.9844

$$M_D = M_{D1} + M_{D2}$$

379.434

$$I_{IM} = \text{If} \left[ \left( 1 + \frac{50}{S_b + 125} \right) > 1.3, 1.3, \left( 1 + \frac{50}{S_b + 125} \right) \right]$$

1.3

$$M_{LL} = (S_b - 9 + \frac{2.25}{S_b}) R_{LL} I_{IM}$$

847.75

$$M_{H20} = (S_b - 9 + \frac{2.25}{S_b}) R_{H20} I_{IM}$$

575.259

$$M_3 = (S_b - 9 + \frac{2.25}{S_b}) R_3 I_{IM}$$

635.812

$$M_{3S2} = (S_b - 9 + \frac{2.25}{S_b}) R_{3S2} I_{IM}$$

605.536

$$M_{HL3} = (S_b - 9 + \frac{2.25}{S_b}) R_{HL3}$$

652.115

$$M_{HL3T} = (S_b - 9 + \frac{2.25}{S_b}) R_{HL3T}$$

547.311

#### Beam section: W36x194 no bottom plate

Width of compression flange -  $b_f$  (in.);

Thickness flange thickness -  $t_f$  (in.);

Thickness web thickness -  $t_w$  (in.);

Depth of web depth -  $d_w$  (in.);

Depth of beam -  $d$  (in.);

Moment of inertia of beam supporting deck -  $I_{sh}$  (in.<sup>4</sup>);

Section modulus of beam supporting deck -  $S_x$  (in.<sup>3</sup>);

Yield strength of beam supporting deck -  $F_y$  (ksi);

Modulus of elasticity of beam -  $E_m$  (ksi);

$$b_f = 12.1$$

12.1

$$t_f = 1.26$$

1.26

$$t_w = 0.625$$

0.625

$$d_w = 33.98$$

$$33.98$$

$$d = 35.9$$

$$35.9$$

$$I_{sh} = 12100$$

$$12100$$

$$S_x = 663$$

$$663$$

$$F_y = 50$$

$$50$$

$$E_m = 29000$$

$$29000$$

#### ■ SOLUTION:

#### DEFLECTION:

Applied deflection HS-20 and HL-93:

$$\Delta_{app} = N \left[ \left( \frac{R_{LL} \left( \frac{S_b}{2} \times 12 - 24 \right)}{24 E_m I_{sh}} \right) \times (3 \times (12 S_b)^2 - 4 \times \left( \frac{S_b}{2} \times 12 - 24 \right)^2) + \left( \frac{R_{LL} \left( \frac{S_b}{2} \times 12 - 96 \right)}{24 E_m I_{sh}} \right) \times (3 \times (12 S_b)^2 - 4 \times \left( \frac{S_b}{2} \times 12 - 96 \right)^2) \right]$$

$$0.320763$$

Allowable deflection:

$$\Delta_{all} = N \left[ \frac{12 S_b}{800} \right]$$

$$0.4833$$

#### STRESSES AT POINT OF APPLIED MOMENT:

Stresses as a function of deck and beam:

Maximum flange fiber stress in beam -  $f_d$  (ksi);

$$f_d = \frac{M_D 12}{S_x}$$

6.86759

Stresses as a function of HS-20 live load:

Maximum flange fiber stress in beam -  $f_{tl}$  (ksi);

$$f_{tl} = \frac{M_{LL} 12}{S_x}$$

15.3439

Stresses as a function of H-20 live load:

Maximum flange fiber stress in beam -  $f_{tl20}$  (ksi);

$$f_{tl20} = \frac{M_{H20} 12}{S_x}$$

10.4119

Stresses as a function of Type 3 live load:

Maximum flange fiber stress in beam -  $f_{tl3}$  (ksi);

$$f_{tl3} = \frac{M_3 12}{S_x}$$

11.5079

Stresses as a function of Type 3S2 live load:

Maximum flange fiber stress in beam -  $f_{tl3S2}$  (ksi);

$$f_{tl3S2} = \frac{M_{3S2} 12}{S_x}$$

10.9599

Allowable stresses:

Allowable steel stress -  $f_b$  (ksi);

$$J = \frac{(b_f \times t_w^3) + (b_f \times t_w^3) + (d_w \times t_w^3)}{3}$$

4.7347

$$I_c = \frac{(t_f \times b_f^3)}{12}$$

$$186.014$$

$$F_{FS} = 1.82$$

$$1.82$$

$$f_{b1} = \left( \frac{91000000}{F_{FS} \times S_x} \left( \frac{I_c}{12 L_u} \right) \sqrt{0.772 \frac{J}{I_c} + 9.87 \left( \frac{d}{12 L_u} \right)^2} \right) \frac{1}{1000}$$

$$10988.6$$

$$f_{b2} = 0.55 * F_y - \frac{14.4 \left( \frac{12 L_u}{b_f} \right)^2}{1000}$$

$$27.4858$$

$$f_b = \text{If}[f_{b1} > f_{b2}, f_{b1}, f_{b2}]$$

$$27.4858$$

#### ■ SUMMARY FOR HS-20, H-20, TYPE 3 AND TYPE 3S2 TRUCK LOAD RATINGS:

##### INVENTORY HS-20 TRUCK RATING:

Function of steel flange fiber stress -  $R_t$  (tons);

$$R_t = \frac{f_b - f_d}{f_{tl}} (36 \text{ tons})$$

$$48.3748 \text{ tons}$$

##### INVENTORY H-20 TRUCK RATING:

Function of steel flange fiber stress -  $R_{t20}$  (tons);

$$R_{t20} = \frac{f_b - f_d}{f_{tl20}} (20 \text{ tons})$$

$$39.6051 \text{ tons}$$

##### INVENTORY TYPE 3 TRUCK RATING:

Function of steel flange fiber stress -  $R_{t3}$  (tons);

$$R_{t3} = \frac{f_b - f_d}{f_{tl3}} (25 \text{ tons})$$

$$44.7914 \text{ tons}$$

## INVENTORY TYPE 3S2 TRUCK RATING:

Function of steel flange fiber stress -  $R_{t3}$  (tons);

$$R_{t3S2} = \frac{f_b - f_d}{f_{t3S2}} (36 \text{ tons})$$

67.7247 tons

- SUMMARY FOR HL-93 TRUCK LOAD RATING:

## INVENTORY HL-93 TRUCK RATING:

Determine maximum live load truck load moment as a function of controlling interior distribution factor  $g_{int}$

$$g_{int} = 1$$

1

$$M_{LL} = g_{int} \times 1.33 \times M_{HL3}$$

867.313

## Stresses as a function of truck live load:

Maximum flange fiber stress in beam -  $f_{tT}$  (ksi);

$$f_{tT} = \frac{M_{LL}}{S_x}$$

15.698

Determine interior distribution factor lanes tandem loaded, since the two floor beams on either side of the directly loaded floor beam evenly receives the remaining four foot spaced tandem load of  $g_{int}$  tandem

$$g_{intT} = 1$$

1

$$M_{LLT} = g_{intT} \times 1.33 \times M_{HL3T}$$

727.924

## Stresses as a function of tandem live load:

Maximum flange fiber stress in beam -  $f_{tT}$  (ksi);

$$f_{IT} = \frac{M_{LLT} 12}{S_x}$$

13.1751

### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{LLInventory} = 1.75$$

1.75

### Service II Load Factors

$$Y_{DCII} = 1.00$$

1.

$$Y_{LLInventoryII} = 1.30$$

1.3

### ALLOWABLE STRESS

Allowable steel stress -  $f_b$  (ksi);

$$f_b = F_y$$

50

### INVENTORY HL-93 TRUCK RATING

Function of steel flange fiber stress -  $R_b$  ;

#### Inventory Rating Factor for Strength I Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_d)}{Y_{LLInventory} f_{tl}}$$

1.50758

#### Inventory Rating Factor for Service II Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DCII} f_d}{Y_{LLInventoryII} f_{tl}}$$

2.11357

### INVENTORY HL-93 TANDEM RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

#### Inventory Rating Factor for Strength I Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DC}(f_d)}{Y_{LLInventory} f_{tIT}}$$

1.79627

#### Inventory Rating Factor for Service II Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DCII}(f_d)}{Y_{LLInventoryII} f_{tIT}}$$

2.5183

### Applied live load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta_{app}$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$$\Delta_{app}$$

0.320763

$$\Delta_{all} = N \left[ \frac{12 S_b}{800} \right]$$

0.4833

## Interior Non-composite bridge beam design and rating W-section or plate girder :

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Frank J. Wood bridge interior stringer beams

### ■ INPUT DATA:

Beam span -  $S_s$  (ft.);

Centerline to centerline girders -  $C_b$  (ft.);

Dead load moment: exodermic steel grid deck with 2 in. concrete overfill 68 psf- + stringers beams 12 psf  
 $M_{D1}$  (ft. k);

Superimposed dead load moment: superimposed dead weight from polymer epoxy wearing surface 5 psf -  
 $M_{D2}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading  
(maximum between Axle loadings) -  $M_{LL}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading  
(maximum between Tandem loadings) -  $M_{LLTL}$  (ft. k);

Live load moment distribution factor for H-20, Type 3 and Type 3S2 truck loadings based on steel grid deck  
(Used only if level rule distribution factor:  $g_{1ext}$  as computed below is less than DF) - DF (ft. k);

Live load moment for H-20, Type 3 and Type 3S2 truck loadings -  $M_{LLH20}$  ,  $M_{LL3}$  &  $M_{LL3S2}$  (ft. k);

Number of lanes (for deflection use appropriate number of lanes) -  $N_L$  (unitless);

Number of beams -  $N_b$  (unitless);

Multiple presence factor for deflection using maximum number of lanes loaded / 1.2 for 1 lane; 1.0 for 2 lanes;  
0.85 for 3 lanes; 0.65 for 4 lanes or more -  $m$  (unitless);

$$S_s = 22$$

$$22$$

$$C_b = 5.5$$

$$5.5$$

$$M_{DC} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 80 \frac{\text{lbs}}{\text{ft}^2}) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) (S_s)^2 \left( \frac{1}{\text{kips}} \right)$$

$$26.62$$

$$M_{DW} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 5 \frac{\text{lbs}}{\text{ft}^2}) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) (S_s)^2 \left( \frac{1}{\text{kips}} \right)$$

$$1.66375$$

$$M_{LL} = 1.33 \left( \frac{88}{wl} \right) (2 wl) + \left( 0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8} \right) \left( \frac{1}{\text{ft kips}} \right)$$

272.8

$$M_{LLTL} = 1.33 \left( (25 \text{ kips} \times \frac{(S_s \text{ ft})}{2} - 25 \text{ kips} \times (2 \text{ ft})) \right) \left( \frac{1}{\text{ft kips}} \right) + \left( 0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8} \right) \left( \frac{1}{\text{ft kips}} \right)$$

350.748

$$DF = \frac{C_b}{5}$$

1.1

$$M_{LLH20} = \left( \frac{88}{wl} \right) ((1.33)) (wl) (DF)$$

128.744

$$M_{LL3} = \left( \frac{77.3}{wl} \right) (1.33) (wl) (DF)$$

113.09

$$M_{LL3S2} = \left( \frac{70.5}{wl} \right) (1.33) (wl) (DF)$$

103.142

$$N_L = 2$$

2

$$N_b = 6$$

6

$$m = 1.0$$

1.

#### Beam section: W21x62

Dimensions of beam:  $d$ ,  $b_f$  (in.);

Area of beam supporting concrete slab -  $A_{sh}$  (in.<sup>2</sup>);

Moment of inertia of beam supporting concrete slab or deck -  $I_{sh}$  (in.<sup>4</sup>);

Yield strength of beam -  $F_y$  (ksi);

Modulus of elasticity of structural steel beam -  $E_b$  (ksi);

Modulus of elasticity of deck -  $E_c$  (ksi);

Depth of concrete deck in exodermic steel grid deck with 2 in. concrete overfill -  $t_s$  (in);

Over all depth of concrete deck in exodermic steel grid deck with 2 in. concrete overfill -  $t_{se}$  (in);

$$b_f = 8.24$$

$$8.24$$

$$d = 21$$

$$21$$

$$A_{sh} = 18.3$$

$$18.3$$

$$I_{sh} = 1330$$

$$1330$$

$$F_y = 50$$

$$50$$

$$E_b = 29000$$

$$29000$$

$$E_c = 3800$$

$$3800$$

$$t_s = 5$$

$$5$$

$$t_{se} = 7$$

$$7$$

$$S_x = \frac{I_{sh}}{\frac{d}{2}}$$

$$\frac{380}{3}$$

Determine longitudinal stiffness parameter  $K_g$

$$n = N\left[\left(\frac{E_b}{E_c}\right)\right]$$

$$7.63158$$

$$e_g = N \left[ \frac{d}{2} + \left( t_{se} - \frac{t_s}{2} \right) \right]$$

15.

$$K_g = n (I_{sh} + A_{sh} e_g^2)$$

41 573.

Determine interior distribution factors one lane loaded  $g_{1 \text{ int}}$

$$g_{1 \text{ int}} = 0.06 + \left( \frac{C_b}{14} \right)^{0.4} \left( \frac{C_b}{S_s} \right)^{0.3} \left( \frac{K_g}{12 S_s t_s^3} \right)^{0.1}$$

0.524628

Determine interior distribution factors for two or more lanes loaded  $g_{2 \text{ int}}$

$$g_{2 \text{ int}} = 0.075 + \left( \frac{C_b}{9.5} \right)^{0.6} \left( \frac{C_b}{S_s} \right)^{0.2} \left( \frac{K_g}{12 S_s t_s^3} \right)^{0.1}$$

0.633729

Determine maximum interior distribution factor based on one lane or two or more lanes loaded  $g_{\text{int}}$

$$g_{\text{int}} = \text{If}[g_{1 \text{ int}} > g_{2 \text{ int}}, g_{1 \text{ int}}, g_{2 \text{ int}}]$$

0.633729

Determine maximum live load truck and tandem load moment as a function of controlling interior distribution factor  $g_{\text{ext}}$

$$M_{LLg} = g_{\text{int}} \times M_{LL}$$

172.881

$$M_{LLgTL} = g_{\text{int}} \times M_{LLTL}$$

222.279

Maximum live load deflection - HL-93 truck or 25% of HL-93 plus Design Lane Load - Two truck configurations are investigated (1) one center 32 kip axle of HL-93 truck is placed at centerline of span ( $\Delta_{11}$  and  $\Delta_{12}$ ) and the other (2) two main 32 kip axles equally straddling centerline of span ( $\Delta_{21}$  and  $\Delta_{22}$ ):

$$\Delta_{11} = N \left[ \left( \frac{32 S_s^3 12^3}{48 E_b I_{sh}} \right) + \left( \frac{(8) \left( \frac{S_s}{2} - 14 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 14 \right)^2 \right) + \right. \\ \left. \left( \frac{24 \left( \frac{S_s}{2} - 14 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} + 14 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.144093

$$\Delta_{12} = N \left[ \left( (0.25 \times \Delta_{11}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) \times m \left( \frac{N_L}{N_b} \right) \right]$$

0.0416162

$$\Delta_{21} = N \left[ \left( \frac{(32) \left( \frac{S_s}{2} - 7 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 7 \right)^2 \right) + \left( \frac{8 \left( \frac{S_s}{2} - 21 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} - 21 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] \\ 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.112207

$$\Delta_{22} = N \left[ \left( (0.25 \times \Delta_{21}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) m \left( \frac{N_L}{N_b} \right) \right]$$

0.0389591

$$\Delta_1 = \text{lf} [\Delta_{11} > \Delta_{12}, \Delta_{11}, \Delta_{12}]$$

0.144093

$$\Delta_2 = \text{lf} [\Delta_{21} > \Delta_{22}, \Delta_{21}, \Delta_{22}]$$

0.112207

$$\Delta = \text{If } [\Delta_1 > \Delta_2, \Delta_1, \Delta_2]$$

0.144093

#### ■ SUMMARY:

#### STRESSES AT POINT OF APPLIED MOMENT

##### Stresses as a function of deck:

Maximum top and bottom flange fiber stress in beam -  $f_{bw}$  (ksi);

$$f_{bw} = \frac{M_{DC} 12}{S_x}$$

2.52189

##### Stresses as a function of superimposed dead load:

Maximum top and bottom flange fiber stress support beam -  $f_{bd}$  (ksi);

$$f_{bd} = \frac{M_{DW} 12}{S_x}$$

0.157618

##### Stresses as a function of live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLg} 12}{S_x}$$

16.3782

##### Stresses as a function of deck, superimposed dead load and live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bs} = f_{bw} + f_{bd} + f_{bl}$$

19.0577

##### Stresses as a function of live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{bITL} = \frac{M_{LLgTL}}{S_x}$$

21.058

Stresses as a function of deck, superimposed dead load and live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bsTL} = f_{bw} + f_{bd} + f_{bITL}$$

23.7375

Allowable stresses:

Allowable steel stress -  $f_b$  (ksi);

$$f_b = F_y$$

50

Applied live HL-93 load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$$\Delta$$

0.144093

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.33

## INVENTORY HL-93 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{LLInventory} = 1.75$$

1.75

### Service II Load Factors

$$Y_{DCII} = 1.00$$

1.

$$Y_{LLInventoryII} = 1.30$$

1.3

### Inventory Rating Factor for Strength I Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{bl}}$$

1.62762

### Inventory Rating Factor for Service II Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{bl}}$$

2.22249

### INVENTORY HL-93 TANDEM RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Inventory Rating Factor for Strength I Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{blTL}}$$

1.26591

### Inventory Rating Factor for Service II Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{blTL}}$$

1.72858

### INVENTORY H-20 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLH20} 12}{S_x}$$

12.1968

## Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl}} (20 \text{ tons})$$

46.6661 tons

## Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl}} (20 \text{ tons})$$

62.8694 tons

## INVENTORY Type 3 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3} = \frac{M_{LL3} 12}{S_x}$$

10.7138

## Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3}} (25 \text{ tons})$$

66.4071 tons

## Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3}} (25 \text{ tons})$$

89.4649 tons

## INVENTORY Type 3S2 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3S2} = \frac{M_{LL3S2} 12}{S_x}$$

9.7713

Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3S2}} (36 \text{ tons})$$

104.85 tons

Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3S2}} (36 \text{ tons})$$

141.256 tons

Applied live load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$\Delta$

0.144093

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.33

## Exterior Non-composite bridge beam design and rating W-section or plate girder :

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Frank J. Wood bridge exterior stringer beams

### ■ INPUT DATA:

Beam span -  $S_s$  (ft.);

Centerline to centerline girders -  $C_b$  (ft.);

Dead load moment: exodermic steel grid deck with 2 in. concrete overfill 68 psf + stringers beams 12 psf  
 $M_{D1}$  (ft. k);

Superimposed dead load moment: superimposed dead weight from polymer epoxy wearing surface 5 psf -  
 $M_{D2}$  (ft. k);;

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading  
(maximum between Axle loadings) -  $M_{LL}$  (ft. k);

Live load moment including a dynamic load allowance of 1.33 for moving loads for HL-93 truck loading  
(maximum between Tandem loadings) -  $M_{LLTL}$  (ft. k);

Live load moment distribution factor for H-20, Type 3 and Type 3S2 truck loadings based on steel grid deck  
(Used only if level rule distribution factor:  $g_{1ext}$  as computed below is less than DF) - DF (ft. k);

Live load moment for H-20, Type 3 and Type 3S2 truck loadings -  $M_{LLH20}$ ,  $M_{LL3}$  &  $M_{LL3S2}$  (ft. k);

Ratio: modulus of elasticity of beam to concrete composite deck -  $n$  (unitless);

$k$  - factor: modulus of elasticity of beam to concrete composite deck at the time the superimposed dead load  
moment is applied -  $k$  (unitless);

Compressive strength of concrete deck -  $f_c$  (psi);

Number of lanes (for deflection use appropriate number of lanes) -  $N_{LL}$  (unitless);

Number of beams -  $N_{bb}$  (unitless);

Multiples presence factor for deflection using maximum number of lanes loaded / 1.2 for 1 lane; 1.0 for 2 lanes;  
0.85 for 3 lanes; 0.65 for 4 lanes or more -  $m$  (unitless);

$$S_s = 22$$

$$22$$

$$C_b = 5.5$$

$$5.5$$

$$M_{DC} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 80 \frac{\text{lbs}}{\text{ft}^2}) (\frac{\text{kips}}{1000 \text{ lbs}}) (S_s)^2 (\frac{1}{\text{kips}})$$

$$26.62$$

5.0 Polymer Epoxy WS Span 3 LRFR Rating for 2 Lane Bridge Non-composite Exterior Stringer Positive Bending Stress w: Four Truck

$$M_{DW} = \frac{1}{8} (C_b \text{ ft} \times 1 \text{ ft} \times 5 \frac{\text{lbs}}{\text{ft}^2}) (\frac{\text{kips}}{1000 \text{ lbs}}) (S_s)^2 (\frac{1}{\text{kips}})$$

1.66375

$$M_{LL} = 1.33 (\frac{88}{wl}) (2 \text{ wl}) + (0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8}) (\frac{1}{\text{ft kips}})$$

272.8

$$M_{LLTL} = 1.33 ((25 \text{ kips} \times \frac{(S_s \text{ ft})}{2} - 25 \text{ kips} \times (2 \text{ ft})) (\frac{1}{\text{ft kips}}) + (0.64 \frac{\text{kips}}{\text{ft}} \times \frac{(S_s \text{ ft})^2}{8}) (\frac{1}{\text{ft kips}}))$$

350.748

$$DF = \frac{C_b}{5}$$

1.1

$$M_{LLH20} = (\frac{88}{wl}) ((1.33) (wl) (DF))$$

128.744

$$M_{LL3} = (\frac{77.3}{wl}) (1.33) (wl) (DF)$$

113.09

$$M_{LL3S2} = (\frac{70.5}{wl}) (1.33) (wl) (DF)$$

103.142

$$N_L = 2$$

2

$$N_b = 6$$

6

$$m = 1.0$$

1.

Beam section: W21x62

Dimensions of beam: d, b<sub>f</sub> (in.);

Area of beam supporting concrete slab - A<sub>sh</sub> (in.<sup>2</sup>);

Moment of inertia of beam supporting concrete slab or deck - I<sub>sh</sub> (in.<sup>4</sup>);

Yield strength of beam - F<sub>y</sub> (ksi);

Modulus of elasticity of structural steel beam -  $E_b$  (ksi);

Modulus of elasticity of deck -  $E_c$  (ksi);

Depth of deck -  $t_s$  (in);

$$b_f = 8.24$$

$$8.24$$

$$d = 21$$

$$21$$

$$A_{sh} = 18.3$$

$$18.3$$

$$I_{sh} = 1330$$

$$1330$$

$$F_y = 50$$

$$50$$

$$E_b = 29000$$

$$29000$$

$$E_c = 3800$$

$$3800$$

$$t_s = 5$$

$$5$$

$$S_x = \frac{I_{sh}}{\frac{d}{2}}$$

$$\frac{380}{3}$$

$$3$$

#### ■ SOLUTION:

Determine exterior distribution factors one lane loaded using lever rule with multiple presence factor  $m=1.2$  one lane loaded- for steel grid deck  $g_{1\text{ext}}$

$$g_{1\text{ext}} = 1.2 (\text{DF wl}) \left( \frac{\text{lane}}{2 \text{wl}} \right) \left( \frac{1}{\text{lane}} \right)$$

$$0.66$$

Two lanes loaded:

$$m_2 = 1$$

1

$$N_{L2} = 2$$

2

$$X_{\text{ext}} = 13.75$$

13.75

$$g_{2\text{ext}} = m_2 \left( \left( \frac{N_{L2}}{N_b} \right) + \left( \frac{X_{\text{ext}} (11 + 3)}{2 (13.75^2 + 8.25^2 + 2.75^2)} \right) \right)$$

0.69697

One lane loaded:

$$m_1 = 1.2$$

1.2

$$N_{L1} = 1$$

1

$$g_{3\text{ext}} = m_1 \left( \left( \frac{N_{L1}}{N_b} \right) + \left( \frac{X_{\text{ext}} (11)}{2 (13.75^2 + 8.25^2 + 2.75^2)} \right) \right)$$

0.542857

Determine maximum interior distribution factor based on one lane or two or more lanes loaded  $g_{\text{ext}}$ 

$$g_{11} = \text{If}[g_{1\text{ext}} > g_{2\text{ext}}, g_{1\text{ext}}, g_{2\text{ext}}]$$

0.69697

$$g_{\text{ext}} = \text{If}[g_{11} > g_{3\text{ext}}, g_{11}, g_{3\text{ext}}]$$

0.69697

Determine maximum live load truck and tandem load moment as a function of controlling interior distribution factor  $g_{\text{int}}$ 

$$M_{LLg} = g_{\text{ext}} \times M_{LL}$$

190.133

$$M_{LLgTL} = g_{\text{ext}} \times M_{LLTL}$$

244.46

Maximum live load deflection - HL-93 truck or 25% of HL-93 plus Design Lane Load - Two truck configurations are investigated (1) one center 32 kip axle of HL-93 truck is placed at

centerline of span ( $\Delta_{11}$  and  $\Delta_{12}$ ) and the other (2) two main 32 kip axles equally straddling centerline of span ( $\Delta_{21}$  and  $\Delta_{22}$ ):

$$N_{L2} = 2$$

2

$$\Delta_{11} = N \left[ \left( \frac{32 S_s^3 12^3}{48 E_b I_{sh}} \right) + \left( \frac{(8) \left( \frac{S_s}{2} - 14 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 14 \right)^2 \right) + \left( \frac{24 \left( \frac{S_s}{2} - 14 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} + 14 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.144093

$$\Delta_{12} = N \left[ \left( (0.25 \times \Delta_{11}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) \times m \left( \frac{N_L}{N_b} \right) \right]$$

0.0416162

$$\Delta_{21} = N \left[ \left( \frac{(32) \left( \frac{S_s}{2} - 7 \right) 12^3}{24 E_b I_{sh}} \right) \left( 3 S_s^2 - 4 \left( \frac{S_s}{2} - 7 \right)^2 \right) + \left( \frac{8 \left( \frac{S_s}{2} - 21 \right) \left( \frac{S_s}{2} \right) 12^3}{6 E_b I_{sh} S_s} \right) \left( S_s^2 - \left( \frac{S_s}{2} - 21 \right)^2 - \left( \frac{S_s}{2} \right)^2 \right) \right] 1.33 m \left( \frac{N_L}{N_b} \right)$$

0.112207

$$\Delta_{22} = N \left[ \left( (0.25 \times \Delta_{21}) + \left( \frac{5 \times 0.65 S_s^4 12^3}{384 E_b I_{sh}} \right) \right) m \left( \frac{N_L}{N_b} \right) \right]$$

0.0389591

$$\Delta_1 = \text{If} [\Delta_{11} > \Delta_{12}, \Delta_{11}, \Delta_{12}]$$

0.144093

$$\Delta_2 = \text{If} [\Delta_{21} > \Delta_{22}, \Delta_{21}, \Delta_{22}]$$

0.112207

$$\Delta = \text{If} [\Delta_1 > \Delta_2, \Delta_1, \Delta_2]$$

0.144093

#### ■ SUMMARY:

#### STRESSES AT POINT OF APPLIED MOMENT

##### Stresses as a function of deck:

Maximum top and bottom flange fiber stress in beam -  $f_{bw}$  (ksi);

$$f_{bw} = \frac{M_{DC} 12}{S_x}$$

2.52189

##### Stresses as a function of superimposed dead load:

Maximum top and bottom flange fiber stress support beam -  $f_{bd}$  (ksi);

$$f_{bd} = \frac{M_{DW} 12}{S_x}$$

0.157618

##### Stresses as a function of live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLg} 12}{S_x}$$

18.0126

##### Stresses as a function of deck, superimposed dead load and live HL-93 Truck load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bs} = f_{bw} + f_{bd} + f_{bl}$$

20.6921

##### Stresses as a function of live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bl}$  (ksi);

$$f_{blTL} = \frac{M_{LLgTL} 12}{S_x}$$

23.1594

Stresses as a function of deck, superimposed dead load and live HL-93 Tandem load:

Maximum top and bottom flange fiber stress in beam -  $f_{bs}$  (ksi);

$$f_{bsTL} = f_{bw} + f_{bd} + f_{blTL}$$

25.8389

Allowable stresses:

Allowable steel stress -  $f_b$  (ksi);

$$f_b = F_y$$

50

Applied live HL-93 load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$$\Delta$$

0.144093

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.33

## INVENTORY HL-93 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{LLInventory} = 1.75$$

1.75

### Service II Load Factors

$$Y_{DCII} = 1.00$$

1.

$$Y_{LLInventoryII} = 1.30$$

1.3

### Inventory Rating Factor for Strength I Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{bl}}$$

1.47993

### Inventory Rating Factor for Service II Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{bl}}$$

2.02082

### INVENTORY HL-93 TANDEM RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Inventory Rating Factor for Strength I Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DC} (f_{bw} + f_{bd})}{Y_{LLInventory} f_{blTL}}$$

1.15104

### Inventory Rating Factor for Service II Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bw} + f_{bd})}{Y_{LLInventoryII} f_{blTL}}$$

1.57173

### INVENTORY H-20 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

### Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl} = \frac{M_{LLH20} 12}{S_x}$$

12.1968

## Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl}} (20 \text{ tons})$$

46.6661 tons

## Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl}} (20 \text{ tons})$$

62.8694 tons

## INVENTORY Type 3 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3} = \frac{M_{LL3} 12}{S_x}$$

10.7138

## Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3}} (25 \text{ tons})$$

66.4071 tons

## Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3}} (25 \text{ tons})$$

89.4649 tons

## INVENTORY Type 3S2 TRUCK RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Stresses as a function of live truck load:

Maximum top and bottom flange fiber stress beam -  $f_{bl}$  (ksi);

$$f_{bl3S2} = \frac{M_{LL3S2} 12}{S_x}$$

9.7713

Inventory Rating Factor for Strength I Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_{bd})}{Y_{LLInventory} f_{bl3S2}} (36 \text{ tons})$$

104.85 tons

Inventory Rating Factor for Service II Load Factors-Truck Load

$$R_b = \frac{f_b - Y_{DCII} (f_{bd})}{Y_{LLInventoryII} f_{bl3S2}} (36 \text{ tons})$$

141.256 tons

Applied live load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta$  (in.);

Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$\Delta$

0.144093

$$\Delta_{all} = N \left[ \frac{12 S_s}{800} \right]$$

0.33

## ASD bridge two lane non-composite floorbeam - stress check for HS-20 truck load and bridge load rating for HS-20, H-20, Type 3 and Type 3S2 Trucks and LRFR HL-93 Truck rating:

Note: Live load moments are based on a 9 foot travel lane width and one HL93 truck.

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Frank J. Wood bridge Span 3 floorbeams

### ■ INPUT DATA:

Beam span -  $S_b$  (ft.);

Centerline to centerline floorbeams -  $C_b$  (ft.);

Distance of unsupported compression flange between lateral connections -  $L_u$  (in.);

Dead load moment: exodermic steel grid deck with 2 in. concrete overfill 68 psf + stringers beams 12 psf + floorbeam (150 lbs./ft.) 7 psf -  $M_{D1}$  (ft. k);

Superimposed dead load moment: superimposed dead weight from polymer epoxy wearing surface 5 psf -  $M_{D2}$  (ft. k);

Maximum live load reaction of HS-20 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_{LL}$  (k);

Maximum live load reaction of H-20 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_{H20}$  (k);

Maximum live load reaction of Type 3 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_3$  (k);

Maximum live load reaction of Type 3S2 truck loading on to floorbeam (AASHTO Man. Condition of Evaluation Bridges Appendix D6B) -  $R_{3S2}$  (k);

Live load moment including impact for HS-20 truck loading -  $M_{LL}$  (ft. k);

Live load moment including impact for H-20 truck loading -  $M_{H20}$  (ft. k);

Live load moment including impact for Type 3 truck loading -  $M_3$  (ft. k);

Live load moment including impact for Type 3S2 truck loading -  $M_{3S2}$  (ft. k);

Live load moment for HL-93 truck loading -  $M_{HL3}$  (ft. k);

Live load moment for HL-93 tandem truck loading -  $M_{HL3T}$  (ft. k);

$$S_b = 31.92$$

$$31.92$$

$$C_b = 22$$

$$22$$

$$L_u = 1$$

1

$$R_{LL} = 23.3$$

23.3

$$R_{H20} = 17.5$$

17.5

$$R_3 = 18$$

18

$$R_{3S2} = 16.5$$

16.5

$$R_{HL3} = 28$$

28

$$R_{HL3T} = 23.3$$

23.3

$$M_{D1} = N \left[ \left( C_b \text{ ft} \times \left( 87 \frac{\text{lbs}}{\text{ft}^2} \right) \right) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) \left( \frac{\text{ft}}{\text{kips}} \right) \frac{(S_b)^2}{8} \right]$$

243.769

$$M_{D2} = N \left[ \left( C_b \text{ ft} \times 1 \text{ ft} \times \frac{0.375 \text{ in}}{\left( \frac{12 \text{ in}}{\text{ft}} \right)} \times 150 \frac{\text{lbs}}{\text{ft}^3} \right) \left( \frac{\text{kips}}{1000 \text{ lbs}} \right) \left( \frac{1}{\text{ft}} \right) \left( \frac{\text{ft}}{\text{kips}} \right) \frac{(S_b)^2}{8} \right]$$

13.1341

$$M_D = M_{D1} + M_{D2}$$

256.903

$$I_{IM} = \text{If} \left[ \left( 1 + \frac{50}{S_b + 125} \right) > 1.3, 1.3, \left( 1 + \frac{50}{S_b + 125} \right) \right]$$

1.3

$$M_{LL} = (S_b - 9 + \frac{2.25}{S_b}) R_{LL} I_{IM}$$

696.382

$$M_{H20} = (S_b - 9 + \frac{2.25}{S_b}) R_{H20} I_{IM}$$

523.034

$$M_3 = (S_b - 9 + \frac{2.25}{S_b}) R_3 I_{IM}$$

537.977

$$M_{3S2} = (S_b - 9 + \frac{2.25}{S_b}) R_{3S2} I_{IM}$$

493.146

$$M_{HL3} = (S_b - 9 + \frac{2.25}{S_b}) R_{HL3}$$

643.734

$$M_{HL3T} = (S_b - 9 + \frac{2.25}{S_b}) R_{HL3T}$$

535.678

#### Beam section: W36x150 no bottom plate

Width of compression flange -  $b_f$  (in.);

Thickness flange thickness -  $t_f$  (in.);

Thickness web thickness -  $t_w$  (in.);

Depth of web depth -  $d_w$  (in.);

Depth of beam -  $d$  (in.);

Moment of inertia of beam supporting deck -  $I_{sh}$  (in.<sup>4</sup>);

Section modulus of beam supporting deck -  $S_x$  (in.<sup>3</sup>);

Yield strength of beam supporting deck -  $F_y$  (ksi);

Modulus of elasticity of beam -  $E_m$  (ksi);

$$b_f = 12$$

12

$$t_f = 0.94$$

0.94

$$t_w = 0.625$$

0.625

$$d_w = 34.02$$

$$34.02$$

$$d = 35.9$$

$$35.9$$

$$I_{sh} = 9400$$

$$9400$$

$$S_x = 504$$

$$504$$

$$F_y = 50$$

$$50$$

$$E_m = 29000$$

$$29000$$

#### ■ SOLUTION:

#### DEFLECTION:

Applied deflection HS-20 and HL-93:

$$\Delta_{app} = N \left[ \left( \frac{R_{LL} \left( \frac{S_b}{2} \times 12 - 24 \right)}{24 E_m I_{sh}} \right) \times (3 \times (12 S_b)^2 - 4 \times \left( \frac{S_b}{2} \times 12 - 24 \right)^2) + \left( \frac{R_{LL} \left( \frac{S_b}{2} \times 12 - 96 \right)}{24 E_m I_{sh}} \right) \times (3 \times (12 S_b)^2 - 4 \times \left( \frac{S_b}{2} \times 12 - 96 \right)^2) \right]$$

$$0.33295$$

Allowable deflection:

$$\Delta_{all} = N \left[ \frac{12 S_b}{800} \right]$$

$$0.4788$$

#### STRESSES AT POINT OF APPLIED MOMENT:

Stresses as a function of deck and beam:

Maximum flange fiber stress in beam -  $f_d$  (ksi);

$$f_d = \frac{M_D 12}{S_x}$$

6.11673

Stresses as a function of HS-20 live load:

Maximum flange fiber stress in beam -  $f_{tl}$  (ksi);

$$f_{tl} = \frac{M_{LL} 12}{S_x}$$

16.5805

Stresses as a function of H-20 live load:

Maximum flange fiber stress in beam -  $f_{tl20}$  (ksi);

$$f_{tl20} = \frac{M_{H20} 12}{S_x}$$

12.4532

Stresses as a function of Type 3 live load:

Maximum flange fiber stress in beam -  $f_{tl3}$  (ksi);

$$f_{tl3} = \frac{M_3 12}{S_x}$$

12.809

Stresses as a function of Type 3S2 live load:

Maximum flange fiber stress in beam -  $f_{tl3S2}$  (ksi);

$$f_{tl3S2} = \frac{M_{3S2} 12}{S_x}$$

11.7416

Allowable stresses:

Allowable steel stress -  $f_b$  (ksi);

$$J = \frac{(b_f \times t_w^3) + (b_f \times t_w^3) + (d_w \times t_w^3)}{3}$$

4.72168

$$I_c = \frac{(t_f \times b_f^3)}{12}$$

$$135.36$$

$$F_{FS} = 1.82$$

$$1.82$$

$$f_{b1} = \left( \frac{91000000}{F_{FS} \times S_x} \left( \frac{I_c}{12 L_u} \right) \sqrt{0.772 \frac{J}{I_c} + 9.87 \left( \frac{d}{12 L_u} \right)^2} \right) \frac{1}{1000}$$

$$10519.3$$

$$f_{b2} = 0.55 * F_y - \frac{14.4 \left( \frac{12 L_u}{b_f} \right)^2}{1000}$$

$$27.4856$$

$$f_b = \text{If}[f_{b1} > f_{b2}, f_{b1}, f_{b2}]$$

$$27.4856$$

#### ■ SUMMARY FOR HS-20, H-20, TYPE 3 AND TYPE 3S2 TRUCK LOAD RATINGS:

##### INVENTORY HS-20 TRUCK RATING:

Function of steel flange fiber stress -  $R_t$  (tons);

$$R_t = \frac{f_b - f_d}{f_{tl}} (36 \text{ tons})$$

$$46.3966 \text{ tons}$$

##### INVENTORY H-20 TRUCK RATING:

Function of steel flange fiber stress -  $R_{t20}$  (tons);

$$R_{t20} = \frac{f_b - f_d}{f_{tl20}} (20 \text{ tons})$$

$$34.3187 \text{ tons}$$

##### INVENTORY TYPE 3 TRUCK RATING:

Function of steel flange fiber stress -  $R_{t3}$  (tons);

$$R_{t3} = \frac{f_b - f_d}{f_{tl3}} (25 \text{ tons})$$

$$41.7068 \text{ tons}$$

**INVENTORY TYPE 3S2 TRUCK RATING:**

Function of steel flange fiber stress -  $R_{t3}$  (tons);

$$R_{t3S2} = \frac{f_b - f_d}{f_{t3S2}} (36 \text{ tons})$$

65.5176 tons

- **SUMMARY FOR HL-93 TRUCK LOAD RATING:**

**INVENTORY HL-93 TRUCK RATING:**

Determine maximum live load truck load moment as a function of controlling interior distribution factor  $g_{int}$

$$g_{int} = 1$$

1

$$M_{LL} = g_{int} \times 1.33 \times M_{HL3}$$

856.166

**Stresses as a function of truck live load:**

Maximum flange fiber stress in beam -  $f_{tT}$  (ksi);

$$f_{tT} = \frac{M_{LL}}{S_x}$$

20.3849

Determine interior distribution factor lanes tandem loaded, since the two floor beams on either side of the directly loaded floor beam evenly receives the remaining four foot spaced tandem load of  $g_{int}$  tandem

$$g_{intT} = 1$$

1

$$M_{LLT} = g_{intT} \times 1.33 \times M_{HL3T}$$

712.452

**Stresses as a function of tandem live load:**

Maximum flange fiber stress in beam -  $f_{tT}$  (ksi);

$$f_{IT} = \frac{M_{LLT} 12}{S_x}$$

16.9631

### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{LLInventory} = 1.75$$

1.75

### Service II Load Factors

$$Y_{DCII} = 1.00$$

1.

$$Y_{LLInventoryII} = 1.30$$

1.3

### ALLOWABLE STRESS

Allowable steel stress -  $f_b$  (ksi);

$$f_b = F_y$$

50

### INVENTORY HL-93 TRUCK RATING

Function of steel flange fiber stress -  $R_b$  ;

#### Inventory Rating Factor for Strength I Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DC} (f_d)}{Y_{LLInventory} f_{tl}}$$

1.18727

#### Inventory Rating Factor for Service II Load Factors HL-93 Truck Load

$$R_b = \frac{f_b - Y_{DCII} f_d}{Y_{LLInventoryII} f_{tl}}$$

1.65595

### INVENTORY HL-93 TANDEM RATING

Function of steel top and bottom flange fiber stress -  $R_b$  ;

Inventory Rating Factor for Strength I Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DC} (f_d)}{Y_{LLInventory} f_{tIT}}$$

1.42676

Inventory Rating Factor for Service II Load Factors HL-93 Tandem Load

$$R_b = \frac{f_b - Y_{DCII} (f_d)}{Y_{LLInventoryII} f_{tIT}}$$

1.98998

Applied live load deflection and maximum allowable live load deflection:

Applied Live Load Deflection -  $\Delta_{app}$  (in.);

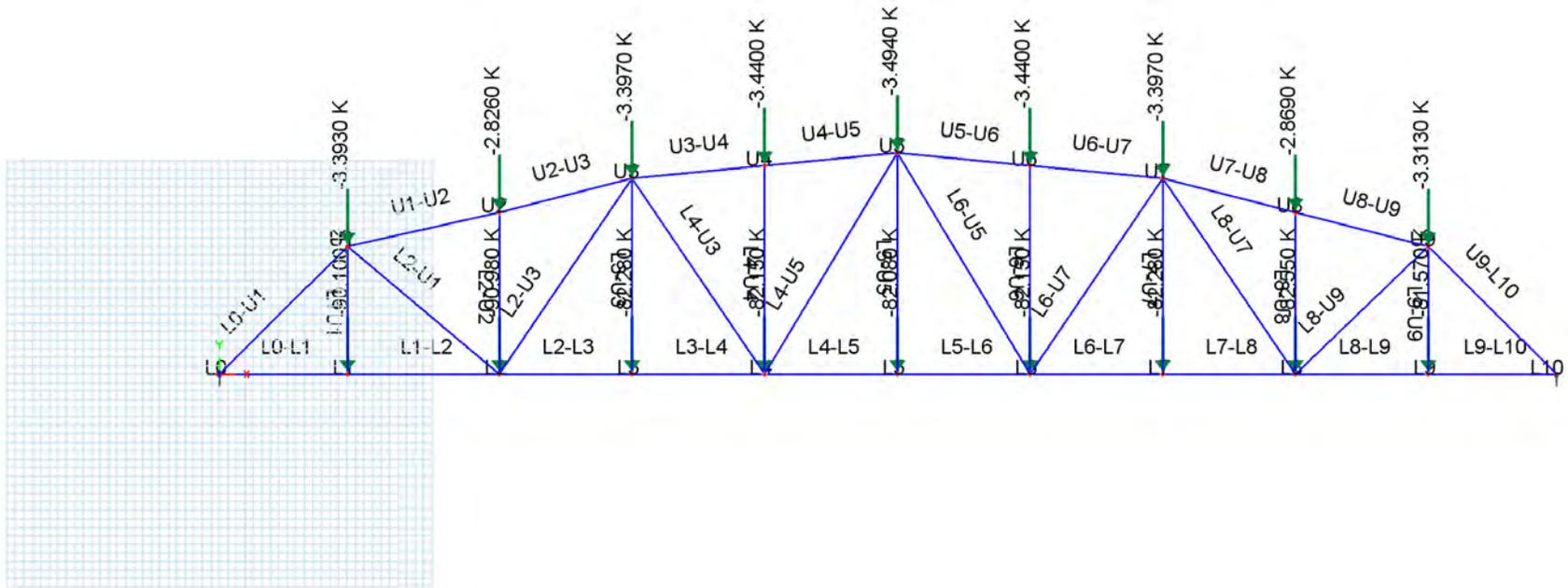
Maximum allowable live load deflection -  $\Delta_{all}$  (in.);

$$\Delta_{app}$$

0.33295

$$\Delta_{all} = N \left[ \frac{12 S_b}{800} \right]$$

0.4788



# 1.0 Frank J. Wood Span 2 Roadway Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
 VisualAnalysis 7.00 Report

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## Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L10	No	Yes

## Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L0	0.000	0.000	Yes	Yes
L1	30.165	0.000	No	No
U1	30.165	30.000	No	No
L2	65.832	0.000	No	No
U2	65.832	38.000	No	No
L3	97.040	0.000	No	No
U3	97.040	46.000	No	No
L4	128.248	0.000	No	No
U4	128.248	49.000	No	No
L5	159.457	0.000	No	No
U5	159.457	52.000	No	No
L6	190.665	0.000	No	No
U6	190.665	49.000	No	No
L7	221.873	0.000	No	No
U7	221.873	46.000	No	No
L8	253.082	0.000	No	No
U8	253.082	38.000	No	No
L9	284.29	0.000	No	No
U9	284.29	30.000	No	No
L10	314.458	0.000	No	Yes

## Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A99	L0	L1	30.165	Normal	Beam
L0-U1	L0-U1	ASTM A99	L0	U1	42.543	Normal	Bracing
L1-L2	L0-L2	ASTM A99	L1	L2	35.667	Normal	Beam
U1-U2	U1-U3	ASTM A99	U1	U2	36.553	Normal	Beam
L1U1	Verticals	ASTM A99	L1	U1	30.000	Normal	Column
L2-U1	L2-U1	ASTM A99	U1	L2	46.606	Normal	Bracing

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L2-U2	Verticals	ASTM A99	L2	U2	38.000	Normal	Column
L2-U3	1st. Diagonals	ASTM A99	L2	U3	55.587	Normal	Bracing
L2-L3	L2-L4	ASTM A99	L2	L3	31.208	Normal	Beam
U2-U3	U1-U3	ASTM A99	U2	U3	32.217	Normal	Beam
L3-U3	Verticals	ASTM A99	L3	U3	46.000	Normal	Column
L3-L4	L2-L4	ASTM A99	L3	L4	31.208	Normal	Beam
U3-U4	U3-U6	ASTM A99	U3	U4	31.352	Normal	Beam
L4-U3	1st. Diagonals	ASTM A99	U3	L4	55.587	Normal	Bracing
L4-U4	Verticals	ASTM A99	L4	U4	49.000	Normal	Column
L4-U5	2nd. Diagonals	ASTM A99	L4	U5	60.646	Normal	Bracing
L4-L5	L4-L6	ASTM A99	L4	L5	31.208	Normal	Beam
U4-U5	U3-U6	ASTM A99	U4	U5	31.352	Normal	Beam
L5-U5	Verticals	ASTM A99	L5	U5	52.000	Normal	Column
L5-L6	L4-L6	ASTM A99	L5	L6	31.208	Normal	Beam
U5-U6	U3-U6	ASTM A99	U5	U6	31.352	Normal	Beam
L6-U5	2nd. Diagonals	ASTM A99	U5	L6	60.646	Normal	Bracing
L6-U6	Verticals	ASTM A99	L6	U6	49.000	Normal	Column
L6-U7	1st. Diagonals	ASTM A99	L6	U7	55.587	Normal	Bracing
L6-L7	L6-L8	ASTM A99	L6	L7	31.208	Normal	Beam
U6-U7	U3-U6	ASTM A99	U6	U7	31.352	Normal	Beam
L7-U7	Verticals	ASTM A99	L7	U7	46.000	Normal	Column
L7-L8	L6-L8	ASTM A99	L7	L8	31.208	Normal	Beam
U7-U8	U7-U9	ASTM A99	U7	U8	32.217	Normal	Beam
L8-U7	1st. Diagonals	ASTM A99	U7	L8	55.587	Normal	Bracing
L8-U8	Verticals	ASTM A99	L8	U8	38.000	Normal	Column
L8-L9	L8-L10	ASTM A99	L8	L9	31.208	Normal	Beam
U8-U9	U7-U9	ASTM A99	U8	U9	32.217	Normal	Beam
L8-U9	l8-u9	ASTM A99	L8	U9	43.289	Normal	Bracing
L9-U9	Verticals	ASTM A99	L9	U9	30.000	Normal	Column
L9-L10	L8-L10	ASTM A99	L9	L10	30.168	Normal	Beam
U9-L10	U9-L10	ASTM A99	U9	L10	42.546	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results Analyze?	Envelope?
( 1)D	-NA-	-NA-	Yes	No

## Nodal Loads

Load Case	Node	Direction	Force K	Moment K-in
D	L1	DY	-90.100	0.000
D	U1	DY	-3.393	0.000
D	L2	DY	-90.980	0.000
D	U2	DY	-2.826	0.000
D	L3	DY	-82.280	0.000
D	U3	DY	-3.397	0.000
D	L4	DY	-82.150	0.000
D	U4	DY	-3.440	0.000
D	L5	DY	-82.080	0.000
D	U5	DY	-3.494	0.000
D	L6	DY	-82.150	0.000
D	U6	DY	-3.440	0.000
D	L7	DY	-82.280	0.000
D	U7	DY	-3.397	0.000
D	L8	DY	-82.550	0.000
D	U8	DY	-2.869	0.000
D	L9	DY	-81.570	0.000
D	U9	DY	-3.313	0.000

Load Case	Node	Direction	Force K	Moment K-in
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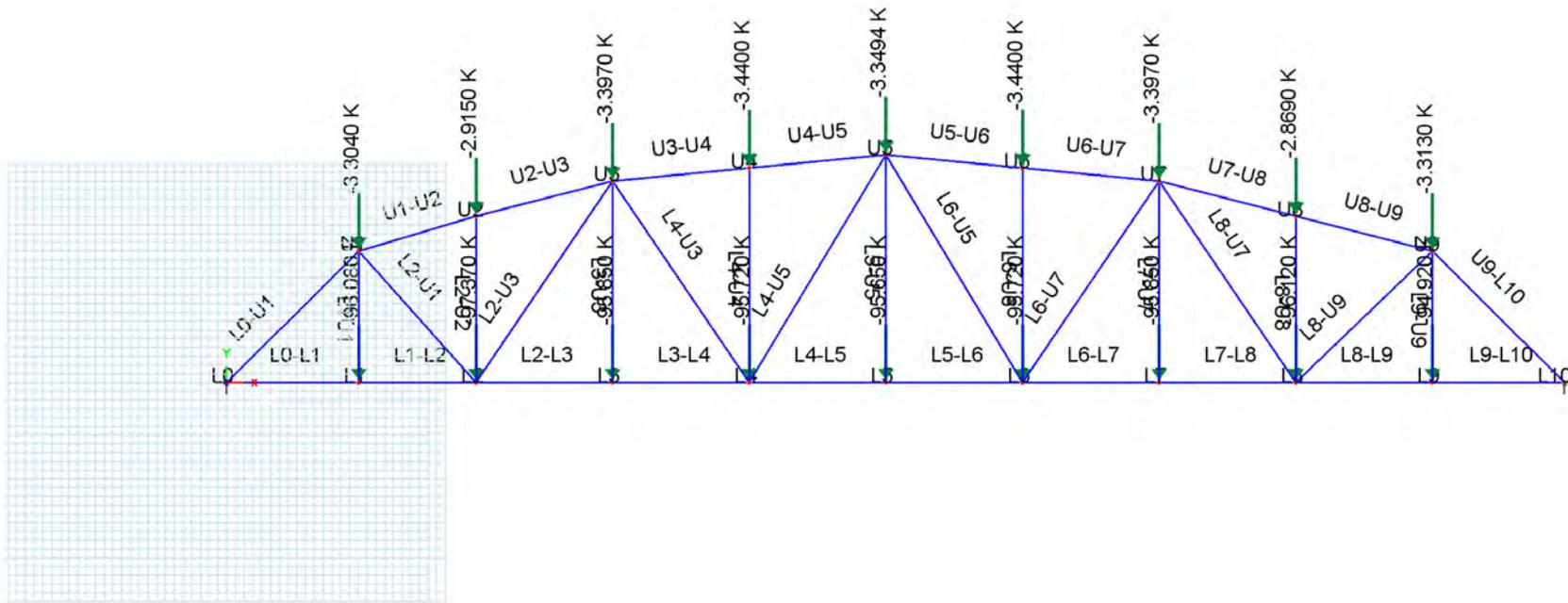
## Nodal Displacements

Node	Result Case Name	DX in	DY in
L0	D	<b>-0.0000</b>	-0.0000
L1	D	0.1135	-0.9769
U1	D	0.7671	-0.9131
L2	D	0.2477	-1.8318
U2	D	0.8280	-1.8643
L3	D	0.3646	-2.3669
U3	D	0.7964	-2.2729
L4	D	0.4815	-2.5567
U4	D	0.6990	-2.5728
U5	D	0.5742	-2.5871
L5	D	0.5992	<b>-2.6936</b>
U6	D	0.4551	-2.5296
L6	D	0.7169	-2.5135
U7	D	0.3634	-2.1872
L7	D	0.8305	-2.2812
U8	D	0.3520	-1.7102
L8	D	0.9440	-1.6995
U9	D	0.4285	-0.8903
L9	D	1.0608	-0.9482
L10	D	<b>1.1737</b>	<b>-0.0000</b>

## Member Extreme Results

Member	Fx (lc) K
L0-U1	-750.500 ( 1)
L0-U1	-737.106 ( 1)
L0-L1	527.386 ( 1)
L0-L1	527.386 ( 1)
U1-U2	-817.528 ( 1)
U1-U2	-815.265 ( 1)
L1-L2	527.386 ( 1)
L1-L2	527.386 ( 1)
L1U1	96.606 ( 1)
L1U1	98.549 ( 1)
L2-U1	349.998 ( 1)
L2-U1	353.577 ( 1)
L2-U2	-40.540 ( 1)
L2-U2	-38.080 ( 1)
U2-U3	-823.492 ( 1)
U2-U3	-821.229 ( 1)
L2-U3	-99.640 ( 1)
L2-U3	-93.526 ( 1)
L2-L3	850.829 ( 1)
L2-L3	850.829 ( 1)
L3-U3	92.278 ( 1)
L3-U3	95.256 ( 1)
U3-U4	<b>-910.718 ( 1)</b>
U3-U4	-909.757 ( 1)
L3-L4	850.829 ( 1)
L3-L4	850.829 ( 1)
L4-U3	95.321 ( 1)
L4-U3	101.435 ( 1)
L4-U4	-16.657 ( 1)

Member	Fx (lc) K
L4-U4	-13.484 ( 1)
U4-U5	-910.718 ( 1)
U4-U5	-909.757 ( 1)
L4-U5	38.007 ( 1)
L4-U5	46.691 ( 1)
L4-L5	<b>884.268 ( 1)</b>
L4-L5	884.268 ( 1)
L5-U5	92.397 ( 1)
L5-U5	95.764 ( 1)
U5-U6	-899.293 ( 1)
U5-U6	-898.332 ( 1)
L5-L6	884.268 ( 1)
L5-L6	884.268 ( 1)
L6-U5	15.907 ( 1)
L6-U5	24.591 ( 1)
L6-U6	-16.657 ( 1)
L6-U6	-13.484 ( 1)
U6-U7	-899.293 ( 1)
U6-U7	-898.332 ( 1)
L6-U7	118.220 ( 1)
L6-U7	124.334 ( 1)
L6-L7	826.6 ( 1)
L6-L7	826.6 ( 1)
L7-U7	92.278 ( 1)
L7-U7	95.256 ( 1)
U7-U8	-778.174 ( 1)
U7-U8	-775.993 ( 1)
L7-L8	826.6 ( 1)
L7-L8	826.6 ( 1)
L8-U7	-134.605 ( 1)
L8-U7	-128.491 ( 1)
L8-U8	-14.113 ( 1)
L8-U8	-11.653 ( 1)
U8-U9	-778.174 ( 1)
U8-U9	-775.993 ( 1)
L8-U9	315.218 ( 1)
L8-U9	318.286 ( 1)
L8-L9	524.390 ( 1)
L8-L9	524.390 ( 1)
L9-U9	87.636 ( 1)
L9-U9	89.579 ( 1)
U9-L10	-746.232 ( 1)
U9-L10	-732.839 ( 1)
L9-L10	524.390 ( 1)
L9-L10	524.390 ( 1)



# 1.0 Frank J. Wood Span 2 Sidewalk Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
 VisualAnalysis 7.00 Report

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## Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L10	No	Yes

## Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L0	0.000	0.000	Yes	Yes
L1	30.167	0.000	No	No
U1	30.167	30.000	No	No
L2	56.917	0.000	No	No
U2	56.917	38.000	No	No
L3	88.125	0.000	No	No
U3	88.125	46.000	No	No
L4	119.334	0.000	No	No
U4	119.334	49.000	No	No
L5	150.542	0.000	No	No
U5	150.542	52.000	No	No
L6	181.75	0.000	No	No
U6	181.75	49.000	No	No
L7	212.959	0.000	No	No
U7	212.959	46.000	No	No
L8	244.167	0.000	No	No
U8	244.167	38.000	No	No
L9	275.375	0.000	No	No
U9	275.375	30.000	No	No
L10	305.539	0.000	No	Yes

## Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A99	L0	L1	30.167	Normal	Beam
L0-U1	L0-U1	ASTM A99	L0	U1	42.544	Normal	Bracing
L1-L2	L0-L2	ASTM A99	L1	L2	26.750	Normal	Beam
U1-U2	U1-U3	ASTM A99	U1	U2	27.921	Normal	Beam
L1U1	Verticals	ASTM A99	L1	U1	30.000	Normal	Column
L2-U1	L2-U1	ASTM A99	U1	L2	40.194	Normal	Bracing

Member	Section	Material	(1)Node	(2)Node	Length	One Way	Framing
					ft		
L2-U2	Verticals	ASTM A99	L2	U2	38.000	Normal	Column
L2-U3	1st. Diagonals	ASTM A99	L2	U3	55.587	Normal	Bracing
L2-L3	L2-L4	ASTM A99	L2	L3	31.208	Normal	Beam
U2-U3	U1-U3	ASTM A99	U2	U3	32.217	Normal	Beam
L3-U3	Verticals	ASTM A99	L3	U3	46.000	Normal	Column
L3-L4	L2-L4	ASTM A99	L3	L4	31.208	Normal	Beam
U3-U4	U3-U6	ASTM A99	U3	U4	31.352	Normal	Beam
L4-U3	1st. Diagonals	ASTM A99	U3	L4	55.587	Normal	Bracing
L4-U4	Verticals	ASTM A99	L4	U4	49.000	Normal	Column
L4-U5	2nd. Diagonals	ASTM A99	L4	U5	60.646	Normal	Bracing
L4-L5	L4-L6	ASTM A99	L4	L5	31.208	Normal	Beam
U4-U5	U3-U6	ASTM A99	U4	U5	31.352	Normal	Beam
L5-U5	Verticals	ASTM A99	L5	U5	52.000	Normal	Column
L5-L6	L4-L6	ASTM A99	L5	L6	31.208	Normal	Beam
U5-U6	U3-U6	ASTM A99	U5	U6	31.352	Normal	Beam
L6-U5	2nd. Diagonals	ASTM A99	U5	L6	60.646	Normal	Bracing
L6-U6	Verticals	ASTM A99	L6	U6	49.000	Normal	Column
L6-U7	1st. Diagonals	ASTM A99	L6	U7	55.587	Normal	Bracing
L6-L7	L6-L8	ASTM A99	L6	L7	31.208	Normal	Beam
U6-U7	U3-U6	ASTM A99	U6	U7	31.352	Normal	Beam
L7-U7	Verticals	ASTM A99	L7	U7	46.000	Normal	Column
L7-L8	L6-L8	ASTM A99	L7	L8	31.208	Normal	Beam
U7-U8	U7-U9	ASTM A99	U7	U8	32.217	Normal	Beam
L8-U7	1st. Diagonals	ASTM A99	U7	L8	55.587	Normal	Bracing
L8-U8	Verticals	ASTM A99	L8	U8	38.000	Normal	Column
L8-L9	L8-L10	ASTM A99	L8	L9	31.208	Normal	Beam
L8-U9	L8-U9	ASTM A99	L8	U9	43.289	Normal	Bracing
U8-U9	U7-U9	ASTM A99	U8	U9	32.217	Normal	Beam
L9-U9	Verticals	ASTM A99	L9	U9	30.000	Normal	Column
L9-L10	L8-L10	ASTM A99	L9	L10	30.164	Normal	Beam
U9-L10	U9-L10	ASTM A99	U9	L10	42.542	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results Analyze?	Envelope?	
( 1)D	-NA-	-NA-	Yes	Yes	No

## Nodal Loads

Load Case	Node	Direction	Force	Moment
			K	K-in
D	L1	DY	-96.08	0.000
D	U1	DY	-3.304	0.000
D	L2	DY	-97.37	0.000
D	U2	DY	-2.915	0.000
D	L3	DY	-95.85	0.000
D	U3	DY	-3.397	0.000
D	L4	DY	-95.72	0.000
D	U4	DY	-3.440	0.000
D	L5	DY	-95.65	0.000
D	U5	DY	-3.349	0.000
D	L6	DY	-95.72	0.000
D	U6	DY	-3.440	0.000
D	L7	DY	-95.85	0.000
D	U7	DY	-3.397	0.000
D	L8	DY	-96.12	0.000
D	U8	DY	-2.869	0.000
D	L9	DY	-94.92	0.000
D	U9	DY	-3.313	0.000

Load Case	Node	Direction	Force K	Moment K-in
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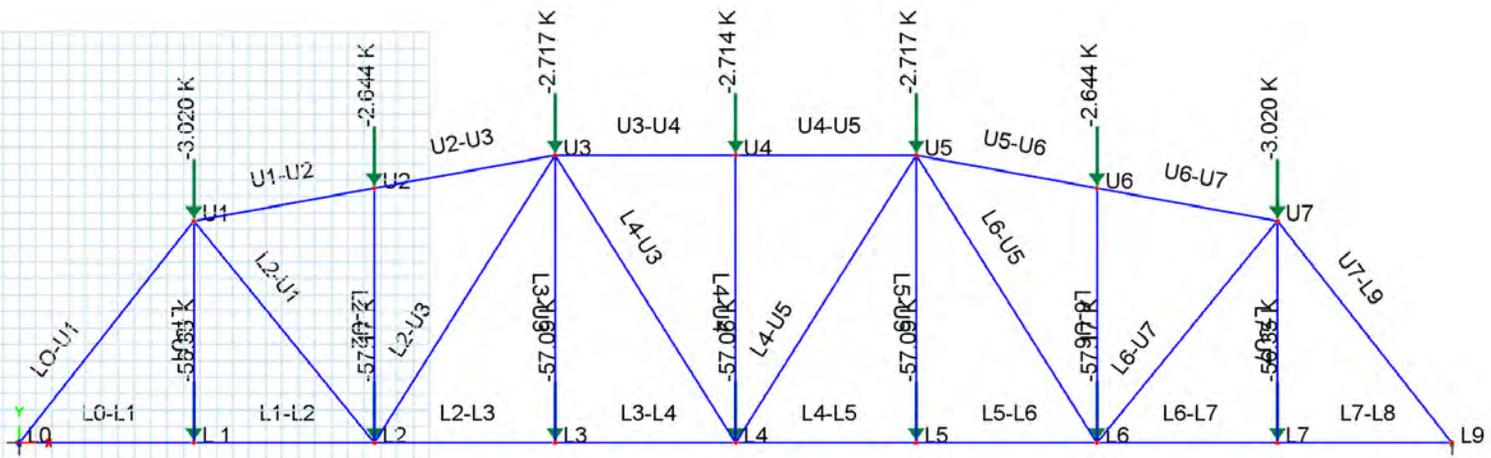
## Nodal Displacements

Node	Result	Case Name	DX in	DY in
L0	D		<b>0.0000</b>	-0.0000
L1	D		0.1129	-0.9610
U1	D		0.7314	-0.8935
L2	D		0.2130	-1.5659
U2	D		0.8120	-1.5488
L3	D		0.3254	-2.2016
U3	D		0.8213	-2.0933
L4	D		0.4378	-2.4508
U4	D		0.7346	-2.4678
L5	D		0.5517	<b>-2.6690</b>
U5	D		0.6194	-2.5458
U6	D		0.4951	-2.5556
L6	D		0.6655	-2.5387
U7	D		0.3991	-2.2702
L7	D		0.8401	-2.3748
U8	D		0.3931	-1.7676
L8	D		1.0147	-1.7564
U9	D		0.4706	-0.9391
L9	D		1.1282	-1.0062
L10	D		<b>1.2379</b>	<b>-0.0000</b>

## Member Extreme Results

Member	Fx (lc) K
L0-U1	-835.684 ( 1)
L0-U1	-822.290 ( 1)
L0-L1	587.805 ( 1)
L0-L1	587.805 ( 1)
U1-U2	-824.368 ( 1)
U1-U2	-822.023 ( 1)
L1-L2	587.805 ( 1)
L1-L2	587.805 ( 1)
L1U1	102.384 ( 1)
L1U1	104.327 ( 1)
L2-U1	300.197 ( 1)
L2-U1	303.468 ( 1)
L2-U2	19.504 ( 1)
L2-U2	21.965 ( 1)
U2-U3	-815.355 ( 1)
U2-U3	-813.010 ( 1)
L2-U3	-164.012 ( 1)
L2-U3	-157.898 ( 1)
L2-L3	879.047 ( 1)
L2-L3	879.047 ( 1)
L3-U3	106.592 ( 1)
L3-U3	109.571 ( 1)
U3-U4	-960.618 ( 1)
U3-U4	-959.575 ( 1)
L3-L4	879.047 ( 1)
L3-L4	879.047 ( 1)
L4-U3	133.460 ( 1)
L4-U3	139.574 ( 1)
L4-U4	-17.511 ( 1)

Member	Fx (lc) K
L4-U4	-14.339 ( 1)
U4-U5	-960.618 ( 1)
U4-U5	-959.575 ( 1)
L4-U5	19.076 ( 1)
L4-U5	27.76 ( 1)
L4-L5	943.640 ( 1)
L4-L5	943.640 ( 1)
L5-U5	107.030 ( 1)
L5-U5	110.397 ( 1)
U5-U6	<b>-966.252 ( 1)</b>
U5-U6	-965.210 ( 1)
L5-L6	<b>943.640 ( 1)</b>
L5-L6	943.640 ( 1)
L6-U5	29.975 ( 1)
L6-U5	38.659 ( 1)
L6-U6	-17.511 ( 1)
L6-U6	-14.339 ( 1)
U6-U7	-966.252 ( 1)
U6-U7	-965.210 ( 1)
L6-U7	119.917 ( 1)
L6-U7	126.031 ( 1)
L6-L7	892.258 ( 1)
L6-L7	892.258 ( 1)
L7-U7	102.870 ( 1)
L7-U7	105.848 ( 1)
U7-U8	-844.065 ( 1)
U7-U8	-841.721 ( 1)
L7-L8	892.258 ( 1)
L7-L8	892.258 ( 1)
L8-U7	-138.008 ( 1)
L8-U7	-131.894 ( 1)
L8-U8	-14.772 ( 1)
L8-U8	-12.312 ( 1)
U8-U9	-844.065 ( 1)
U8-U9	-841.721 ( 1)
L8-U9	338.478 ( 1)
L8-U9	342.056 ( 1)
L8-L9	571.186 ( 1)
L8-L9	571.186 ( 1)
L9-U9	101.718 ( 1)
L9-U9	103.660 ( 1)
U9-L10	-811.724 ( 1)
U9-L10	-799.456 ( 1)
L9-L10	571.186 ( 1)
L9-L10	571.186 ( 1)



# 1.0 Frank J. Wood Span 3 Roadway Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
 VisualAnalysis 7.00 Report

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## Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L9	No	Yes

## Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L 1	21.250	0.000	No	No
L0	0.000	0.000	Yes	Yes
U1	21.250	27.000	No	No
L2	43.250	0.000	No	No
U2	43.250	31.000	No	No
L3	65.250	0.000	No	No
U3	65.250	35.000	No	No
L4	87.250	0.000	No	No
U4	87.250	35.000	No	No
L5	109.25	0.000	No	No
U5	109.25	35.000	No	No
L6	131.25	0.000	No	No
U6	131.25	31.000	No	No
L7	153.25	0.000	No	No
U7	153.25	27.000	No	No
L9	174.50	0.000	No	Yes

## Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A57	L0	L 1	21.250	Normal	Beam
L1-U1	Vertical 1	ASTM A57	L 1	U1	27.000	Normal	Column
L1-L2	L0-L2	ASTM A57	L 1	L2	22.000	Normal	Beam
U1-U2	U1-U3	ASTM A57	U1	U2	22.361	Normal	Beam
L2-U1	Diagonal 1	ASTM A57	U1	L2	34.828	Normal	Bracing
L2-U2	Vertical 2	ASTM A57	L2	U2	31.000	Normal	Column
L2-U3	Diagonal 2	ASTM A57	L2	U3	41.340	Normal	Bracing
L2-L3	L2-L6	ASTM A57	L2	L3	22.000	Normal	Beam
U2-U3	U1-U3	ASTM A57	U2	U3	22.361	Normal	Beam
L3-U3	Vertical 1	ASTM A57	L3	U3	35.000	Normal	Column

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L3-L4	L2-L6	ASTM A57	L3	L4	22.000	Normal	Beam
U3-U4	U3-U5	ASTM A57	U3	U4	22.000	Normal	Beam
L4-U3	Diagonal 3	ASTM A57	U3	L4	41.340	Normal	Bracing
L4-U4	Vertical 2	ASTM A57	L4	U4	35.000	Normal	Column
L4-U5	Diagonal 3	ASTM A57	L4	U5	41.340	Normal	Bracing
L4-L5	L2-L6	ASTM A57	L4	L5	22.000	Normal	Beam
U4-U5	U3-U5	ASTM A57	U4	U5	22.000	Normal	Beam
L5-U5	Vertical 1	ASTM A57	L5	U5	35.000	Normal	Column
L5-L6	L2-L6	ASTM A57	L5	L6	22.000	Normal	Beam
U5-U6	U1-U3	ASTM A57	U5	U6	22.361	Normal	Beam
L6-U5	Diagonal 2	ASTM A57	U5	L6	41.340	Normal	Bracing
L6-U6	Vertical 2	ASTM A57	L6	U6	31.000	Normal	Column
L6-U7	Diagonal 1	ASTM A57	L6	U7	34.828	Normal	Bracing
L6-L7	L0-L2	ASTM A57	L6	L7	22.000	Normal	Beam
L7-U7	Vertical 1	ASTM A57	L7	U7	27.000	Normal	Column
L7-L8	L0-L2	ASTM A99	L7	L9	21.250	Normal	Beam
L0-U1	L0-U1	ASTM A57	L0	U1	34.359	Normal	Bracing
U6-U7	U1-U3	ASTM A57	U6	U7	22.361	Normal	Beam
U7-L9	L0-U1	ASTM A57	U7	L9	34.359	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results Analyze?	Envelope?
( 1)D	-NA-	-NA-	Yes	No

## Nodal Loads

Load Case	Node	Direction	Force K	Moment K-in
D	L 1	DY	-56.35	0.000
D	U1	DY	-3.020	0.000
D	L2	DY	-57.17	0.000
D	U2	DY	-2.644	0.000
D	L3	DY	-57.09	0.000
D	U3	DY	-2.717	0.000
D	L4	DY	-57.06	0.000
D	U4	DY	-2.714	0.000
D	L5	DY	-57.09	0.000
D	U5	DY	-2.717	0.000
D	L6	DY	-57.17	0.000
D	U6	DY	-2.644	0.000
D	L7	DY	-56.35	0.000
D	U7	DY	-3.020	0.000

## Nodal Displacements

Node	Result Case Name	DX in	DY in
L 1	D	0.0872	-0.4943
L0	D	<b>-0.0000</b>	-0.0000
U1	D	0.4381	-0.4352
L2	D	0.1774	-0.8070
U2	D	0.4290	-0.8145
L3	D	0.2448	-1.0963
U3	D	0.3876	-1.0160
U4	D	0.3122	<b>-1.1473</b>

Node	Result	Case Name	DX in	DY in
L4	D		0.3122	-1.1381
U5	D		0.2367	-1.0160
L5	D		0.3795	-1.0963
U6	D		0.1953	-0.8145
L6	D		0.4469	-0.8070
U7	D		0.1862	-0.4352
L7	D		0.5372	-0.4943
L9	D		<b>0.6243</b>	<b>-0.0000</b>

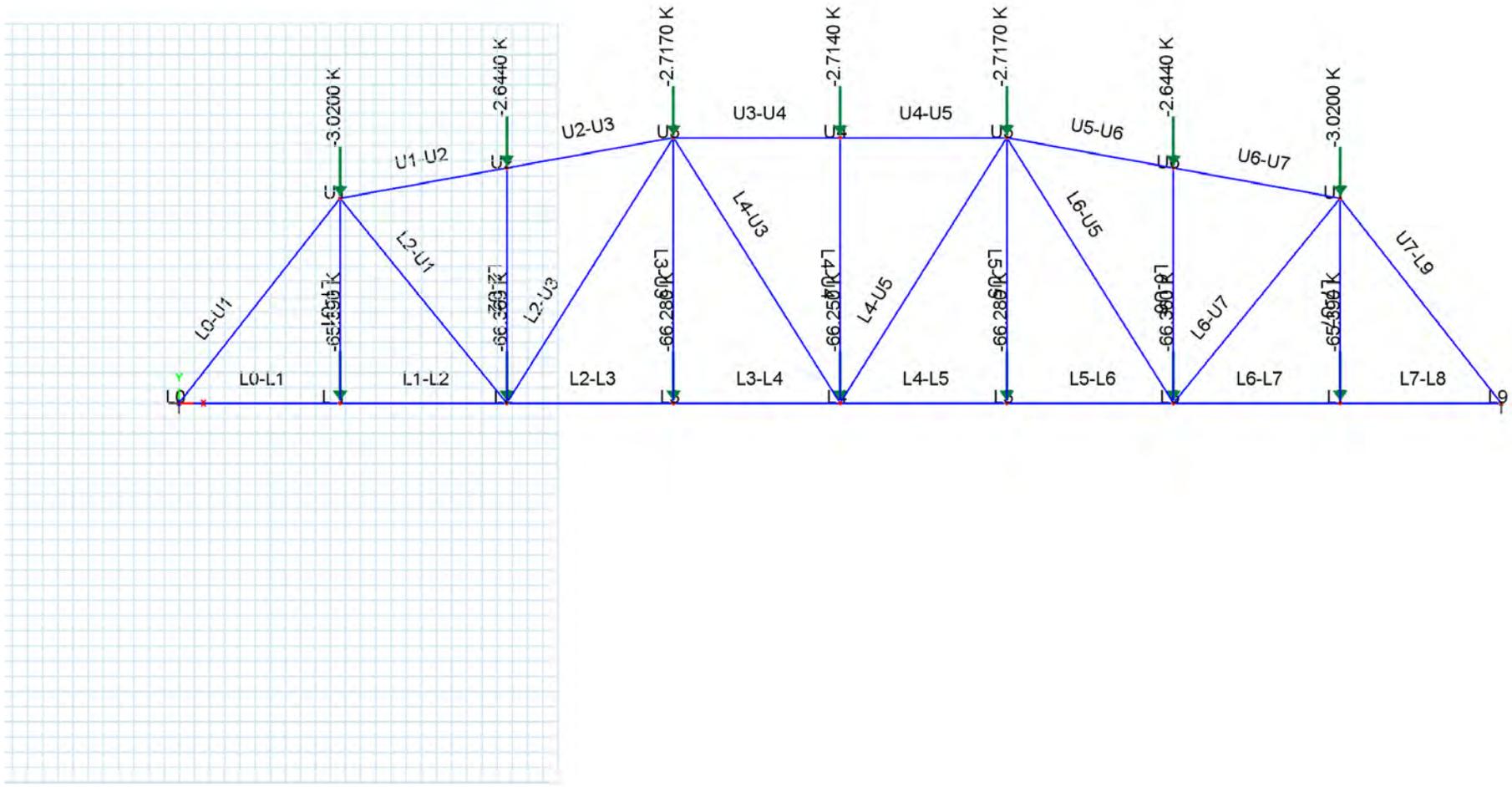
## Member Extreme Results

Member	Fx (lc) K
L0-L1	188.366 ( 1)
L0-L1	188.366 ( 1)
L1-U1	57.75 ( 1)
L1-U1	58.762 ( 1)
U1-U2	-290.752 ( 1)
U1-U2	-290.275 ( 1)
L1-L2	188.366 ( 1)
L1-L2	188.366 ( 1)
L2-U1	153.463 ( 1)
L2-U1	155.119 ( 1)
L2-U2	-6.368 ( 1)
L2-U2	-5.311 ( 1)
U2-U3	-290.752 ( 1)
U2-U3	-290.275 ( 1)
L2-U3	-61.847 ( 1)
L2-U3	-59.939 ( 1)
L2-L3	318.233 ( 1)
L2-L3	318.233 ( 1)
L3-U3	60.314 ( 1)
L3-U3	61.626 ( 1)
U3-U4	<b>-339.860 ( 1)</b>
U3-U4	-339.860 ( 1)
L3-L4	318.233 ( 1)
L3-L4	318.233 ( 1)
L4-U3	39.984 ( 1)
L4-U3	41.296 ( 1)
L4-U4	-6.981 ( 1)
L4-U4	-5.788 ( 1)
U4-U5	-339.860 ( 1)
U4-U5	-339.860 ( 1)
L4-U5	39.984 ( 1)
L4-U5	41.296 ( 1)
L4-L5	318.233 ( 1)
L4-L5	318.233 ( 1)
L5-U5	60.314 ( 1)
L5-U5	61.626 ( 1)
U5-U6	-290.752 ( 1)
U5-U6	-290.275 ( 1)
L5-L6	318.233 ( 1)
L5-L6	<b>318.233 ( 1)</b>
L6-U5	-61.847 ( 1)
L6-U5	-59.939 ( 1)
L6-U6	-6.368 ( 1)
L6-U6	-5.311 ( 1)
U6-U7	-290.752 ( 1)
U6-U7	-290.275 ( 1)
L6-U7	153.463 ( 1)
L6-U7	155.119 ( 1)

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Member	Fx (lc) K
L6-L7	188.366 ( 1)
L6-L7	188.366 ( 1)
L7-U7	57.75 ( 1)
L7-U7	58.762 ( 1)
L7-L8	188.366 ( 1)
L7-L8	188.366 ( 1)
LO-U1	-307.377 ( 1)
LO-U1	-301.764 ( 1)
U7-L9	-307.377 ( 1)
U7-L9	-301.764 ( 1)

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# 1.0 Frank J. Wood Span 3 Sidewalk Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
 VisualAnalysis 7.00 Report

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## Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L9	No	Yes

## Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L 1	21.250	0.000	No	No
L0	0.000	0.000	Yes	Yes
U1	21.250	27.000	No	No
L2	43.250	0.000	No	No
U2	43.250	31.000	No	No
L3	65.250	0.000	No	No
U3	65.250	35.000	No	No
L4	87.250	0.000	No	No
U4	87.250	35.000	No	No
L5	109.25	0.000	No	No
U5	109.25	35.000	No	No
L6	131.25	0.000	No	No
U6	131.25	31.000	No	No
L7	153.25	0.000	No	No
U7	153.25	27.000	No	No
L9	174.50	0.000	No	Yes

## Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A57	L0	L 1	21.250	Normal	Beam
L0-U1	L0-U1	ASTM A57	L0	U1	34.359	Normal	Bracing
L1-U1	Vertical 1	ASTM A57	L 1	U1	27.000	Normal	Column
L1-L2	L0-L2	ASTM A57	L 1	L2	22.000	Normal	Beam
U1-U2	U1-U3	ASTM A57	U1	U2	22.361	Normal	Beam
L2-U1	Diagonal 1	ASTM A57	U1	L2	34.828	Normal	Bracing
L2-U2	Vertical 2	ASTM A57	L2	U2	31.000	Normal	Column
L2-U3	Diagonal 1	ASTM A57	L2	U3	41.340	Normal	Bracing
L2-L3	L2-L6	ASTM A57	L2	L3	22.000	Normal	Beam
U2-U3	U1-U3	ASTM A57	U2	U3	22.361	Normal	Beam

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L3-U3	Vertical 1	ASTM A57 L3	U3	U3	35.000	Normal	Column
L3-L4	L2-L6	ASTM A57 L3	L4	L4	22.000	Normal	Beam
U3-U4	U3-U5	ASTM A57 U3	U4	U4	22.000	Normal	Beam
L4-U3	Diagonal 2	ASTM A57 U3	L4	L4	41.340	Normal	Bracing
L4-U4	Vertical 2	ASTM A57 L4	U4	U4	35.000	Normal	Column
L4-U5	Diagonal 2	ASTM A57 L4	U5	U5	41.340	Normal	Bracing
L4-L5	L2-L6	ASTM A57 L4	L5	L5	22.000	Normal	Beam
U4-U5	U3-U5	ASTM A57 U4	U5	U5	22.000	Normal	Beam
L5-U5	Vertical 1	ASTM A57 L5	U5	U5	35.000	Normal	Column
L5-L6	L2-L6	ASTM A57 L5	L6	L6	22.000	Normal	Beam
U5-U6	U1-U3	ASTM A57 U5	U6	U6	22.361	Normal	Beam
L6-U5	W16x26	ASTM A57 U5	L6	L6	41.340	Normal	Bracing
L6-U6	Vertical 2	ASTM A57 L6	U6	U6	31.000	Normal	Column
L6-U7	Diagonal 1	ASTM A57 L6	U7	U7	34.828	Normal	Bracing
L6-L7	L0-L2	ASTM A57 L6	L7	L7	22.000	Normal	Beam
U6-U7	U1-U3	ASTM A57 U6	U7	U7	22.361	Normal	Beam
L7-U7	Vertical 1	ASTM A57 L7	U7	U7	27.000	Normal	Column
L7-L8	L0-L2	ASTM A99 L7	L9	L9	21.250	Normal	Beam
U7-L9	L0-U1	ASTM A57 U7	L9	L9	34.359	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results	Analyze?	Envelope?
( 1)D	-NA-	-NA-	Yes	Yes	No

## Nodal Loads

Load Case	Node	Direction	Force K	Moment K-in
D	L 1	DY	-65.39	0.000
D	U1	DY	-3.020	0.000
D	L2	DY	-66.369	0.000
D	U2	DY	-2.644	0.000
D	L3	DY	-66.28	0.000
D	U3	DY	-2.717	0.000
D	L4	DY	-66.25	0.000
D	U4	DY	-2.714	0.000
D	L5	DY	-66.28	0.000
D	U5	DY	-2.717	0.000
D	L6	DY	-66.36	0.000
D	U6	DY	-2.644	0.000
D	L7	DY	-65.39	0.000
D	U7	DY	-3.020	0.000

## Nodal Displacements

Node	Result Case Name	DX in	DY in
L 1	D	0.0619	-0.4751
L0	D	<b>-0.0000</b>	-0.0000
U1	D	0.4080	-0.4165
L2	D	0.1260	-0.7906
U2	D	0.3964	-0.7985
L3	D	0.1893	-1.0725
U3	D	0.3506	-0.9933
L4	D	0.2526	-1.1172

Node	Result	Case Name	DX in	DY in
U4	D		0.2711	<b>-1.1269</b>
U5	D		0.1916	-1.0145
L5	D		0.3157	-1.0936
U6	D		0.1645	-0.7190
L6	D		0.3788	-0.7111
U7	D		0.1457	-0.3774
L7	D		0.4427	-0.4361
L9	D		<b>0.5045</b>	<b>-0.0000</b>

## Member Extreme Results

Member	Fx (lc) K
L0-U1	-356.025 ( 1)
L0-U1	-349.860 ( 1)
L0-L1	218.282 ( 1)
L0-L1	218.282 ( 1)
L1-U1	67.675 ( 1)
L1-U1	68.871 ( 1)
U1-U2	-336.812 ( 1)
U1-U2	-336.280 ( 1)
L1-L2	218.282 ( 1)
L1-L2	218.282 ( 1)
L2-U1	177.571 ( 1)
L2-U1	179.687 ( 1)
L2-U2	-6.672 ( 1)
L2-U2	-5.616 ( 1)
U2-U3	-336.812 ( 1)
U2-U3	-336.280 ( 1)
L2-U3	-71.418 ( 1)
L2-U3	-68.674 ( 1)
L2-L3	<b>368.394 ( 1)</b>
L2-L3	368.394 ( 1)
L3-U3	70.254 ( 1)
L3-U3	71.804 ( 1)
U3-U4	<b>-392.993 ( 1)</b>
U3-U4	-392.993 ( 1)
L3-L4	368.394 ( 1)
L3-L4	368.394 ( 1)
L4-U3	45.33 ( 1)
L4-U3	47.119 ( 1)
L4-U4	-7.281 ( 1)
L4-U4	-6.088 ( 1)
U4-U5	-392.993 ( 1)
U4-U5	-392.993 ( 1)
L4-U5	46.921 ( 1)
L4-U5	48.71 ( 1)
L4-L5	367.548 ( 1)
L4-L5	367.548 ( 1)
L5-U5	70.254 ( 1)
L5-U5	71.804 ( 1)
U5-U6	-335.648 ( 1)
U5-U6	-335.116 ( 1)
L5-L6	367.548 ( 1)
L5-L6	367.548 ( 1)
L6-U5	-71.066 ( 1)
L6-U5	-70.150 ( 1)
L6-U6	-6.672 ( 1)
L6-U6	-5.616 ( 1)
U6-U7	-335.648 ( 1)
U6-U7	-335.116 ( 1)

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Member	Fx (lc) K
L6-U7	176.780 ( 1)
L6-U7	178.897 ( 1)
L6-L7	217.636 ( 1)
L6-L7	217.636 ( 1)
L7-U7	67.675 ( 1)
L7-U7	68.871 ( 1)
L7-L8	217.636 ( 1)
L7-L8	217.636 ( 1)
U7-L9	-354.981 ( 1)
U7-L9	-348.816 ( 1)

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# 1.0 Rehab Truss with Polymer Wearing Frank J. Wood Span 2 Roadway Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
VisualAnalysis 7.00 Report

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## Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L10	No	Yes

## Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L0	0.000	0.000	Yes	Yes
L1	30.165	0.000	No	No
U1	30.165	30.000	No	No
L2	65.832	0.000	No	No
U2	65.832	38.000	No	No
L3	97.040	0.000	No	No
U3	97.040	46.000	No	No
L4	128.248	0.000	No	No
U4	128.248	49.000	No	No
L5	159.457	0.000	No	No
U5	159.457	52.000	No	No
L6	190.665	0.000	No	No
U6	190.665	49.000	No	No
L7	221.873	0.000	No	No
U7	221.873	46.000	No	No
L8	253.082	0.000	No	No
U8	253.082	38.000	No	No
L9	284.29	0.000	No	No
U9	284.29	30.000	No	No
L10	314.458	0.000	No	Yes

## Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A99	L0	L1	30.165	Normal	Beam
L0-U1	L0-U1	ASTM A99	L0	U1	42.543	Normal	Bracing
L1-L2	L0-L2	ASTM A99	L1	L2	35.667	Normal	Beam
U1-U2	U1-U3	ASTM A99	U1	U2	36.553	Normal	Beam

Member	Section	Material	(1)Node	(2)Node	Length	One Way	Framing
					ft		
L1U1	Verticals	ASTM A99	L1	U1	30.000	Normal	Column
L2-U1	L2-U1	ASTM A99	U1	L2	46.606	Normal	Bracing
L2-U2	Verticals	ASTM A99	L2	U2	38.000	Normal	Column
L2-U3	1st. Diagonals	ASTM A99	L2	U3	55.587	Normal	Bracing
L2-L3	L2-L4	ASTM A99	L2	L3	31.208	Normal	Beam
U2-U3	U1-U3	ASTM A99	U2	U3	32.217	Normal	Beam
L3-U3	Verticals	ASTM A99	L3	U3	46.000	Normal	Column
L3-L4	L2-L4	ASTM A99	L3	L4	31.208	Normal	Beam
U3-U4	U3-U6	ASTM A99	U3	U4	31.352	Normal	Beam
L4-U3	1st. Diagonals	ASTM A99	U3	L4	55.587	Normal	Bracing
L4-U4	Verticals	ASTM A99	L4	U4	49.000	Normal	Column
L4-U5	2nd. Diagonals	ASTM A99	L4	U5	60.646	Normal	Bracing
L4-L5	L4-L6	ASTM A99	L4	L5	31.208	Normal	Beam
U4-U5	U3-U6	ASTM A99	U4	U5	31.352	Normal	Beam
L5-U5	Verticals	ASTM A99	L5	U5	52.000	Normal	Column
L5-L6	L4-L6	ASTM A99	L5	L6	31.208	Normal	Beam
U5-U6	U3-U6	ASTM A99	U5	U6	31.352	Normal	Beam
L6-U5	2nd. Diagonals	ASTM A99	U5	L6	60.646	Normal	Bracing
L6-U6	Verticals	ASTM A99	L6	U6	49.000	Normal	Column
L6-U7	1st. Diagonals	ASTM A99	L6	U7	55.587	Normal	Bracing
L6-L7	L6-L8	ASTM A99	L6	L7	31.208	Normal	Beam
U6-U7	U3-U6	ASTM A99	U6	U7	31.352	Normal	Beam
L7-U7	Verticals	ASTM A99	L7	U7	46.000	Normal	Column
L7-L8	L6-L8	ASTM A99	L7	L8	31.208	Normal	Beam
U7-U8	U7-U9	ASTM A99	U7	U8	32.217	Normal	Beam
L8-U7	1st. Diagonals	ASTM A99	U7	L8	55.587	Normal	Bracing
L8-U8	Verticals	ASTM A99	L8	U8	38.000	Normal	Column
L8-L9	L8-L10	ASTM A99	L8	L9	31.208	Normal	Beam
U8-U9	U7-U9	ASTM A99	U8	U9	32.217	Normal	Beam
L8-U9	l8-u9	ASTM A99	L8	U9	43.289	Normal	Bracing
L9-U9	Verticals	ASTM A99	L9	U9	30.000	Normal	Column
L9-L10	L8-L10	ASTM A99	L9	L10	30.168	Normal	Beam
U9-L10	U9-L10	ASTM A99	U9	L10	42.546	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results	Analyze?	Envelope?
( 1)D	-NA-	-NA-	Yes	Yes	No

## Nodal Loads

Load Case	Node	Direction	Force K	Moment K-in
D	L1	DY	-50.30	0.000
D	U1	DY	-3.393	0.000
D	L2	DY	-50.30	0.000
D	U2	DY	-2.826	0.000
D	L3	DY	-50.30	0.000
D	U3	DY	-3.397	0.000
D	L4	DY	-50.30	0.000
D	U4	DY	-3.440	0.000
D	L5	DY	-50.30	0.000
D	U5	DY	-3.494	0.000
D	L6	DY	-50.30	0.000
D	U6	DY	-3.440	0.000
D	L7	DY	-50.30	0.000
D	U7	DY	-3.397	0.000
D	L8	DY	-50.30	0.000
D	U8	DY	-2.869	0.000

Load Case	Node	Direction	Force K	Moment K-in
D	L9	DY	-50.30	0.000
D	U9	DY	-3.313	0.000

## Nodal Displacements

Node	Result Case Name	DX in	DY in
L0	D	<b>0.0000</b>	<b>-0.0000</b>
L1	D	0.0797	-0.6835
U1	D	0.5432	-0.6458
L2	D	0.1740	-1.3007
U2	D	0.5881	-1.3271
L3	D	0.2574	-1.6848
U3	D	0.5675	-1.6229
L4	D	0.3408	-1.8305
U4	D	0.4985	-1.8466
U5	D	0.4089	-1.8551
L5	D	0.4254	<b>-1.9256</b>
U6	D	0.3226	-1.8197
L6	D	0.5100	-1.8036
U7	D	0.2571	-1.5695
L7	D	0.5917	-1.6314
U8	D	0.2483	-1.2294
L8	D	0.6733	-1.2187
U9	D	0.3039	-0.6382
L9	D	0.7570	-0.6757
L10	D	<b>0.8380</b>	-0.0000

## Member Extreme Results

Member	Fx (lc) K
L0-U1	-529.213 ( 1)
L0-U1	-515.821 ( 1)
L0-L1	370.486 ( 1)
L0-L1	370.486 ( 1)
U1-U2	-578.766 ( 1)
U1-U2	-576.503 ( 1)
L1-L2	370.486 ( 1)
L1-L2	370.486 ( 1)
L1U1	56.806 ( 1)
L1U1	58.748 ( 1)
L2-U1	250.594 ( 1)
L2-U1	254.172 ( 1)
L2-U2	-33.073 ( 1)
L2-U2	-30.613 ( 1)
U2-U3	-582.986 ( 1)
U2-U3	-580.723 ( 1)
L2-U3	-80.501 ( 1)
L2-U3	-74.388 ( 1)
L2-L3	607.110 ( 1)
L2-L3	607.110 ( 1)
L3-U3	60.297 ( 1)
L3-U3	63.275 ( 1)
U3-U4	<b>-652.984 ( 1)</b>
U3-U4	-652.024 ( 1)
L3-L4	607.110 ( 1)
L3-L4	607.110 ( 1)
L4-U3	72.465 ( 1)

Member	Fx (lc) K
L4-U3	78.578 ( 1)
L4-U4	-16.655 ( 1)
L4-U4	-13.483 ( 1)
U4-U5	-652.984 ( 1)
U4-U5	-652.024 ( 1)
L4-U5	22.917 ( 1)
L4-U5	31.60 ( 1)
L4-L5	<b>635.483 ( 1)</b>
L4-L5	635.483 ( 1)
L5-U5	60.616 ( 1)
L5-U5	63.982 ( 1)
U5-U6	-646.895 ( 1)
U5-U6	-645.934 ( 1)
L5-L6	635.483 ( 1)
L5-L6	635.483 ( 1)
L6-U5	11.137 ( 1)
L6-U5	19.82 ( 1)
L6-U6	-16.655 ( 1)
L6-U6	-13.483 ( 1)
U6-U7	-646.895 ( 1)
U6-U7	-645.934 ( 1)
L6-U7	84.671 ( 1)
L6-U7	90.784 ( 1)
L6-L7	594.196 ( 1)
L6-L7	594.196 ( 1)
L7-U7	60.297 ( 1)
L7-U7	63.275 ( 1)
U7-U8	-558.876 ( 1)
U7-U8	-556.695 ( 1)
L7-L8	594.196 ( 1)
L7-L8	594.196 ( 1)
L8-U7	-99.026 ( 1)
L8-U7	-92.912 ( 1)
L8-U8	-14.112 ( 1)
L8-U8	-11.652 ( 1)
U8-U9	-558.876 ( 1)
U8-U9	-556.695 ( 1)
L8-U9	226.194 ( 1)
L8-U9	229.261 ( 1)
L8-L9	376.142 ( 1)
L8-L9	376.142 ( 1)
L9-U9	56.365 ( 1)
L9-U9	58.308 ( 1)
U9-L10	-537.160 ( 1)
U9-L10	-523.768 ( 1)
L9-L10	376.142 ( 1)
L9-L10	376.142 ( 1)

## 2.0 Rehab Truss with Polymer Wearing Frank J. Wood Span 2 Sidewalk Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
VisualAnalysis 7.00 Report

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### Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L10	No	Yes

### Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L0	0.000	0.000	Yes	Yes
L1	30.167	0.000	No	No
U1	30.167	30.000	No	No
L2	56.917	0.000	No	No
U2	56.917	38.000	No	No
L3	88.125	0.000	No	No
U3	88.125	46.000	No	No
L4	119.334	0.000	No	No
U4	119.334	49.000	No	No
L5	150.542	0.000	No	No
U5	150.542	52.000	No	No
L6	181.75	0.000	No	No
U6	181.75	49.000	No	No
L7	212.959	0.000	No	No
U7	212.959	46.000	No	No
L8	244.167	0.000	No	No
U8	244.167	38.000	No	No
L9	275.375	0.000	No	No
U9	275.375	30.000	No	No
L10	305.539	0.000	No	Yes

### Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A99	L0	L1	30.167	Normal	Beam
L0-U1	L0-U1	ASTM A99	L0	U1	42.544	Normal	Bracing
L1-L2	L0-L2	ASTM A99	L1	L2	26.750	Normal	Beam
U1-U2	U1-U3	ASTM A99	U1	U2	27.921	Normal	Beam

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L1U1	Verticals	ASTM A99	L1	U1	30.000	Normal	Column
L2-U1	L2-U1	ASTM A99	U1	L2	40.194	Normal	Bracing
L2-U2	Verticals	ASTM A99	L2	U2	38.000	Normal	Column
L2-U3	1St. Diagonals	ASTM A99	L2	U3	55.587	Normal	Bracing
L2-L3	L2-L4	ASTM A99	L2	L3	31.208	Normal	Beam
U2-U3	U1-U3	ASTM A99	U2	U3	32.217	Normal	Beam
L3-U3	Verticals	ASTM A99	L3	U3	46.000	Normal	Column
L3-L4	L2-L4	ASTM A99	L3	L4	31.208	Normal	Beam
U3-U4	U3-U6	ASTM A99	U3	U4	31.352	Normal	Beam
L4-U3	1St. Diagonals	ASTM A99	U3	L4	55.587	Normal	Bracing
L4-U4	Verticals	ASTM A99	L4	U4	49.000	Normal	Column
L4-U5	2nd. Diagonals	ASTM A99	L4	U5	60.646	Normal	Bracing
L4-L5	L4-L6	ASTM A99	L4	L5	31.208	Normal	Beam
U4-U5	U3-U6	ASTM A99	U4	U5	31.352	Normal	Beam
L5-U5	Verticals	ASTM A99	L5	U5	52.000	Normal	Column
L5-L6	L4-L6	ASTM A99	L5	L6	31.208	Normal	Beam
U5-U6	U3-U6	ASTM A99	U5	U6	31.352	Normal	Beam
L6-U5	2nd. Diagonals	ASTM A99	U5	L6	60.646	Normal	Bracing
L6-U6	Verticals	ASTM A99	L6	U6	49.000	Normal	Column
L6-U7	1St. Diagonals	ASTM A99	L6	U7	55.587	Normal	Bracing
L6-L7	L6-L8	ASTM A99	L6	L7	31.208	Normal	Beam
U6-U7	U3-U6	ASTM A99	U6	U7	31.352	Normal	Beam
L7-U7	Verticals	ASTM A99	L7	U7	46.000	Normal	Column
L7-L8	L6-L8	ASTM A99	L7	L8	31.208	Normal	Beam
U7-U8	U7-U9	ASTM A99	U7	U8	32.217	Normal	Beam
L8-U7	1St. Diagonals	ASTM A99	U7	L8	55.587	Normal	Bracing
L8-U8	Verticals	ASTM A99	L8	U8	38.000	Normal	Column
L8-L9	L8-L10	ASTM A99	L8	L9	31.208	Normal	Beam
L8-U9	L8-U9	ASTM A99	L8	U9	43.289	Normal	Bracing
U8-U9	U7-U9	ASTM A99	U8	U9	32.217	Normal	Beam
L9-U9	Verticals	ASTM A99	L9	U9	30.000	Normal	Column
L9-L10	L8-L10	ASTM A99	L9	L10	30.164	Normal	Beam
U9-L10	U9-L10	ASTM A99	U9	L10	42.542	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results	Analyze?	Envelope?
( 1)D	-NA-	-NA-	Yes	Yes	No

## Nodal Loads

Load Case	Node	Direction	Force K	Moment K-in
D	L1	DY	-65.80	0.000
D	U1	DY	-3.304	0.000
D	L2	DY	-65.80	0.000
D	U2	DY	-2.915	0.000
D	L3	DY	-65.80	0.000
D	U3	DY	-3.397	0.000
D	L4	DY	-65.80	0.000
D	U4	DY	-3.440	0.000
D	L5	DY	-65.80	0.000
D	U5	DY	-3.349	0.000
D	L6	DY	-65.80	0.000
D	U6	DY	-3.440	0.000
D	L7	DY	-65.80	0.000
D	U7	DY	-3.397	0.000
D	L8	DY	-65.80	0.000
D	U8	DY	-2.869	0.000

Load Case	Node	Direction	Force K	Moment K-in
D	L9	DY	-65.80	0.000
D	U9	DY	-3.313	0.000

## Nodal Displacements

Node	Result Case Name	DX in	DY in
L0	D	<b>0.0000</b>	-0.0000
L1	D	0.0867	-0.7346
U1	D	0.5624	-0.6868
L2	D	0.1635	-1.2047
U2	D	0.6254	-1.1942
L3	D	0.2502	-1.6921
U3	D	0.6327	-1.6137
L4	D	0.3368	-1.8908
U4	D	0.5663	-1.9081
L5	D	0.4248	<b>-2.0541</b>
U5	D	0.4770	-1.9646
U6	D	0.3807	-1.9755
L6	D	0.5128	-1.9583
U7	D	0.3072	-1.7499
L7	D	0.6473	-1.8245
U8	D	0.3023	-1.3638
L8	D	0.7819	-1.3525
U9	D	0.3628	-0.7229
L9	D	0.8692	-0.7711
L10	D	<b>0.9536</b>	<b>-0.0000</b>

## Member Extreme Results

Member	Fx (lc) K
L0-U1	-643.243 ( 1)
L0-U1	-629.632 ( 1)
L0-L1	451.275 ( 1)
L0-L1	451.275 ( 1)
U1-U2	-634.082 ( 1)
U1-U2	-631.699 ( 1)
L1-L2	451.275 ( 1)
L1-L2	451.275 ( 1)
L1U1	72.207 ( 1)
L1U1	74.181 ( 1)
L2-U1	231.357 ( 1)
L2-U1	234.682 ( 1)
L2-U2	11.531 ( 1)
L2-U2	14.032 ( 1)
U2-U3	-627.152 ( 1)
U2-U3	-624.769 ( 1)
L2-U3	-130.233 ( 1)
L2-U3	-124.019 ( 1)
L2-L3	677.727 ( 1)
L2-L3	677.727 ( 1)
L3-U3	76.717 ( 1)
L3-U3	79.744 ( 1)
U3-U4	-741.846 ( 1)
U3-U4	-740.786 ( 1)
L3-L4	677.727 ( 1)
L3-L4	677.727 ( 1)
L4-U3	104.096 ( 1)

Member	Fx (lc) K
L4-U3	110.310 ( 1)
L4-U4	-17.741 ( 1)
L4-U4	-14.516 ( 1)
U4-U5	-741.846 ( 1)
U4-U5	-740.786 ( 1)
L4-U5	13.046 ( 1)
L4-U5	21.871 ( 1)
L4-L5	728.930 ( 1)
L4-L5	<b>728.930 ( 1)</b>
L5-U5	77.366 ( 1)
L5-U5	80.788 ( 1)
U5-U6	<b>-745.956 ( 1)</b>
U5-U6	-744.896 ( 1)
L5-L6	728.930 ( 1)
L5-L6	728.930 ( 1)
L6-U5	20.996 ( 1)
L6-U5	29.822 ( 1)
L6-U6	-17.741 ( 1)
L6-U6	-14.516 ( 1)
U6-U7	-745.956 ( 1)
U6-U7	-744.896 ( 1)
L6-U7	93.573 ( 1)
L6-U7	99.786 ( 1)
L6-L7	687.727 ( 1)
L6-L7	687.727 ( 1)
L7-U7	72.934 ( 1)
L7-U7	75.961 ( 1)
U7-U8	-649.905 ( 1)
U7-U8	-647.523 ( 1)
L7-L8	687.727 ( 1)
L7-L8	687.727 ( 1)
L8-U7	-108.785 ( 1)
L8-U7	-102.571 ( 1)
L8-U8	-14.966 ( 1)
L8-U8	-12.465 ( 1)
U8-U9	-649.905 ( 1)
U8-U9	-647.523 ( 1)
L8-U9	260.335 ( 1)
L8-U9	263.972 ( 1)
L8-L9	439.403 ( 1)
L8-L9	439.403 ( 1)
L9-U9	72.708 ( 1)
L9-U9	74.683 ( 1)
U9-L10	-625.960 ( 1)
U9-L10	-613.491 ( 1)
L9-L10	439.403 ( 1)
L9-L10	439.403 ( 1)

# 4.0 Rehab Truss with Polymer Wearing Frank J. Wood Span 3 Sidewalk Truss - Present Dead Loads.vap

Company: JDB Consulting Engineers    Engineer: Joseph Bianchi  
VisualAnalysis 7.00 Report

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## Nodal Supports

Node	Fix DX	Fix DY
L0	Yes	Yes
L8	No	Yes

## Nodes

Node	X ft	Y ft	Fix DX	Fix DY
L 1	21.250	0.000	No	No
L0	0.000	0.000	Yes	Yes
U1	21.250	27.000	No	No
L2	43.250	0.000	No	No
U2	43.250	31.000	No	No
L3	65.250	0.000	No	No
U3	65.250	35.000	No	No
L4	87.250	0.000	No	No
U4	87.250	35.000	No	No
L5	109.25	0.000	No	No
U5	109.25	35.000	No	No
L6	131.25	0.000	No	No
U6	131.25	31.000	No	No
L7	153.25	0.000	No	No
U7	153.25	27.000	No	No
L8	174.50	0.000	No	Yes

## Member Elements

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L0-L1	L0-L2	ASTM A57 L0	L 1	L 1	21.250	Normal	Beam
L0-U1	L0-U1	ASTM A57 L0	L0	U1	34.359	Normal	Bracing
L1-U1	Vertical 1	ASTM A57 L 1	L 1	U1	27.000	Normal	Column
L1-L2	L0-L2	ASTM A57 L 1	L 1	L2	22.000	Normal	Beam
U1-U2	U1-U3	ASTM A57 U1	U1	U2	22.361	Normal	Beam
L2-U1	Diagonal 1	ASTM A57 U1	L2	L2	34.828	Normal	Bracing
L2-U2	Vertical 2	ASTM A57 L2	L2	U2	31.000	Normal	Column
L2-U3	Diagonal 1	ASTM A57 L2	L2	U3	41.340	Normal	Bracing

Member	Section	Material	(1)Node	(2)Node	Length ft	One Way	Framing
L2-L3	L2-L6	ASTM A57	L2	L3	22.000	Normal	Beam
U2-U3	U1-U3	ASTM A57	U2	U3	22.361	Normal	Beam
L3-U3	Vertical 1	ASTM A57	L3	U3	35.000	Normal	Column
L3-L4	L2-L6	ASTM A57	L3	L4	22.000	Normal	Beam
U3-U4	U3-U5	ASTM A57	U3	U4	22.000	Normal	Beam
L4-U3	Diagonal 2	ASTM A57	U3	L4	41.340	Normal	Bracing
L4-U4	Vertical 2	ASTM A57	L4	U4	35.000	Normal	Column
L4-U5	Diagonal 2	ASTM A57	L4	U5	41.340	Normal	Bracing
L4-L5	L2-L6	ASTM A57	L4	L5	22.000	Normal	Beam
U4-U5	U3-U5	ASTM A57	U4	U5	22.000	Normal	Beam
L5-U5	Vertical 1	ASTM A57	L5	U5	35.000	Normal	Column
L5-L6	L2-L6	ASTM A57	L5	L6	22.000	Normal	Beam
U5-U6	U1-U3	ASTM A57	U5	U6	22.361	Normal	Beam
L6-U5	W16x26	ASTM A57	U5	L6	41.340	Normal	Bracing
L6-U6	Vertical 2	ASTM A57	L6	U6	31.000	Normal	Column
L6-U7	Diagonal 1	ASTM A57	L6	U7	34.828	Normal	Bracing
L6-L7	L0-L2	ASTM A57	L6	L7	22.000	Normal	Beam
U6-U7	U1-U3	ASTM A57	U6	U7	22.361	Normal	Beam
L7-U7	Vertical 1	ASTM A57	L7	U7	27.000	Normal	Column
L7-L8	L0-L2	ASTM A99	L7	L8	21.250	Normal	Beam
U7-L8	L0-U1	ASTM A57	U7	L8	34.359	Normal	Bracing

## Load Cases

Load Case	Design Checks	Seismic Type	Results Analyze?	Envelope?
( 1)D	-NA-	-NA-	Yes	Yes No

## Nodal Loads

Load Case	Node	Direction	Force K	Moment K-in
D	L 1	DY	-45.00	0.000
D	U1	DY	-3.020	0.000
D	L2	DY	-45.00	0.000
D	U2	DY	-2.644	0.000
D	L3	DY	-45.00	0.000
D	U3	DY	-2.717	0.000
D	L4	DY	-45.00	0.000
D	U4	DY	-2.714	0.000
D	L5	DY	-45.00	0.000
D	U5	DY	-2.717	0.000
D	L6	DY	-45.00	0.000
D	U6	DY	-2.644	0.000
D	L7	DY	-45.00	0.000
D	U7	DY	-3.020	0.000

## Nodal Displacements

Node	Result	Case Name	DX in	DY in
L 1	D		0.0464	-0.3536
L0	D		-0.0000	-0.0000
U1	D		0.3058	-0.3122
L2	D		0.0945	-0.5922
U2	D		0.2975	-0.6006
L3	D		0.1419	-0.8001

Node	Result	Case Name	DX in	DY in
U3	D		0.2628	-0.7440
L4	D		0.1893	-0.8365
U4	D		0.2033	<b>-0.8468</b>
U5	D		0.1437	-0.7592
L5	D		0.2365	-0.8153
U6	D		0.1231	-0.5399
L6	D		0.2838	-0.5315
U7	D		0.1095	-0.2824
L7	D		0.3316	-0.3238
L8	D		<b>0.3779</b>	<b>-0.0000</b>

## Member Extreme Results

Member	Fx (lc) K
L0-U1	-268.172 ( 1)
L0-U1	-261.273 ( 1)
L0-L1	163.721 ( 1)
L0-L1	163.721 ( 1)
L1-U1	47.557 ( 1)
L1-U1	48.895 ( 1)
U1-U2	-252.366 ( 1)
U1-U2	-251.771 ( 1)
L1-L2	163.721 ( 1)
L1-L2	163.721 ( 1)
L2-U1	132.242 ( 1)
L2-U1	134.610 ( 1)
L2-U2	-7.152 ( 1)
L2-U2	-5.97 ( 1)
U2-U3	-252.366 ( 1)
U2-U3	-251.771 ( 1)
L2-U3	-54.002 ( 1)
L2-U3	-50.932 ( 1)
L2-L3	<b>275.924 ( 1)</b>
L2-L3	275.924 ( 1)
L3-U3	49.447 ( 1)
L3-U3	51.182 ( 1)
U3-U4	<b>-294.195 ( 1)</b>
U3-U4	-294.195 ( 1)
L3-L4	275.924 ( 1)
L3-L4	275.924 ( 1)
L4-U3	33.331 ( 1)
L4-U3	35.333 ( 1)
L4-U4	-7.824 ( 1)
L4-U4	-6.489 ( 1)
U4-U5	-294.195 ( 1)
U4-U5	-294.195 ( 1)
L4-U5	35.105 ( 1)
L4-U5	37.107 ( 1)
L4-L5	274.980 ( 1)
L4-L5	274.980 ( 1)
L5-U5	49.447 ( 1)
L5-U5	51.182 ( 1)
U5-U6	-251.071 ( 1)
U5-U6	-250.476 ( 1)
L5-L6	274.980 ( 1)
L5-L6	274.980 ( 1)
L6-U5	-53.6 ( 1)
L6-U5	-52.575 ( 1)
L6-U6	-7.152 ( 1)
L6-U6	-5.97 ( 1)

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Member	Fx (lc) K
U6-U7	-251.071 ( 1)
U6-U7	-250.476 ( 1)
L6-U7	131.362 ( 1)
L6-U7	133.730 ( 1)
L6-L7	163.002 ( 1)
L6-L7	163.002 ( 1)
L7-U7	47.557 ( 1)
L7-U7	48.895 ( 1)
U7-L8	-267.009 ( 1)
U7-L8	-260.111 ( 1)
L7-L8	163.002 ( 1)
L7-L8	163.002 ( 1)

---

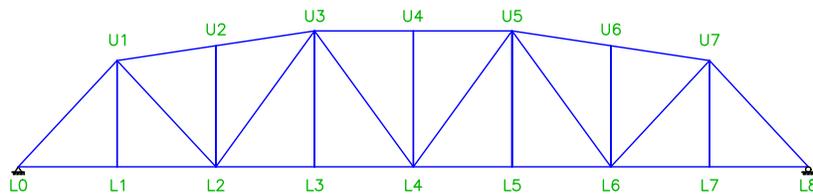
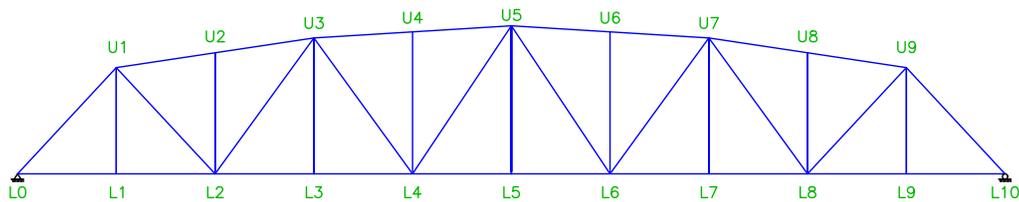
## LRFR Truss members: Frank J. Wood Bridge

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Span 3 Roadway and Sidewalk Trusses (Reference: Maine DOT Bridge Load Rating completed by Parson Brinckerhoff March 2013 - Starting at node point L0 based on original plans)

Show[ Import["TrussBridgeRating.pdf"][[1]], AspectRatio → Automatic, ImageSize → 6 \* 90]



### ■ INPUT DATA AND TRUSS RATING:

#### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{DW} = 1.50$$

1.5

$$Y_{LLInventory} = 1.75$$

1.75

### Resistance and strength of element:

Resistance of element (capacity) in force or stress (TRAP) -  $C_{xx}$  ;

Dead load of structural components or attachments effecting element (VA) -  $DC_{xx}$  ;

Dead load of structural components or attachments effecting element (TRAP) -  $DCTRAP_{xx}$  ;

Dead load adjustment factor for structural components or attachments effecting  $DC_{xx}$  elements (TRAP) -  $FC_{xx}$  ;

Dead load of wearing surface or utilities effecting element (TRAP) -  $DW_{xx}$  ;

Live HL-93 vehicular truck load including dynamic load allowance effecting element (TRAP) -  $LL_{xx}$  ;

### Roadway Truss Members (xxxx - subscript denotes member & xx - subscript denotes gusset plate):

#### Correction factor based on new rehabilitation repairs :

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$DL_T = 417.8$$

417.8

$$DL_E = 385.7$$

385.7

$$DL_N = 287$$

287

$$CF_{RWtruss} = \frac{DL_T - (DL_E - DL_N)}{DL_T}$$

0.763763

#### Member L3U3 TENSION (Ref. Page 68-69/RF=0.89):

$$C_{L3U3} = 228$$

228

$$DC_{L3U3} = 63$$

63

$$DCTRAP_{L3U3} = 65$$

65

$$FC_{L3U3} = 1.0$$

1.

$$DW_{L3U3} = 0$$

0

$$LL_{L3U3} = 94$$

94

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L3U3} = \frac{C_{L3U3} - CF_{RWtruss} Y_{DC} (FC_{L3U3} DC_{L3U3}) - Y_{DW} (DW_{L3U3})}{Y_{LLInventory} (LL_{L3U3})}$$

1.02039

Gusset L3 - Member L3U3 (Ref. Page 1,394-1,395/RF=0.85):

$$C_{L3} = 222$$

222

$$DC_{L3} = 63$$

63

$$DCTRAP_{L3} = 65$$

65

$$FC_{L3} = 1.0$$

1.

$$DW_{L3} = 0$$

0

$$LL_{L3} = 94$$

94

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{FinV_{L3}} = \frac{C_{L3} - C_{FRWtruss} Y_{DC} (FC_{L3} DC_{L3}) - Y_{DW} (DW_{L3})}{Y_{LLInventory} (LL_{L3})}$$

0.983913

Gusset L1 - Member L1U1 (Ref. Page 1,344/RF=0.88):

$$C_{L1} = 222$$

222

$$DC_{L1} = 59$$

59

$$DCTRAP_{L1} = 63$$

63

$$FC_{L1} = 1.0$$

1.

$$DW_{L1} = 0$$

0

$$LL_{L1} = 94$$

94

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{FinV_{L1}} = \frac{C_{L1} - C_{FRWtruss} Y_{DC} (FC_{L1} DC_{L1}) - Y_{DW} (DW_{L1})}{Y_{LLInventory} (LL_{L1})}$$

1.00713

Gusset L0 - Member L0U1 (Ref. Page 1,283/RF=0.91):

$$C_{L0} = 288$$

288

$$DC_{L0} = 125$$

125

$$DCTRAP_{L0} = 132$$

132

$$FC_{L0} = 1.00$$

1.

$$DW_{L0} = 0$$

0

$$LL_{L0} = 79$$

79

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L0} = \frac{C_{L0} - CF_{RWtruss} Y_{DC} (FC_{L0} DC_{L0}) - Y_{DW} (DW_{L0})}{Y_{LLInventory} (LL_{L0})}$$

1.21998

Gusset L3 - Member L3U3 (Ref. Page 1,419/RF=0.98): Maine Legal Load Configuration 6

Strength I Load Factor - Maine Legal Load Factor

$$Y_{MLLInventory} = 1.35$$

1.35

$$C_{L3} = 222$$

222

$$DC_{L3} = 63$$

63

$$DCTRAP_{L3} = 65$$

65

$$FC_{L3} = 1.0$$

1.

$$DW_{L3} = 0$$

0

$$LL_{L3} = 106$$

106

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RF_{invL3} = \frac{C_{L3} - CF_{RWtruss} Y_{DC} (FC_{L3} DC_{L3}) - Y_{DW} (DW_{L3})}{Y_{MLLInventory} (LL_{L3})}$$

1.13105

### Sidewalk Truss Members (xxxx - denotes member & xx - denotes gusset plate):

#### Correction factor based on new rehabilitation repairs :

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$DL_T = 481.8$$

481.8

$$DL_E = 377$$

377

$$DL_N = 287$$

287

$$CF_{SWtruss} = \frac{DL_T - (DL_E - DL_N)}{DL_T}$$

0.8132

#### Member U1-U2 = U3-U4 & U5-U6 = U6-U8 COMPRESSION (Ref. Page 73-74/RF=0.95):

$$C_{U1U2} = 776$$

776

$$DC_{U1U2} = N \left[ \frac{399 + 341}{2} \right]$$

370.

$$DCTRAP_{U1U2} = 365$$

365

$$FC_{U1U2} = 1.0$$

1.

$$DW_{U1U2} = 0$$

0

$$LL_{U1U2} = 192$$

192

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1U2} = \frac{C_{U1U2} - CF_{SWtruss} Y_{DC} (FC_{U1U2} DC_{U1U2}) - Y_{DW} (DW_{U1U2})}{Y_{LLInventory} (LL_{U1U2})}$$

1.19016

Gusset L0 - Member L0U1 (Ref. Page 1,479/RF=0.72):

$$C_{L0} = 288$$

288

$$DC_{L0} = 142$$

142

$$DCTRAP_{L0} = 150$$

150

$$FC_{L0} = 1.0$$

1.

$$DW_{L0} = 0$$

0

$$LL_{L0} = 79$$

79

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L0} = \frac{C_{L0} - CF_{SWtruss} Y_{DC} (FC_{L0} DC_{L0}) - Y_{DW} (DW_{L0})}{Y_{LLInventory} (LL_{L0})}$$

1.03911

Gusset U1 - Member L2U1 (Ref. Page 1,662/RF=0.94):

$$C_{U1} = 222$$

222

$$DC_{U1} = 92$$

92

$$DCTRAP_{U1} = 97$$

97

$$FC_{U1} = 1.0$$

1.

$$DW_{U1} = 0$$

0

$$LL_{U1} = 61$$

61

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1} = \frac{C_{U1} - CF_{SWtruss} Y_{DC} (FC_{U1} DC_{U1}) - Y_{DW} (DW_{U1})}{Y_{LLInventory} (LL_{U1})}$$

1.20358

Gusset U3 - Member L3U3 (Ref. Page 1,790/RF=0.99):

$$C_{U3} = 130$$

130

$$DC_{U3} = 37$$

37

$$DCTRAP_{U3} = 38$$

38

$$FC_{U3} = 1.0$$

1.

$$DW_{U3} = 0$$

0

$$LL_{U3} = 47$$

47

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{U3}} = \frac{C_{U3} - C_{F_{SWtruss}} Y_{DC} (F_{C_{U3}} DC_{U3}) - Y_{DW} (DW_{U3})}{Y_{LLInventory} (LL_{U3})}$$

1.12328

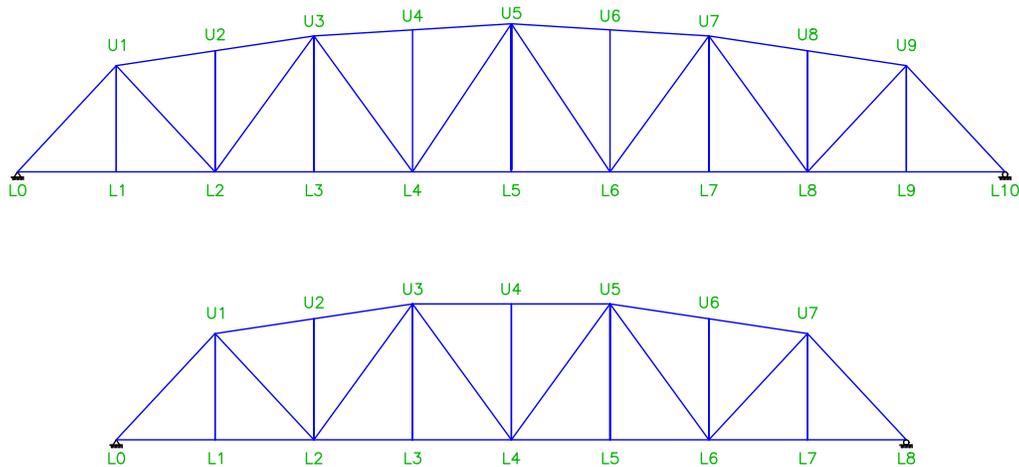
## LRFR Truss members: Frank J. Wood Bridge

**Project:** Bridge Rehabilitation

**Date:** January 25, 2018

**Type:** Span 2 Roadway and Sidewalk Trusses (Reference: Maine DOT Bridge Load Rating completed by Parson Brinckerhoff March 2013 - Starting at node point L0 based on original plans)

Show[ Import["TrussBridgeRating.pdf"][[1]], AspectRatio → Automatic, ImageSize → 6 \* 90]



### ■ INPUT DATA AND TRUSS RATING:

#### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{DW} = 1.50$$

1.5

$$Y_{LLInventory} = 1.75$$

1.75

### Resistance and strength of element:

Resistance of element (capacity) in force or stress (TRAP) -  $C_{xx}$  ;

Dead load of structural components or attachments effecting element (VA) -  $DC_{xx}$  ;

Dead load of structural components or attachments effecting element (TRAP) -  $DCTRAP_{xx}$  ;

Dead load adjustment factor for structural components or attachments effecting  $DC_{xx}$  elements (TRAP) -  $FC_{xx}$  ;

Dead load of wearing surface or utilities effecting element (TRAP) -  $DW_{xx}$  ;

Live HL-93 vehicular truck load including dynamic load allowance effecting element (TRAP) -  $LL_{xx}$  ;

### Roadway Truss Members (xxxx - subscript denotes member & xx - subscript denotes gusset plate):

#### Correction factor based on new rehabilitation repairs :

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$DL_T = 827.1$$

827.1

$$DL_E = 729.1$$

729.1

$$DL_N = 480$$

480

$$CF_{RWtruss} = \frac{DL_T - (DL_E - DL_N)}{DL_T}$$

0.698827

#### Member U1U2 COMPRESSION (Ref. Page 56-57/RF=0.92):

$$C_{U1U2} = 1588$$

1588

$$DC_{U1U2} = 818$$

818

$$DCTRAP_{U1U2} = 840$$

840

$$FC_{U1U2} = 1.0$$

1.

$$DW_{U1U2} = 0$$

0

$$LL_{U1U2} = 336$$

336

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1U2} = \frac{C_{U1U2} - CF_{RWtruss} CF_{RWtruss} Y_{DC} (FC_{U1U2} DCTRAP_{U1U2}) - Y_{DW} (DW_{U1U2})}{Y_{LLInventory} (LL_{U1U2})}$$

1.82861

Member U2U3 COMPRESSION (Ref. Page 56-57/RF=0.94):

$$C_{U2U3} = 1613$$

1613

$$DC_{U2U3} = 824$$

824

$$DCTRAP_{U2U3} = 846$$

846

$$FC_{U2U3} = 1.0$$

1.

$$DW_{U2U3} = 0$$

0

$$LL_{U2U3} = 338$$

338

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{U2U3}} = \frac{C_{U2U3} - C_{FRWtruss} Y_{DC} (FC_{U2U3} DCTRAP_{U2U3}) - Y_{DW} (DW_{U2U3})}{Y_{LLInventory} (LL_{U2U3})}$$

1.47758

Member U3U4 = U4U5 COMPRESSION (Ref. Page 56-57/RF=0.87):

$$C_{U3U4} = 1737$$

1737

$$DC_{U3U4} = 911$$

911

$$DCTRAP_{U3U4} = 938$$

938

$$FC_{U3U4} = 1.0$$

1.

$$DW_{U3U4} = 0$$

0

$$LL_{U3U4} = 371$$

371

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{U3U4}} = \frac{C_{U3U4} - C_{FRWtruss} Y_{DC} (FC_{U3U4} DCTRAP_{U3U4}) - Y_{DW} (DW_{U3U4})}{Y_{LLInventory} (LL_{U3U4})}$$

1.41336

Member U5U6 = U6U7 COMPRESSION (Ref. Page 56-57/RF=0.87):

$$C_{U5U6} = 1737$$

1737

$$DC_{U5U6} = 900$$

900

$$DCTRAP_{U5U6} = 928$$

928

$$FC_{U5U6} = 1.0$$

1.

$$DW_{U5U6} = 0$$

0

$$LL_{U5U6} = 367$$

367

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U5U6} = \frac{C_{U5U6} - CF_{RWtruss} Y_{DC} (FC_{U5U6} DCTRAP_{U5U6}) - Y_{DW} (DW_{U5U6})}{Y_{LLInventory} (LL_{U5U6})}$$

1.44237

Member U7U8 = U8U9 COMPRESSION (Ref. Page 56-57/RF=0.97):

$$C_{U7U8} = 1554$$

1554

$$DC_{U7U8} = 778$$

778

$$DCTRAP_{U7U8} = 806$$

806

$$FC_{U7U8} = 1.0$$

1.

$$DW_{U7U8} = 0$$

0

$$LL_{U7U8} = 321$$

321

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U7U8} = \frac{C_{U7U8} - CF_{RWtruss} Y_{DC} (FC_{U7U8} DCTRAP_{U7U8}) - Y_{DW} (DW_{U7U8})}{Y_{LLInventory} (LL_{U7U8})}$$

1.51301

Gusset L1 - Member L1U1 (Ref. Page 227/RF=0.92):

$$C_{L1} = 315$$

$$315$$

$$DC_{L1} = 99$$

$$99$$

$$DCTRAP_{L1} = 99$$

$$99$$

$$FC_{L1} = 1.0$$

$$1.$$

$$DW_{L1} = 0$$

$$0$$

$$LL_{L1} = 118.0$$

$$118.$$

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L1} = \frac{C_{L1} - CF_{RWtruss} Y_{DC} (FC_{L1} DCTRAP_{L1}) - Y_{DW} (DW_{L1})}{Y_{LLInventory} (LL_{L1})}$$

$$1.10664$$

Gusset U1 - Member L2U1 (Ref. Page 404/RF=0.86):

$$C_{U1} = 352$$

$$352$$

$$DC_{U1} = 177$$

$$177$$

$$DCTRAP_{U1} = 181$$

$$181$$

$$FC_{U1} = 1.0$$

$$1.$$

$$DW_{U1} = 0$$

$$0$$

$$LL_{U1} = 84$$

84

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1} = \frac{C_{U1} - CF_{RWtruss} Y_{DC} (FC_{U1} DCTRAP_{U1}) - Y_{DW} (DW_{U1})}{Y_{LLInventory} (LL_{U1})}$$

1.31898

Gusset L10 - Member L10U9 (Ref. Page 331/RF=0.94):

$$C_{L10} = 518$$

518

$$DC_{L10} = 266$$

266

$$DCTRAP_{L10} = 271$$

271

$$FC_{L10} = 1.0$$

1.

$$DW_{L10} = 0$$

0

$$LL_{L10} = 108$$

108

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L10} = \frac{C_{L10} - CF_{RWtruss} Y_{DC} (FC_{L10} DCTRAP_{L10}) - Y_{DW} (DW_{L10})}{Y_{LLInventory} (LL_{L10})}$$

1.48821

Gusset L2 (Ref. Page 266):

Gusset L2 - Member L2U1 (Ref. Page 266/RF=0.99):

$$C_{L2} = 370$$

370

$$DC_{L2} = 177$$

177

$$DCTRAP_{L2} = 181$$

181

$$FC_{L2} = 1.0$$

1.

$$DW_{L2} = 0$$

0

$$LL_{L2} = 84$$

84

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L2} = \frac{C_{L2} - CF_{RWtruss} Y_{DC} (FC_{L2} DCTRAP_{L2}) - Y_{DW} (DW_{L2})}{Y_{LLInventory} (LL_{L2})}$$

1.44143

Gusset U1 - Member L2U1 (Ref. Page 404/RF=0.86):

$$C_{U1} = 352$$

352

$$DC_{U1} = 177$$

177

$$DCTRAP_{U1} = 181$$

181

$$FC_{U1} = 1.0$$

1.

$$DW_{U1} = 0$$

0

$$LL_{U1} = 84$$

84

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{U1}} = \frac{C_{U1} - C_{FRWtruss} Y_{DC} (FC_{U1} DCTRAP_{U1}) - Y_{DW} (DW_{U1})}{Y_{LLInventory} (LL_{U1})}$$

1.31898

Gusset L5 - Member L5U5 (Ref. Page 293/RF=0.95):

$$C_{L5} = 315$$

315

$$DC_{L5} = 96$$

96

$$DCTRAP_{L5} = 101$$

101

$$FC_{L5} = 1.0$$

1.

$$DW_{L5} = 0$$

0

$$LL_{L5} = 114$$

114

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{L5}} = \frac{C_{L5} - C_{FRWtruss} Y_{DC} (FC_{L5} DCTRAP_{L5}) - Y_{DW} (DW_{L5})}{Y_{LLInventory} (LL_{L5})}$$

1.13671

Gusset L9 - Member L9U9 (Ref. Page 322/RF=0.99):

$$C_{L9} = 315$$

315

$$DC_{L9} = 90$$

90

$$DCTRAP_{L9} = 94$$

94

$$FC_{L9} = 1.0$$

1.

$$DW_{L9} = 0$$

0

$$LL_{L9} = 113$$

113

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L9} = \frac{C_{L9} - CF_{RWtruss} Y_{DC} (FC_{L9} DCTRAP_{L9}) - Y_{DW} (DW_{L9})}{Y_{LLInventory} (LL_{L9})}$$

1.17769

**Sidewalk Truss Members (xxxx - denotes member & xx - denotes gusset plate):**

Correction factor based on new rehabilitation repairs :

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$DL_T = 893.9$$

893.9

$$DL_E = 701.6$$

701.6

$$DL_N = 480$$

480

$$CF_{RWtruss} = \frac{DL_T - (DL_E - DL_N)}{DL_T}$$

0.752098

Correction factor based on new rehabilitation repairs :

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$DL_T = 892.8$$

892.8

$$DL_N = 480$$

480

$$CF_{SWtruss} = \frac{DL_T - (DL_T - DL_N)}{DL_T}$$

0.537634

### Member L2U3 COMPRESSION (Ref. Page 62-63/RF=0.59):

$$C_{L2U3} = 320$$

320

$$DC_{L2U3} = 165$$

165

$$DCTRAP_{L2U3} = 167$$

167

$$FC_{L2U3} = 1.0$$

1.

$$DW_{L2U3} = 0$$

0

$$LL_{L2U3} = 108$$

108

### Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L2U3} = \frac{C_{L2U3} - CF_{RWtruss} Y_{DC} (FC_{L2U3} DC_{L2U3}) - Y_{DW} (DW_{L2U3})}{Y_{LLInventory} (LL_{L2U3})}$$

0.87238

### Member L8U7 COMPRESSION (Ref. Page 62-63/RF=0.86):

$$C_{L8U7} = 320$$

320

$$DC_{L8U7} = 139$$

139

$$DCTRAP_{L8U7} = 136$$

136

$$FC_{L8U7} = 1.0$$

1.

$$DW_{L8U7} = 0$$

0

$$LL_{L8U7} = 99$$

99

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L8U7} = \frac{C_{L8U7} - CF_{RWtruss} Y_{DC} (FC_{L8U7} DC_{L8U7}) - Y_{DW} (DW_{L8U7})}{Y_{LLInventory} (LL_{L8U7})}$$

1.09277

Member L8U9 TENSION (Ref. Page 62-63/RF=0.92):

$$C_{L8U9} = 681$$

681

$$DC_{L8U9} = 343$$

343

$$DCTRAP_{L8U9} = 357$$

357

$$FC_{L8U9} = 1.0$$

1.

$$DW_{L8U9} = 0$$

0

$$LL_{L8U9} = 146$$

146

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{L8U9}} = \frac{C_{L8U9} - C_{FRWtruss} Y_{DC} (FC_{L8U9} DC_{L8U9}) - Y_{DW} (DW_{L8U9})}{Y_{LLInventory} (LL_{L8U9})}$$

1.40328

### Member L10U9 COMPRESSION (Ref. Page 62-63/RF=0.96):

$$C_{L10U9} = 1606$$

1606

$$DC_{L10U9} = 815$$

815

$$DCTRAP_{L10U9} = 872$$

872

$$FC_{L10U9} = 1.0$$

1.

$$DW_{L10U9} = 0$$

0

$$LL_{L10U9} = 307$$

307

### Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{L10U9}} = \frac{C_{L10U9} - C_{FRWtruss} Y_{DC} (FC_{L10U9} DC_{L10U9}) - Y_{DW} (DW_{L10U9})}{Y_{LLInventory} (LL_{L10U9})}$$

1.56315

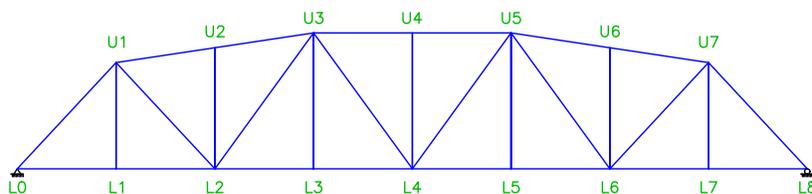
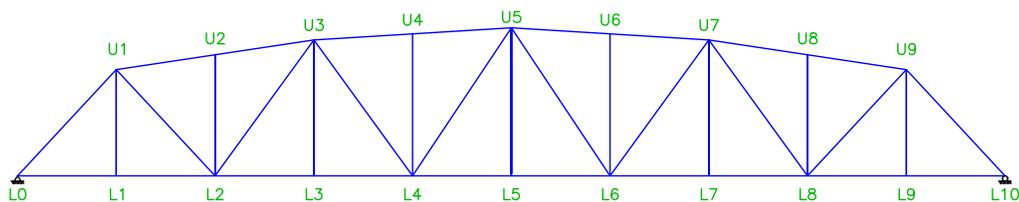
## LRFR Truss members: Frank J. Wood Bridge

**Project:** Bridge Rehabilitation - Exodermic Deck

**Date:** January 25, 2018

**Type:** Span 2 Roadway and Sidewalk Trusses (Reference: Maine DOT Bridge Load Rating completed by Parson Brinckerhoff March 2013 - Starting at node point L0 based on original plans)

Show[ Import["TrussBridgeRating.pdf"][[1]], AspectRatio → Automatic, ImageSize → 6 \* 90]



### ■ INPUT DATA AND TRUSS RATING:

#### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{DW} = 1.50$$

1.5

$$Y_{LLInventory} = 1.75$$

1.75

### Resistance and strength of element:

Resistance of element (capacity) in force or stress (TRAP) -  $C_{xx}$  ;

Dead load of structural components or attachments effecting element (VA) -  $DC_{xx}$  ;

Dead load of structural components or attachments effecting element (TRAP) -  $DCTRAP_{xx}$  ;

Dead load of wearing surface or utilities effecting element (TRAP) -  $DW_{xx}$  ;

Live HL-93 vehicular truck load including dynamic load allowance effecting element (TRAP) -  $LL_{xx}$  ;

Exodermic deck with dead load of structural components or attachments effecting element (VA) -  $DCX_{xx}$  ;

### Correction factor based on new rehabilitation repairs with respect to TRAP and VA analysis:

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$FC_{xxxx} = \frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

$$\frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

### Roadway Truss Members (xxxx - subscript denotes member & xx - subscript denotes gusset plate):

Member U1U2 COMPRESSION (Ref. Page 56-57/RF=0.92):

$$C_{U1U2} = 1588$$

1588

$$DC_{U1U2} = 818$$

818

$$DCTRAP_{U1U2} = 840$$

840

$$DW_{U1U2} = 0$$

0

$$LL_{U1U2} = 336$$

336

$$FC_{U1U2} = N\left[\frac{DCTRAP_{U1U2}}{DC_{U1U2}}\right]$$

1.02689

$$DCX_{U1U2} = 254$$

254

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1U2} = \frac{C_{U1U2} - Y_{DC} (FC_{U1U2} DCX_{U1U2}) - Y_{DW} (DW_{U1U2})}{Y_{LLInventory} (LL_{U1U2})}$$

2.14619

Member U2U3 COMPRESSION (Ref. Page 56-57/RF=0.94):

$$C_{U2U3} = 1613$$

1613

$$DC_{U2U3} = 824$$

824

$$DCTRAP_{U2U3} = 846$$

846

$$DW_{U2U3} = 0$$

0

$$LL_{U2U3} = 338$$

338

$$FC_{U2U3} = N\left[\frac{DCTRAP_{U2U3}}{DC_{U2U3}}\right]$$

1.0267

$$DCX_{U2U3} = 583$$

583

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U2U3} = \frac{C_{U2U3} - Y_{DC} (FC_{U2U3} DCX_{U2U3}) - Y_{DW} (DW_{U2U3})}{Y_{LLInventory} (LL_{U2U3})}$$

1.46203

Member U3U4 = U4U5 COMPRESSION (Ref. Page 56-57/RF=0.87):

$$C_{U3U4} = 1737$$

1737

$$DC_{U3U4} = 911$$

911

$$DCTRAP_{U3U4} = 938$$

938

$$DW_{U3U4} = 0$$

0

$$LL_{U3U4} = 371$$

371

$$FC_{U3U4} = N \left[ \frac{DCTRAP_{U3U4}}{DC_{U3U4}} \right]$$

1.02964

$$DCX_{U3U4} = 653$$

653

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U3U4} = \frac{C_{U3U4} - Y_{DC} (FC_{U3U4} DCX_{U3U4}) - Y_{DW} (DW_{U3U4})}{Y_{LLInventory} (LL_{U3U4})}$$

1.38091

Member U5U6 = U6U7 COMPRESSION (Ref. Page 56-57/RF=0.87):

$$C_{U5U6} = 1737$$

1737

$$DC_{U5U6} = 900$$

900

$$DCTRAP_{U5U6} = 928$$

928

$$DW_{U5U6} = 0$$

0

$$LL_{U5U6} = 367$$

367

$$FC_{U5U6} = N \left[ \frac{DCTRAP_{U5U6}}{DC_{U5U6}} \right]$$

1.03111

$$DCX_{U5U6} = 647$$

647

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U5U6} = \frac{C_{U5U6} - Y_{DC} (FC_{U5U6} DCX_{U5U6}) - Y_{DW} (DW_{U5U6})}{Y_{LLInventory} (LL_{U5U6})}$$

1.40613

Member U7U8 = U8U9 COMPRESSION (Ref. Page 56-57/RF=0.97):

$$C_{U7U8} = 1554$$

1554

$$DC_{U7U8} = 778$$

778

$$DCTRAP_{U7U8} = 806$$

806

$$DW_{U7U8} = 0$$

0

$$LL_{U7U8} = 321$$

321

$$FC_{U7U8} = N\left[\frac{DCTRAP_{U7U8}}{DC_{U7U8}}\right]$$

1.03599

$$DCX_{U7U8} = 559$$

559

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U7U8} = \frac{C_{U7U8} - Y_{DC} (FC_{U7U8} DCX_{U7U8}) - Y_{DW} (DW_{U7U8})}{Y_{LLInventory} (LL_{U7U8})}$$

1.47771

Member L8U7 COMPRESSION (Ref. Page 62-63/RF=0.85):

$$C_{L8U7} = 320$$

320

$$DC_{L8U7} = 135$$

135

$$DCTRAP_{L8U7} = 136$$

136

$$DW_{L8U7} = 0$$

0

$$LL_{L8U7} = 99$$

99

$$FC_{L8U7} = N\left[\frac{DCTRAP_{L8U7}}{DC_{L8U7}}\right]$$

1.00741

$$DCX_{L8U7} = 99$$

99

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{L8U7}} = \frac{C_{L8U7} - Y_{DC} (FC_{L8U7} DCX_{L8U7}) - Y_{DW} (DW_{L8U7})}{Y_{LLInventory} (LL_{L8U7})}$$

1.12747

Gusset L1 - Member L1U1 (Ref. Page 227/RF=0.92):

$$C_{L1} = 315$$

315

$$DC_{L1} = 99$$

99

$$DCTRAP_{L1} = 99$$

99

$$DW_{L1} = 0$$

0

$$LL_{L1} = 118.0$$

118.

$$FC_{L1} = N\left[\frac{DCTRAP_{L1}}{DC_{L1}}\right]$$

1.

$$DCX_{L1} = 59$$

59

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$R_{Finv_{L1}} = \frac{C_{L1} - Y_{DC} (FC_{L1} DCX_{L1}) - Y_{DW} (DW_{L1})}{Y_{LLInventory} (LL_{L1})}$$

1.16828

Gusset U1 - Member L2U1 (Ref. Page 404/RF=0.86):

$$C_{U1} = 352$$

352

$$DC_{U1} = 177$$

177

$$DCTRAP_{U1} = 181$$

181

$$DW_{U1} = 0$$

0

$$LL_{U1} = 84$$

84

$$FC_{U1} = N\left[\frac{DCTRAP_{U1}}{DC_{U1}}\right]$$

1.0226

$$DCX_{U1} = 127$$

127

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1} = \frac{C_{U1} - Y_{DC}(FC_{U1} DCX_{U1}) - Y_{DW}(DW_{U1})}{Y_{LLInventory}(LL_{U1})}$$

1.29022

Gusset L10 - Member L10U9 (Ref. Page 331/RF=0.94):

$$C_{L10} = 518$$

518

$$DC_{L10} = 266$$

266

$$DCTRAP_{L10} = 271$$

271

$$DW_{L10} = 0$$

0

$$LL_{L10} = 108$$

108

$$FC_{L10} = N\left[\frac{DCTRAP_{L10}}{DC_{L10}}\right]$$

1.0188

$$DCX_{L10} = 191$$

191

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L10} = \frac{C_{L10} - Y_{DC} (FC_{L10} DCX_{L10}) - Y_{DW} (DW_{L10})}{Y_{LLInventory} (LL_{L10})}$$

1.45377

Gusset L2 - Member L2U1 (Ref. Page 266/RF=0.99):

$$C_{L2} = 370$$

370

$$DC_{L2} = 177$$

177

$$DCTRAP_{L2} = 181$$

181

$$DW_{L2} = 0$$

0

$$LL_{L2} = 84$$

84

$$FC_{L2} = N\left[\frac{DCTRAP_{L2}}{DC_{L2}}\right]$$

1.0226

$$DCX_{L2} = 127$$

127

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L2} = \frac{C_{L2} - Y_{DC} (FC_{L2} DCX_{L2}) - Y_{DW} (DW_{L2})}{Y_{LLInventory} (LL_{L2})}$$

1.41267

Gusset L5 - Member L5U5 (Ref. Page 293/RF=0.95):

$$C_{L5} = 315$$

315

$$DC_{L5} = 96$$

96

$$DCTRAP_{L5} = 101$$

101

$$DW_{L5} = 0$$

0

$$LL_{L5} = 114$$

114

$$FC_{L5} = N \left[ \frac{DCTRAP_{L5}}{DC_{L5}} \right]$$

1.05208

$$DCX_{L5} = 64$$

64

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L5} = \frac{C_{L5} - Y_{DC} (FC_{L5} DCX_{L5}) - Y_{DW} (DW_{L5})}{Y_{LLInventory} (LL_{L5})}$$

1.15706

Gusset L9 - Member L9U9 (Ref. Page 322/RF=0.99):

$$C_{L9} = 315$$

315

$$DC_{L9} = 90$$

90

$$DCTRAP_{L9} = 94$$

94

$$DW_{L9} = 0$$

0

$$LL_{L9} = 113$$

113

$$FC_{L9} = N\left[\frac{DCTRAP_{L9}}{DC_{L9}}\right]$$

1.04444

$$DCX_{L9} = 58$$

58

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L9} = \frac{C_{L9} - Y_{DC} (FC_{L9} DCX_{L9}) - Y_{DW} (DW_{L9})}{Y_{LLInventory} (LL_{L9})}$$

1.21

**Sidewalk Truss Members (xxxx - denotes member & xx - denotes gusset plate):**

Member L2U3 COMPRESSION (Ref. Page 62-63/RF=0.59 - Note: One new C15x33.9 top channel connected to each top flange):

$$C_{L2U3} = N\left[320 \left(\frac{477 \text{ kips}}{370 \text{ kips}}\right)\right]$$

412.541

$$DC_{L2U3} = 165$$

165

$$DCTRAP_{L2U3} = 167$$

167

$$DW_{L2U3} = 0$$

0

$$LL_{L2U3} = 108$$

108

$$FC_{L2U3} = N\left[\frac{DCTRAP_{L2U3}}{DC_{L2U3}}\right]$$

1.01212

$$DCX_{L2U3} = 130$$

130

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L2U3} = \frac{C_{L2U3} - Y_{DC} (FC_{L2U3} DCX_{L2U3}) - Y_{DW} (DW_{L2U3})}{Y_{LLInventory} (LL_{L2U3})}$$

1.31254

Member L8U7 COMPRESSION (Ref. Page 62-63/RF=0.86):

$$C_{L8U7} = 320$$

320

$$DC_{L8U7} = 139$$

139

$$DCTRAP_{L8U7} = 136$$

136

$$DW_{L8U7} = 0$$

0

$$LL_{L8U7} = 99$$

99

$$FC_{L8U7} = N\left[\frac{DCTRAP_{L8U7}}{DC_{L8U7}}\right]$$

0.978417

$$DCX_{L8U7} = 109$$

109

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L8U7} = \frac{C_{L8U7} - Y_{DC} (FC_{L8U7} DCX_{L8U7}) - Y_{DW} (DW_{L8U7})}{Y_{LLInventory} (LL_{L8U7})}$$

1.07758

Member L8U9 TENSION (Ref. Page 62-63/RF=0.92):

$$C_{L8U9} = 681$$

681

$$DC_{L8U9} = 343$$

343

$$DCTRAP_{L8U9} = 357$$

357

$$DW_{L8U9} = 0$$

0

$$LL_{L8U9} = 146$$

146

$$FC_{L8U9} = N \left[ \frac{DCTRAP_{L8U9}}{DC_{L8U9}} \right]$$

1.04082

$$DCX_{L8U9} = 264$$

264

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L8U9} = \frac{C_{L8U9} - Y_{DC} (FC_{L8U9} DCX_{L8U9}) - Y_{DW} (DW_{L8U9})}{Y_{LLInventory} (LL_{L8U9})}$$

1.32106

Member L10U9 COMPRESSION (Ref. Page 62-63/RF=0.96):

$$C_{L10U9} = 1606$$

1606

$$DC_{L10U9} = 812$$

812

$$DCTRAP_{L10U9} = 872$$

872

$$DW_{L10U9} = 0$$

0

$$LL_{L10U9} = 307$$

307

$$FC_{L10U9} = N\left[\frac{DCTRAP_{L10U9}}{DC_{L10U9}}\right]$$

1.07389

$$DCX_{L10U9} = 626$$

626

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L10U9} = \frac{C_{L10U9} - Y_{DC} (FC_{L10U9} DCX_{L10U9}) - Y_{DW} (DW_{L10U9})}{Y_{LLInventory} (LL_{L10U9})}$$

1.42518

Gusset L0 - Member Corner Connection L0U1 (Ref. Page 595-597/RF=0.67):

$$C_{L0} = 518$$

518

$$DC_{L0} = 295$$

295

$$DCTRAP_{L0} = 313$$

313

$$DW_{L0} = 0$$

0

$$LL_{L0} = 108$$

108

$$FC_{L0} = N\left[\frac{DCTRAP_{L0}}{DC_{L0}}\right]$$

1.06102

$$DCX_{L0} = 226$$

226

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RF_{InvL0} = \frac{C_{L0} - Y_{DC} (FC_{L0} DCX_{L0}) - Y_{DW} (DW_{L0})}{Y_{LLInventory} (LL_{L0})}$$

1.15483

Gusset L10 - Member L10U9 (Ref. Page 718-720/RF=0.71):

$$C_{L10} = 518$$

518

$$DC_{L10} = 286$$

286

$$DCTRAP_{L10} = 307$$

307

$$DW_{L10} = 0$$

0

$$LL_{L10} = 109$$

109

$$FC_{L10} = N \left[ \frac{DCTRAP_{L10}}{DC_{L10}} \right]$$

1.07343

$$DCX_{L10} = 220$$

220

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RF_{InvL10} = \frac{C_{L10} - Y_{DC} (FC_{L10} DCX_{L10}) - Y_{DW} (DW_{L10})}{Y_{LLInventory} (LL_{L10})}$$

1.16806

Gusset U3 - Member L3U3 (Ref. Page 804/RF=0.94):

$$C_{U3} = 167$$

167

$$DC_{U3} = 55$$

55

$$DCTRAP_{U3} = 59$$

59

$$DW_{U3} = 0$$

0

$$LL_{U3} = 57$$

57

$$FC_{U3} = N\left[\frac{DCTRAP_{U3}}{DC_{U3}}\right]$$

1.07273

$$DCX_{U3} = 40$$

40

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U3} = \frac{C_{U3} - Y_{DC} (FC_{U3} DCX_{U3}) - Y_{DW} (DW_{U3})}{Y_{LLInventory} (LL_{U3})}$$

1.13648

Gusset U5 - Member L5U5 (Ref. Page 957-959/RF=0.93):

$$C_{U5} = 167$$

167

$$DC_{U5} = 54$$

54

$$DCTRAP_{U5} = 59$$

59

$$DW_{U5} = 0$$

0

$$LL_{U5} = 57$$

57

$$FC_{U5} = N\left[\frac{DCTRAP_{U5}}{DC_{U5}}\right]$$

1.09259

$$DCX_{U5} = 42$$

42

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U5} = \frac{C_{U5} - Y_{DC} (FC_{U5} DCX_{U5}) - Y_{DW} (DW_{U5})}{Y_{LLInventory} (LL_{U5})}$$

1.09914

Gusset U7 - Member L7U7 (Ref. Page 1114/RF=0.94):

$$C_{U7} = 167$$

167

$$DC_{U7} = 54$$

54

$$DCTRAP_{U7} = 59$$

59

$$DW_{U7} = 0$$

0

$$LL_{U7} = 57$$

57

$$FC_{U7} = N\left[\frac{DCTRAP_{U7}}{DC_{U7}}\right]$$

1.09259

$$DCX_{U7} = 42$$

42

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U7} = \frac{C_{U7} - Y_{DC} (FC_{U7} DCX_{U7}) - Y_{DW} (DW_{U7})}{Y_{LLInventory} (LL_{U7})}$$

1.09914

Gusset U9 - Member L9U9 (Ref. Page 1266/RF=0.98):

$$C_{U9} = 167$$

167

$$DC_{U9} = 53$$

53

$$DCTRAP_{U9} = 55$$

55

$$DW_{U9} = 0$$

0

$$LL_{U9} = 57$$

57

$$FC_{U9} = N\left[\frac{DCTRAP_{U9}}{DC_{U9}}\right]$$

1.03774

$$DCX_{U9} = 40$$

40

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U9} = \frac{C_{U9} - Y_{DC} (FC_{U9} DCX_{U9}) - Y_{DW} (DW_{U9})}{Y_{LLInventory} (LL_{U9})}$$

1.15402

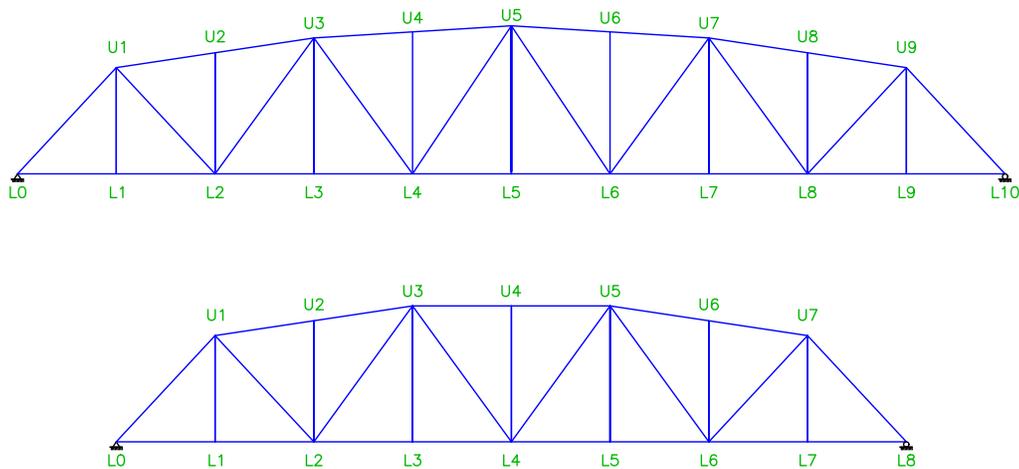
## LRFR Truss members: Frank J. Wood Bridge

**Project:** Bridge Rehabilitation - Exodermic Deck

**Date:** January 25, 2018

**Type:** Span 2 Roadway and Sidewalk Trusses (Reference: Maine DOT Bridge Load Rating completed by Parson Brinckerhoff March 2013 - Starting at node point L0 based on original plans)

Show[ Import["TrussBridgeRating.pdf"][[1]], AspectRatio → Automatic, ImageSize → 6 \* 90]



### ■ INPUT DATA AND TRUSS RATING:

#### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{DW} = 1.50$$

1.5

$$Y_{LL\text{Operating}} = 1.35$$

1.35

### Resistance and strength of element:

Resistance of element (capacity) in force or stress (TRAP) -  $C_{xx}$  ;

Dead load of structural components or attachments effecting element (VA) -  $DC_{xx}$  ;

Dead load of structural components or attachments effecting element (TRAP) -  $DCTRAP_{xx}$  ;

Dead load of wearing surface or utilities effecting element (TRAP) -  $DW_{xx}$  ;

Live HL-93 vehicular truck load including dynamic load allowance effecting element (TRAP) -  $LL_{xx}$  ;

Exodermic deck with dead load of structural components or attachments effecting element (VA) -  $DCX_{xx}$  ;

### Correction factor based on new rehabilitation repairs with respect to TRAP and VA analysis:

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RW\text{truss}}$  (unitless);

$$FC_{xxxx} = \frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

$$\frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

### Roadway Truss Members (xxxx - subscript denotes member & xx - subscript denotes gusset plate):

Member U1U2 COMPRESSION (Ref. Page 56-57/RF=0.92):

$$C_{U1U2} = 1588$$

1588

$$DC_{U1U2} = 818$$

818

$$DCTRAP_{U1U2} = 840$$

840

$$DW_{U1U2} = 0$$

0

$$LL_{U1U2} = 336$$

336

$$FC_{U1U2} = N\left[\frac{DCTRAP_{U1U2}}{DC_{U1U2}}\right]$$

1.02689

$$DCX_{U1U2} = 254$$

254

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper,U1U2} = \frac{C_{U1U2} - Y_{DC} (FC_{U1U2} DCX_{U1U2}) - Y_{DW} (DW_{U1U2})}{Y_{LL,Operating} (LL_{U1U2})}$$

2.7821

Member U2U3 COMPRESSION (Ref. Page 56-57/RF=0.94):

$$C_{U2U3} = 1613$$

1613

$$DC_{U2U3} = 824$$

824

$$DCTRAP_{U2U3} = 846$$

846

$$DW_{U2U3} = 0$$

0

$$LL_{U2U3} = 338$$

338

$$FC_{U2U3} = N\left[\frac{DCTRAP_{U2U3}}{DC_{U2U3}}\right]$$

1.0267

$$DCX_{U2U3} = 583$$

583

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{U2U3}} = \frac{C_{U2U3} - Y_{DC} (FC_{U2U3} DCX_{U2U3}) - Y_{DW} (DW_{U2U3})}{Y_{LLOperating} (LL_{U2U3})}$$

1.89523

Member U3U4 = U4U5 COMPRESSION (Ref. Page 56-57/RF=0.87):

$$C_{U3U4} = 1737$$

1737

$$DC_{U3U4} = 911$$

911

$$DCTRAP_{U3U4} = 938$$

938

$$DW_{U3U4} = 0$$

0

$$LL_{U3U4} = 371$$

371

$$FC_{U3U4} = N \left[ \frac{DCTRAP_{U3U4}}{DC_{U3U4}} \right]$$

1.02964

$$DCX_{U3U4} = 653$$

653

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{U3U4}} = \frac{C_{U3U4} - Y_{DC} (FC_{U3U4} DCX_{U3U4}) - Y_{DW} (DW_{U3U4})}{Y_{LLOperating} (LL_{U3U4})}$$

1.79007

Member U5U6 = U6U7 COMPRESSION (Ref. Page 56-57/RF=0.87):

$$C_{U5U6} = 1737$$

1737

$$DC_{U5U6} = 900$$

900

$$DCTRAP_{U5U6} = 928$$

928

$$DW_{U5U6} = 0$$

0

$$LL_{U5U6} = 367$$

367

$$FC_{U5U6} = N \left[ \frac{DCTRAP_{U5U6}}{DC_{U5U6}} \right]$$

1.03111

$$DCX_{U5U6} = 647$$

647

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{U5U6} = \frac{C_{U5U6} - Y_{DC} (FC_{U5U6} DCX_{U5U6}) - Y_{DW} (DW_{U5U6})}{Y_{LLOperating} (LL_{U5U6})}$$

1.82276

Member U7U8 = U8U9 COMPRESSION (Ref. Page 56-57/RF=0.97):

$$C_{U7U8} = 1554$$

1554

$$DC_{U7U8} = 778$$

778

$$DCTRAP_{U7U8} = 806$$

806

$$DW_{U7U8} = 0$$

0

$$LL_{U7U8} = 321$$

321

$$FC_{U7U8} = N \left[ \frac{DCTRAP_{U7U8}}{DC_{U7U8}} \right]$$

1.03599

$$DCX_{U7U8} = 559$$

559

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{U7U8} = \frac{C_{U7U8} - Y_{DC} (FC_{U7U8} DCX_{U7U8}) - Y_{DW} (DW_{U7U8})}{Y_{LLOperating} (LL_{U7U8})}$$

1.91555

Member L8U7 COMPRESSION (Ref. Page 62-63/RF=0.85):

$$C_{L8U7} = 320$$

320

$$DC_{L8U7} = 135$$

135

$$DCTRAP_{L8U7} = 136$$

136

$$DW_{L8U7} = 0$$

0

$$LL_{L8U7} = 99$$

99

$$FC_{L8U7} = N \left[ \frac{DCTRAP_{L8U7}}{DC_{L8U7}} \right]$$

1.00741

$$DCX_{L8U7} = 99$$

99

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L8U7}} = \frac{C_{L8U7} - Y_{DC} (FC_{L8U7} DCX_{L8U7}) - Y_{DW} (DW_{L8U7})}{Y_{LL_{Operating}} (LL_{L8U7})}$$

1.46153

Gusset L1 - Member L1U1 (Ref. Page 227/RF=0.92):

$$C_{L1} = 315$$

315

$$DC_{L1} = 99$$

99

$$DCTRAP_{L1} = 99$$

99

$$DW_{L1} = 0$$

0

$$LL_{L1} = 118.0$$

118.

$$FC_{L1} = N\left[\frac{DCTRAP_{L1}}{DC_{L1}}\right]$$

1.

$$DCX_{L1} = 59$$

59

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L1}} = \frac{C_{L1} - Y_{DC} (FC_{L1} DCX_{L1}) - Y_{DW} (DW_{L1})}{Y_{LL_{Operating}} (LL_{L1})}$$

1.51444

Gusset U1 - Member L2U1 (Ref. Page 404/RF=0.86):

$$C_{U1} = 352$$

352

$$DC_{U1} = 177$$

177

$$DCTRAP_{U1} = 181$$

181

$$DW_{U1} = 0$$

0

$$LL_{U1} = 84$$

84

$$FC_{U1} = N\left[\frac{DCTRAP_{U1}}{DC_{U1}}\right]$$

1.0226

$$DCX_{U1} = 127$$

127

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{U1} = \frac{C_{U1} - Y_{DC}(FC_{U1} DCX_{U1}) - Y_{DW}(DW_{U1})}{Y_{LLOperating}(LL_{U1})}$$

1.67251

Gusset L10 - Member L10U9 (Ref. Page 331/RF=0.94):

$$C_{L10} = 518$$

518

$$DC_{L10} = 266$$

266

$$DCTRAP_{L10} = 271$$

271

$$DW_{L10} = 0$$

0

$$LL_{L10} = 108$$

108

$$FC_{L10} = N\left[\frac{DCTRAP_{L10}}{DC_{L10}}\right]$$

1.0188

$$DCX_{L10} = 191$$

191

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper,L10} = \frac{C_{L10} - Y_{DC} (FC_{L10} DCX_{L10}) - Y_{DW} (DW_{L10})}{Y_{LLOperating} (LL_{L10})}$$

1.88451

Gusset L2 - Member L2U1 (Ref. Page 266/RF=0.99):

$$C_{L2} = 370$$

370

$$DC_{L2} = 177$$

177

$$DCTRAP_{L2} = 181$$

181

$$DW_{L2} = 0$$

0

$$LL_{L2} = 84$$

84

$$FC_{L2} = N\left[\frac{DCTRAP_{L2}}{DC_{L2}}\right]$$

1.0226

$$DCX_{L2} = 127$$

127

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper,L2} = \frac{C_{L2} - Y_{DC} (FC_{L2} DCX_{L2}) - Y_{DW} (DW_{L2})}{Y_{LLOperating} (LL_{L2})}$$

1.83124

Gusset L5 - Member L5U5 (Ref. Page 293/RF=0.95):

$$C_{L5} = 315$$

315

$$DC_{L5} = 96$$

96

$$DCTRAP_{L5} = 101$$

101

$$DW_{L5} = 0$$

0

$$LL_{L5} = 114$$

114

$$FC_{L5} = N \left[ \frac{DCTRAP_{L5}}{DC_{L5}} \right]$$

1.05208

$$DCX_{L5} = 64$$

64

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper,L5} = \frac{C_{L5} - Y_{DC} (FC_{L5} DCX_{L5}) - Y_{DW} (DW_{L5})}{Y_{LLOperating} (LL_{L5})}$$

1.49989

Gusset L9 - Member L9U9 (Ref. Page 322/RF=0.99):

$$C_{L9} = 315$$

315

$$DC_{L9} = 90$$

90

$$DCTRAP_{L9} = 94$$

94

$$DW_{L9} = 0$$

0

$$LL_{L9} = 113$$

113

$$FC_{L9} = N \left[ \frac{DCTRAP_{L9}}{DC_{L9}} \right]$$

1.04444

$$DCX_{L9} = 58$$

58

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{L9} = \frac{C_{L9} - Y_{DC} (FC_{L9} DCX_{L9}) - Y_{DW} (DW_{L9})}{Y_{LLOperating} (LL_{L9})}$$

1.56852

**Sidewalk Truss Members (xxxx - denotes member & xx - denotes gusset plate):**

Member L2U3 COMPRESSION (Ref. Page 62-63/RF=0.59 - Note: One new C15x33.9 top channel connected to each top flange):

$$C_{L2U3} = N \left[ 320 \left( \frac{477 \text{ kips}}{370 \text{ kips}} \right) \right]$$

412.541

$$DC_{L2U3} = 165$$

165

$$DCTRAP_{L2U3} = 167$$

167

$$DW_{L2U3} = 0$$

0

$$LL_{L2U3} = 108$$

108

$$FC_{L2U3} = N \left[ \frac{DCTRAP_{L2U3}}{DC_{L2U3}} \right]$$

1.01212

$$DCX_{L2U3} = 130$$

130

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L2U3}} = \frac{C_{L2U3} - Y_{DC} (FC_{L2U3} DCX_{L2U3}) - Y_{DW} (DW_{L2U3})}{Y_{LL_{Operating}} (LL_{L2U3})}$$

1.70145

Member L8U7 COMPRESSION (Ref. Page 62-63/RF=0.86):

$$C_{L8U7} = 320$$

320

$$DC_{L8U7} = 139$$

139

$$DCTRAP_{L8U7} = 136$$

136

$$DW_{L8U7} = 0$$

0

$$LL_{L8U7} = 99$$

99

$$FC_{L8U7} = N \left[ \frac{DCTRAP_{L8U7}}{DC_{L8U7}} \right]$$

0.978417

$$DCX_{L8U7} = 109$$

109

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L8U7}} = \frac{C_{L8U7} - Y_{DC} (FC_{L8U7} DCX_{L8U7}) - Y_{DW} (DW_{L8U7})}{Y_{LL_{Operating}} (LL_{L8U7})}$$

1.39686

Member L8U9 TENSION (Ref. Page 62-63/RF=0.92):

$$C_{L8U9} = 681$$

681

$$DC_{L8U9} = 343$$

343

$$DCTRAP_{L8U9} = 357$$

357

$$DW_{L8U9} = 0$$

0

$$LL_{L8U9} = 146$$

146

$$FC_{L8U9} = N \left[ \frac{DCTRAP_{L8U9}}{DC_{L8U9}} \right]$$

1.04082

$$DCX_{L8U9} = 264$$

264

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{L8U9} = \frac{C_{L8U9} - Y_{DC} (FC_{L8U9} DCX_{L8U9}) - Y_{DW} (DW_{L8U9})}{Y_{LLOperating} (LL_{L8U9})}$$

1.71248

Member L10U9 COMPRESSION (Ref. Page 62-63/RF=0.96):

$$C_{L10U9} = 1606$$

1606

$$DC_{L10U9} = 812$$

812

$$DCTRAP_{L10U9} = 872$$

872

$$DW_{L10U9} = 0$$

0

$$LL_{L10U9} = 307$$

307

$$FC_{L10U9} = N \left[ \frac{DCTRAP_{L10U9}}{DC_{L10U9}} \right]$$

1.07389

$$DCX_{L10U9} = 626$$

626

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{L10U9} = \frac{C_{L10U9} - Y_{DC} (FC_{L10U9} DCX_{L10U9}) - Y_{DW} (DW_{L10U9})}{Y_{LLOperating} (LL_{L10U9})}$$

1.84746

Gusset L0 - Member Corner Connection L0U1 (Ref. Page 595-597/RF=0.67):

$$C_{L0} = 518$$

518

$$DC_{L0} = 295$$

295

$$DCTRAP_{L0} = 313$$

313

$$DW_{L0} = 0$$

0

$$LL_{L0} = 108$$

108

$$FC_{L0} = N \left[ \frac{DCTRAP_{L0}}{DC_{L0}} \right]$$

1.06102

$$DCX_{L0} = 226$$

226

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L0}} = \frac{C_{L0} - Y_{DC} (FC_{L0} DCX_{L0}) - Y_{DW} (DW_{L0})}{Y_{LL_{Operating}} (LL_{L0})}$$

1.497

Gusset L10 - Member L10U9 (Ref. Page 718-720/RF=0.71):

$$C_{L10} = 518$$

518

$$DC_{L10} = 286$$

286

$$DCTRAP_{L10} = 307$$

307

$$DW_{L10} = 0$$

0

$$LL_{L10} = 109$$

109

$$FC_{L10} = N \left[ \frac{DCTRAP_{L10}}{DC_{L10}} \right]$$

1.07343

$$DCX_{L10} = 220$$

220

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L10}} = \frac{C_{L10} - Y_{DC} (FC_{L10} DCX_{L10}) - Y_{DW} (DW_{L10})}{Y_{LL_{Operating}} (LL_{L10})}$$

1.51415

Gusset U3 - Member L3U3 (Ref. Page 804/RF=0.94):

$$C_{U3} = 167$$

167

$$DC_{U3} = 55$$

55

$$DCTRAP_{U3} = 59$$

59

$$DW_{U3} = 0$$

0

$$LL_{U3} = 57$$

57

$$FC_{U3} = N\left[\frac{DCTRAP_{U3}}{DC_{U3}}\right]$$

1.07273

$$DCX_{U3} = 40$$

40

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{U3} = \frac{C_{U3} - Y_{DC} (FC_{U3} DCX_{U3}) - Y_{DW} (DW_{U3})}{Y_{LLOperating} (LL_{U3})}$$

1.47321

Gusset U5 - Member L5U5 (Ref. Page 957-959/RF=0.93):

$$C_{U5} = 167$$

167

$$DC_{U5} = 54$$

54

$$DCTRAP_{U5} = 59$$

59

$$DW_{U5} = 0$$

0

$$LL_{U5} = 57$$

57

$$FC_{U5} = N\left[\frac{DCTRAP_{U5}}{DC_{U5}}\right]$$

1.09259

$$DCX_{U5} = 42$$

42

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{U5}} = \frac{C_{U5} - Y_{DC} (FC_{U5} DCX_{U5}) - Y_{DW} (DW_{U5})}{Y_{LL_{Operating}} (LL_{U5})}$$

1.42481

Gusset U7 - Member L7U7 (Ref. Page 1114/RF=0.94):

$$C_{U7} = 167$$

167

$$DC_{U7} = 54$$

54

$$DCTRAP_{U7} = 59$$

59

$$DW_{U7} = 0$$

0

$$LL_{U7} = 57$$

57

$$FC_{U7} = N\left[\frac{DCTRAP_{U7}}{DC_{U7}}\right]$$

1.09259

$$DCX_{U7} = 42$$

42

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{U7}} = \frac{C_{U7} - Y_{DC} (FC_{U7} DCX_{U7}) - Y_{DW} (DW_{U7})}{Y_{LL_{Operating}} (LL_{U7})}$$

1.42481

Gusset U9 - Member L9U9 (Ref. Page 1266/RF=0.98):

$$C_{U9} = 167$$

167

$$DC_{U9} = 53$$

53

$$DCTRAP_{U9} = 55$$

55

$$DW_{U9} = 0$$

0

$$LL_{U9} = 57$$

57

$$FC_{U9} = N\left[\frac{DCTRAP_{U9}}{DC_{U9}}\right]$$

1.03774

$$DCX_{U9} = 40$$

40

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{U9} = \frac{C_{U9} - Y_{DC} (FC_{U9} DCX_{U9}) - Y_{DW} (DW_{U9})}{Y_{LLOperating} (LL_{U9})}$$

1.49595

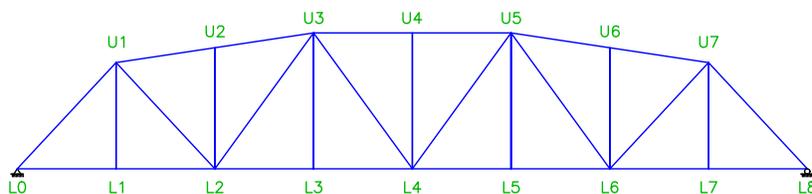
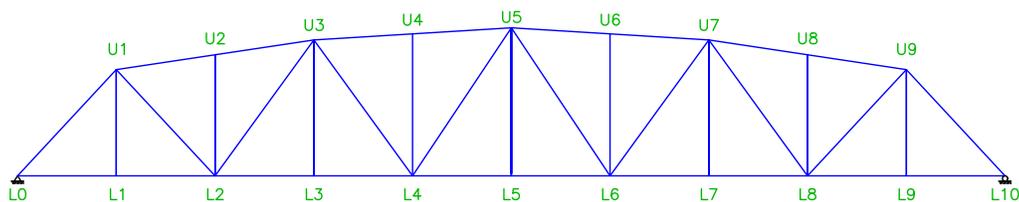
## LRFR Truss members: Frank J. Wood Bridge

**Project:** Bridge Rehabilitation - Exodermic Deck

**Date:** January 25, 2018

**Type:** Span 3 Roadway and Sidewalk Trusses (Reference: Maine DOT Bridge Load Rating completed by Parson Brinckerhoff March 2013 - Starting at node point L0 based on original plans)

Show[ Import["TrussBridgeRating.pdf"][[1]], AspectRatio → Automatic, ImageSize → 6 \* 90]



### ■ INPUT DATA AND TRUSS RATING:

#### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{DW} = 1.50$$

1.5

$$Y_{LLInventory} = 1.75$$

1.75

### Resistance and strength of element:

Resistance of element (capacity) in force or stress (TRAP) -  $C_{xx}$  ;

Dead load of structural components or attachments effecting element (VA) -  $DC_{xx}$  ;

Dead load of structural components or attachments effecting element (TRAP) -  $DCTRAP_{xx}$  ;

Dead load of wearing surface or utilities effecting element (TRAP) -  $DW_{xx}$  ;

Live HL-93 vehicular truck load including dynamic load allowance effecting element (TRAP) -  $LL_{xx}$  ;

Exodermic deck with dead load of structural components or attachments effecting element (VA) -  $DCX_{xx}$  ;

### Correction factor based on new rehabilitation repairs with respect to TRAP and VA analysis:

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RWtruss}$  (unitless);

$$FC_{xxxx} = \frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

$$\frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

### Roadway Truss Members (xxxx - subscript denotes member & xx - subscript denotes gusset plate):

Member L3U3 TENSION (Ref. Page 68-69/RF=0.89):

$$C_{L3U3} = 228$$

228

$$DC_{L3U3} = 62$$

62

$$DCTRAP_{L3U3} = 65$$

65

$$DW_{L3U3} = 0$$

0

$$LL_{L3U3} = 94$$

94

$$FC_{L3U3} = N\left[\frac{DCTRAP_{L3U3}}{DC_{L3U3}}\right]$$

1.04839

$$DCX_{L3U3} = 40$$

40

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L3U3} = \frac{C_{L3U3} - Y_{DC} (FC_{L3U3} DCX_{L3U3}) - Y_{DW} (DW_{L3U3})}{Y_{LLInventory} (LL_{L3U3})}$$

1.06736

Gusset L3 - Member L3U3 (Ref. Page 1,394-1,395/RF=0.85):

$$C_{L3} = 222$$

222

$$DC_{L3} = 63$$

63

$$DCTRAP_{L3} = 65$$

65

$$DW_{L3} = 0$$

0

$$LL_{L3} = 94$$

94

$$FC_{L3} = N\left[\frac{DCTRAP_{L3}}{DC_{L3}}\right]$$

1.03175

$$DCX_{L3} = 40$$

40

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L3} = \frac{C_{L3} - Y_{DC} (FC_{L3} \ DCX_{L3}) - Y_{DW} (DW_{L3})}{Y_{LLInventory} (LL_{L3})}$$

1.03594

Gusset L1 - Member L1U1 (Ref. Page 1,344/RF=0.88):

$$C_{L1} = 222$$

222

$$DC_{L1} = 59$$

59

$$DCTRAP_{L1} = 63$$

63

$$DW_{L1} = 0$$

0

$$LL_{L1} = 94$$

94

$$FC_{L1} = N\left[\frac{DCTRAP_{L1}}{DC_{L1}}\right]$$

1.0678

$$DCX_{L1} = 37$$

37

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L1} = \frac{C_{L1} - Y_{DC} (FC_{L1} \ DCX_{L1}) - Y_{DW} (DW_{L1})}{Y_{LLInventory} (LL_{L1})}$$

1.04933

Gusset L0 - Member L0U1 (Ref. Page 1,283/RF=0.91):

$$C_{L0} = 288$$

288

$$DC_{L0} = 125$$

125

$$DCTRAP_{L0} = 132$$

132

$$DW_{L0} = 0$$

0

$$LL_{L0} = 79$$

79

$$FC_{L0} = N\left[\frac{DCTRAP_{L0}}{DC_{L0}}\right]$$

1.056

$$DCX_{L0} = 88$$

88

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L0} = \frac{C_{L0} - Y_{DC}(FC_{L0} DCX_{L0}) - Y_{DW}(DW_{L0})}{Y_{LLInventory}(LL_{L0})}$$

1.24297

Gusset L3 - Member L3U3 (Ref. Page 1,419/RF=0.98): Maine Legal Load Configuration 6

Strength I Load Factor - Maine Legal Load Factor

$$Y_{MLLInventory} = 1.35$$

1.35

$$C_{L3} = 222$$

222

$$DC_{L3} = 62$$

62

$$DCTRAP_{L3} = 65$$

65

$$DW_{L3} = 0$$

0

$$LL_{L3} = 106$$

106

$$FC_{L3} = N\left[\frac{DCTRAP_{L3}}{DC_{L3}}\right]$$

1.04839

$$DCX_{L3} = 40$$

40

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{L3} = \frac{C_{L3} - Y_{DC}(FC_{L3} DCX_{L3}) - Y_{DW}(DW_{L3})}{Y_{MLLInventory}(LL_{L3})}$$

1.18505

**Sidewalk Truss Members (xxxx - denotes member & xx - denotes gusset plate):**

Member U1-U2 = U3-U4 & U5-U6 = U6-U7 COMPRESSION (Ref. Page 73-74/RF=0.95):

$$C_{U1U2} = 776$$

776

$$DC_{U1U2} = N\left[\frac{393 + 336}{2}\right]$$

364.5

$$DCTRAP_{U1U2} = 365$$

365

$$DW_{U1U2} = 0$$

0

$$LL_{U1U2} = 192$$

192

$$FC_{U1U2} = N\left[\frac{DCTRAP_{U1U2}}{DC_{U1U2}}\right]$$

1.00137

$$DCX_{U1U2} = N\left[\frac{294 + 251}{2}\right]$$

272.5

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U1U2} = \frac{C_{U1U2} - Y_{DC} (FC_{U1U2} DCX_{U1U2}) - Y_{DW} (DW_{U1U2})}{Y_{LLInventory} (LL_{U1U2})}$$

1.29437

Gusset L0 - Member L0U1 (Ref. Page 1,479/RF=0.72):

$$C_{L0} = 288$$

288

$$DC_{L0} = 142$$

142

$$DCTRAP_{L0} = 150$$

150

$$DW_{L0} = 0$$

0

$$LL_{L0} = 79$$

79

$$FC_{L0} = N\left[\frac{DCTRAP_{L0}}{DC_{L0}}\right]$$

1.05634

$$DCX_{L0} = 107$$

107

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RF_{InvL0} = \frac{C_{L0} - Y_{DC} (FC_{L0} DCX_{L0}) - Y_{DW} (DW_{L0})}{Y_{LLInventory} (LL_{L0})}$$

1.06123

Gusset U1 - Member L2U1 (Ref. Page 1,662/RF=0.94):

$$C_{U1} = 222$$

222

$$DC_{U1} = 92$$

92

$$DCTRAP_{U1} = 97$$

97

$$DW_{U1} = 0$$

0

$$LL_{U1} = 61$$

61

$$FC_{U1} = N\left[\frac{DCTRAP_{U1}}{DC_{U1}}\right]$$

1.05435

$$DCX_{U1} = 69$$

69

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RF_{InvU1} = \frac{C_{U1} - Y_{DC} (FC_{U1} DCX_{U1}) - Y_{DW} (DW_{U1})}{Y_{LLInventory} (LL_{U1})}$$

1.22775

Gusset U3 - Member L3U3 (Ref. Page 1,790/RF=0.99):

$$C_{U3} = 130$$

130

$$DC_{U3} = 37$$

37

$$DCTRAP_{U3} = 38$$

38

$$DW_{U3} = 0$$

0

$$LL_{U3} = 47$$

47

$$FC_{U3} = N\left[\frac{DCTRAP_{U3}}{DC_{U3}}\right]$$

1.02703

$$DCX_{U3} = 26$$

26

Inventory HL-93 Truck Load Rating Factor for member or gusset plate - RFinv:

$$RFinv_{U3} = \frac{C_{U3} - Y_{DC} (FC_{U3} DCX_{U3}) - Y_{DW} (DW_{U3})}{Y_{LLInventory} (LL_{U3})}$$

1.17473

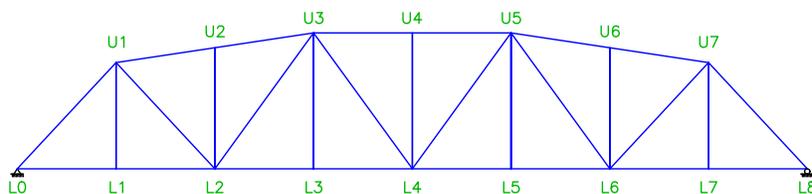
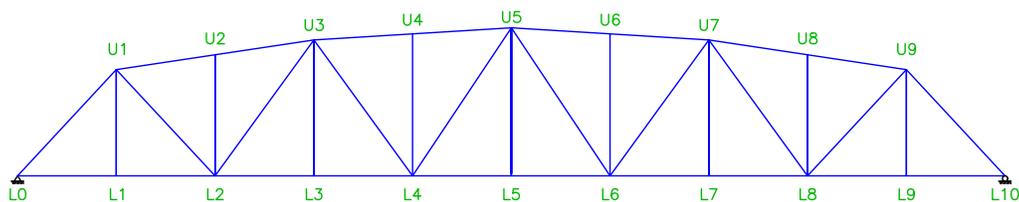
## LRFR Truss members: Frank J. Wood Bridge

**Project:** Bridge Rehabilitation - Exodermic Deck

**Date:** January 25, 2018

**Type:** Span 3 Roadway and Sidewalk Trusses (Reference: Maine DOT Bridge Load Rating completed by Parson Brinckerhoff March 2013 - Starting at node point L0 based on original plans)

Show[ Import["TrussBridgeRating.pdf"][[1]], AspectRatio → Automatic, ImageSize → 6 \* 90]



### ■ INPUT DATA AND TRUSS RATING:

#### Strength I Load Factors

$$Y_{DC} = 1.25$$

1.25

$$Y_{DW} = 1.50$$

1.5

$$Y_{LL\text{Operating}} = 1.35$$

1.35

### Resistance and strength of element:

Resistance of element (capacity) in force or stress (TRAP) -  $C_{xx}$  ;

Dead load of structural components or attachments effecting element (VA) -  $DC_{xx}$  ;

Dead load of structural components or attachments effecting element (TRAP) -  $DCTRAP_{xx}$  ;

Dead load of wearing surface or utilities effecting element (TRAP) -  $DW_{xx}$  ;

Live HL-93 vehicular truck load including dynamic load allowance effecting element (TRAP) -  $LL_{xx}$  ;

Exodermic deck with dead load of structural components or attachments effecting element (VA) -  $DCX_{xx}$  ;

### Correction factor based on new rehabilitation repairs with respect to TRAP and VA analysis:

Sum of all TRAP dead loads -  $DL_T$  (kips);

Sum of TRAP dead loads from stringers and floorbeams -  $DL_E$  (kips);

Sum of NEW dead loads from stringers and floorbeams -  $DL_N$  (kips);

Correction factor -  $CF_{RW\text{truss}}$  (unitless);

$$FC_{xxxx} = \frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

$$\frac{DCTRAP_{xxxx}}{DC_{xxxx}}$$

### Roadway Truss Members (xxxx - subscript denotes member & xx - subscript denotes gusset plate):

Member L3U3 TENSION (Ref. Page 68-69/RF=0.89):

$$C_{L3U3} = 228$$

228

$$DC_{L3U3} = 62$$

62

$$DCTRAP_{L3U3} = 65$$

65

$$DW_{L3U3} = 0$$

0

$$LL_{L3U3} = 94$$

94

$$FC_{L3U3} = N \left[ \frac{DCTRAP_{L3U3}}{DC_{L3U3}} \right]$$

1.04839

$$DCX_{L3U3} = 40$$

40

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper,L3U3} = \frac{C_{L3U3} - Y_{DC} (FC_{L3U3} DCX_{L3U3}) - Y_{DW} (DW_{L3U3})}{Y_{LLOperating} (LL_{L3U3})}$$

1.38361

Gusset L3 - Member L3U3 (Ref. Page 1,394-1,395/RF=0.85):

$$C_{L3} = 222$$

222

$$DC_{L3} = 63$$

63

$$DCTRAP_{L3} = 65$$

65

$$DW_{L3} = 0$$

0

$$LL_{L3} = 94$$

94

$$FC_{L3} = N \left[ \frac{DCTRAP_{L3}}{DC_{L3}} \right]$$

1.03175

$$DCX_{L3} = 40$$

40

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L3}} = \frac{C_{L3} - Y_{DC} (FC_{L3} - DCX_{L3}) - Y_{DW} (DW_{L3})}{Y_{LL_{Operating}} (LL_{L3})}$$

1.34289

Gusset L1 - Member L1U1 (Ref. Page 1,344/RF=0.88):

$$C_{L1} = 222$$

222

$$DC_{L1} = 59$$

59

$$DCTRAP_{L1} = 63$$

63

$$DW_{L1} = 0$$

0

$$LL_{L1} = 94$$

94

$$FC_{L1} = N \left[ \frac{DCTRAP_{L1}}{DC_{L1}} \right]$$

1.0678

$$DCX_{L1} = 37$$

37

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L1}} = \frac{C_{L1} - Y_{DC} (FC_{L1} - DCX_{L1}) - Y_{DW} (DW_{L1})}{Y_{LL_{Operating}} (LL_{L1})}$$

1.36024

Gusset L0 - Member L0U1 (Ref. Page 1,283/RF=0.91):

$$C_{L0} = 288$$

288

$$DC_{L0} = 125$$

125

$$DCTRAP_{L0} = 132$$

132

$$DW_{L0} = 0$$

0

$$LL_{L0} = 79$$

79

$$FC_{L0} = N\left[\frac{DCTRAP_{L0}}{DC_{L0}}\right]$$

1.056

$$DCX_{L0} = 88$$

88

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{L0} = \frac{C_{L0} - Y_{DC}(FC_{L0} DCX_{L0}) - Y_{DW}(DW_{L0})}{Y_{LLOperating}(LL_{L0})}$$

1.61125

Gusset L3 - Member L3U3 (Ref. Page 1,419/RF=0.98): Maine Legal Load Configuration 6

Strength I Load Factor - Maine Legal Load Factor

$$Y_{MLLInventory} = 1.35$$

1.35

$$C_{L3} = 222$$

222

$$DC_{L3} = 62$$

62

$$DCTRAP_{L3} = 65$$

65

$$DW_{L3} = 0$$

0

$$LL_{L3} = 106$$

106

$$FC_{L3} = N \left[ \frac{DCTRAP_{L3}}{DC_{L3}} \right]$$

1.04839

$$DCX_{L3} = 40$$

40

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper,L3} = \frac{C_{L3} - Y_{DC} (FC_{L3} DCX_{L3}) - Y_{DW} (DW_{L3})}{Y_{MLLInventory} (LL_{L3})}$$

1.18505

**Sidewalk Truss Members (xxxx - denotes member & xx - denotes gusset plate):**

Member U1-U2 = U3-U4 & U5-U6 = U6-U7 COMPRESSION (Ref. Page 73-74/RF=0.95):

$$C_{U1U2} = 776$$

776

$$DC_{U1U2} = N \left[ \frac{393 + 336}{2} \right]$$

364.5

$$DCTRAP_{U1U2} = 365$$

365

$$DW_{U1U2} = 0$$

0

$$LL_{U1U2} = 192$$

192

$$FC_{U1U2} = N \left[ \frac{DCTRAP_{U1U2}}{DC_{U1U2}} \right]$$

1.00137

$$DCX_{U1U2} = N \left[ \frac{294 + 251}{2} \right]$$

272.5

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{U1U2}} = \frac{C_{U1U2} - Y_{DC} (FC_{U1U2} DCX_{U1U2}) - Y_{DW} (DW_{U1U2})}{Y_{LL_{Operating}} (LL_{U1U2})}$$

1.67788

Gusset L0 - Member L0U1 (Ref. Page 1,479/RF=0.72):

$$C_{L0} = 288$$

288

$$DC_{L0} = 142$$

142

$$DCTRAP_{L0} = 150$$

150

$$DW_{L0} = 0$$

0

$$LL_{L0} = 79$$

79

$$FC_{L0} = N \left[ \frac{DCTRAP_{L0}}{DC_{L0}} \right]$$

1.05634

$$DCX_{L0} = 107$$

107

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{L0}} = \frac{C_{L0} - Y_{DC} (FC_{L0} DCX_{L0}) - Y_{DW} (DW_{L0})}{Y_{LL_{Operating}} (LL_{L0})}$$

1.37567

Gusset U1 - Member L2U1 (Ref. Page 1,662/RF=0.94):

$$C_{U1} = 222$$

222

$$DC_{U1} = 92$$

92

$$DCTRAP_{U1} = 97$$

97

$$DW_{U1} = 0$$

0

$$LL_{U1} = 61$$

61

$$FC_{U1} = N\left[\frac{DCTRAP_{U1}}{DC_{U1}}\right]$$

1.05435

$$DCX_{U1} = 69$$

69

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RF_{oper_{U1}} = \frac{C_{U1} - Y_{DC} (FC_{U1} DCX_{U1}) - Y_{DW} (DW_{U1})}{Y_{LL_{Operating}} (LL_{U1})}$$

1.59153

Gusset U3 - Member L3U3 (Ref. Page 1,790/RF=0.99):

$$C_{U3} = 130$$

130

$$DC_{U3} = 37$$

37

$$DCTRAP_{U3} = 38$$

38

$$DW_{U3} = 0$$

0

$$LL_{U3} = 47$$

47

$$FC_{U3} = N\left[\frac{DCTRAP_{U3}}{DC_{U3}}\right]$$

1.02703

$$DCX_{U3} = 26$$

26

Operating HL-93 Truck Load Rating Factor for member or gusset plate - RFoper:

$$RFoper_{U3} = \frac{C_{U3} - Y_{DC} (FC_{U3} DCX_{U3}) - Y_{DW} (DW_{U3})}{Y_{LLOperating} (LL_{U3})}$$

1.5228

## E2 Axial compression: Span 2 Sidewalk Truss Member L2-U3

Design of axially loaded compression member.

Project: Frank J. Wood Bridge Rehabilitation

Date: January 29, 2018

Member designation: L2-U3

### INPUT DATA-EXISTING MEMBER:

Unbraced column length -  $L_u$  (ft.);

Effective length factor -  $K$  (unitless);

Steel yield stress -  $F_y$  (ksi);

Modulus of elasticity -  $E_m$  (ksi);

$$L_u = \frac{55.6}{2}$$

27.8

$K = 1$

1

$F_y = 30$

30

$E_m = 29000$

29 000

### Beam properties (inches):

Section: CB 12x65 + 2-12"x 9/16 in. Top Pls.

$A = 32.6$

32.6

$d = 13.125$

13.125

$t_w = 0.4$

0.4

$b_f = 12.0$

12.

$t_f = 1.17$

$$r_y = 3.21$$

$$3.21$$

### SOLUTION:

Computed beam properties:

$$h = d - 2t_f$$

$$10.785$$

Allowable stresses:

Compression:

$$C_c = N \left[ \sqrt{\frac{2 \pi^2 E_m}{F_y}} \right]$$

$$138.135$$

$$k = \frac{K L_u}{r_y}$$

$$103.925$$

$$F_{a1} = \frac{\left(1 - \frac{k^2}{2C_c^2}\right) F_y}{-\frac{k^3}{8C_c^3} + \frac{3k}{8C_c} + \frac{5}{3}}$$

$$11.3473$$

$$F_{a2} = \frac{12 \pi^2 E_m}{23 k^2}$$

$$13.8264$$

$$F_a = \text{lf}[C_c < k, F_{a2}, F_{a1}]$$

$$11.3473$$

### SUMMARY:

Limiting noncompact width to thickness ratios criteria: do not use section if  $h/t_w$  or  $d/t_f$  is greater than  $253/\sqrt{F_y}$ .

$$N \left[ \frac{h}{t_w} \right]$$

$$26.9625$$

$$\dots r d_1$$

$$N \left[ \frac{253}{\sqrt{F_y}} \right]$$

46.1913

Limiting slenderness ratio criteria: do not use section if k is greater than 200.

k

103.925

Capacity of section in weak axis:

Compression (kips):

$$F_{cap} = N [F_a \quad A]$$

369.923

INPUT DATA-EXISTING MEMBER WITH ADDITIONAL BOLTED CHANNEL EACH FLANGE:

Unbraced column length -  $L_u$  (ft.);

Effective length factor - K (unitless);

Steel yield stress -  $F_y$  (ksi);

Modulus of elasticity -  $E_m$  (ksi);

$$L_u = \frac{55.6}{2}$$

27.8

K = 1

1

 $F_y = 30$ 

30

 $E_m = 29000$ 

29000

Beam properties (inches):

Section: CB 12x65 + 2-12"x 9/16 in. Top Pls. + 2-C15X33.9 Channels

A = 52.6

52.6

d = 13.925

13.925

$$b_f = 15.0$$

$$15.$$

$$t_f = 1.57$$

$$1.57$$

$$r_y = 4.17$$

$$4.17$$

### SOLUTION:

#### Computed beam properties:

$$h = d - 2t_f$$

$$10.785$$

#### Allowable stresses:

##### Compression:

$$C_c = N \left[ \sqrt{\frac{2 \pi^2 E_m}{F_y}} \right]$$

$$138.135$$

$$k = \frac{K L_u}{r_y}$$

$$80.$$

$$F_{a1} = \frac{\left(1 - \frac{k^2}{2C_c^2}\right) F_y}{-\frac{k^3}{8C_c^3} + \frac{3k}{8C_c} + \frac{5}{3}}$$

$$13.4273$$

$$F_{a2} = \frac{12 \pi^2 E_m}{23 k^2}$$

$$23.333$$

$$F_a = \text{lf}[C_c < k, F_{a2}, F_{a1}]$$

$$13.4273$$

### SUMMARY:

Limiting noncompact width to thickness ratios criteria: do not use section if  $h/t_w$  or  $d/t_f$  is greater than  $253 / \sqrt{F_y}$ .

$$N \left[ \frac{h}{t_w} \right]$$

26.9625

$$N \left[ \frac{d}{t_f} \right]$$

8.86943

$$N \left[ \frac{253}{\sqrt{F_y}} \right]$$

46.1913

Limiting slenderness ratio criteria: do not use section if k is greater than 200.

k

80.

Capacity of section in weak axis:

Compression (kips):

$$F_{cap} = N [F_a \quad A]$$

706.275

**Historic Frank J. Wood Bridge Study  
Bridge # 2016 Frank J. Wood Bridge US 201 & Rt. 24 Over the  
Androscoggin River Brunswick, Cumberland County  
Maine DOT Region 1 (Southern)**

**APPENDIX C Construction Cost Estimate for Rehabilitation Option 1**

## Frank J. Wood Bridge Construction Estimate

Project No.: :01705-061-02 Frank J. Wood Bridge  
 Location : Brunswick–Topsham, ME  
 Description : OPTION 1: BETTERMENT REPAIRS EXODERMIC DECK REPLACEMENT WITH POLYMER WEARING SURFACE  
 Date : February 8, 2018

TOWN: BRUNSWICK– TOPSHAM

STATION: -----

ROAD: US ROUTE 201 & ROUTE 57

OVER: ANDROSCOGGIN RIVER

TYPE: Warren Truss

ROADWAY WIDTH: 30 Ft.

WALKS: 1

SPANS: 3

ROADWAY LENGTH:

CLEARANCE:

MEDIAN:

### ESTIMATE OF QUANTITIES AND COST - BRIDGE BETTERMENTS, BRUNSWICK - TOPSHAM Bridge #2016

- 114.1 DEMOLITION SUPERSTRUCTURE (SF) - Quantity x Unit Price = Total Item Cost

$$In[1] := TC_{114.1} = N[(850 \text{ ft}) \times (35 \text{ ft}) \times 40.00 \frac{\text{Dollars}}{\text{ft}^2}]$$

$$Out[1] = 1.19 \times 10^6 \text{ Dollars}$$

$$In[2] := Q_{114.1} = N\left[\frac{TC_{114.1}}{40.00 \frac{\text{Dollars}}{\text{ft}^2}}\right]$$

$$Out[2] = 29\,750. \text{ ft}^2$$

- 107.95 NEW EXODERMIC BRIDGE DECK WITH POLYMER WEARING SURFACE - (SF) - Quantity x Unit Price = Total Item Cost

$$In[3] := TC_{107.95} = N[(810 \text{ ft}) \times (35 \text{ ft}) \times ((40 + 35 + 16) \frac{\text{Dollars}}{\text{ft}^2})]$$

$$Out[3] = 2.57985 \times 10^6 \text{ Dollars}$$

$$\text{In}[4] := Q_{107.95} = N\left[\frac{\text{TC}_{107.95}}{(40 + 35 + 16) \frac{\text{Dollars}}{\text{ft}^2}}\right]$$

$$\text{Out}[4] = 28\,350. \text{ ft}^2$$

■ 472 HOT MIX ASPHALT FOR MISCELLANEOUS BRIDGE WORK (TON) - Quantity x Unit Price = Total Item Cost

$$\text{In}[5] := \text{TC}_{472} = N\left[(30 \text{ ft}) \times (100 \text{ ft}) \times (4 \text{ in}) \times \frac{\text{ft}}{12 \text{ in}} \times \frac{144 \text{ lbs}}{\text{ft}^3} \times \frac{\text{ton}}{2000 \text{ lbs}} / \text{approach} \times 2 \text{ approach} \times 250.00 \frac{\text{Dollars}}{\text{ton}}\right]$$

$$\text{Out}[5] = 36\,000. \text{ Dollars}$$

$$\text{In}[6] := Q_{472} = N\left[\frac{\text{TC}_{472}}{250.00 \frac{\text{Dollars}}{\text{ton}}}\right]$$

$$\text{Out}[6] = 144. \text{ ton}$$

■ 851 SAFETY CONTROLS FOR CONSTRUCTION OPERATIONS (UD) - Quantity x Unit Price = Total Item Cost

$$\text{In}[7] := \text{TC}_{851} = N\left[(820 \text{ UD}) \times 80.00 \frac{\text{Dollars}}{\text{UD}}\right]$$

$$\text{Out}[7] = 65\,600. \text{ Dollars}$$

$$\text{In}[8] := Q_{851} = N\left[\frac{\text{TC}_{851}}{80.00 \frac{\text{Dollars}}{\text{UD}}}\right]$$

$$\text{Out}[8] = 820. \text{ UD}$$

■ 852 SAFETY SIGNING FOR CONSTRUCTION OPERATIONS (SF) - Quantity x Unit Price = Total Item Cost

$$\text{In}[9] := \text{TC}_{852} = N\left[(4 \text{ ft} \times 4 \text{ ft}) \times 100 \times (25.00 \frac{\text{Dollars}}{\text{ft}^2})\right]$$

$$\text{Out}[9] = 40\,000. \text{ Dollars}$$

$$\text{In}[10] := Q_{852} = N\left[\frac{\text{TC}_{852}}{25.00 \frac{\text{Dollars}}{\text{ft}^2}}\right]$$

$$\text{Out}[10] = 1\,600. \text{ ft}^2$$

■ 853.21 TEMPORARY CONCRETE BARRIER REMOVED & RESET (LF) - Quantity x Unit Price = Total Item Cost

$$\text{In}[11] := \text{TC}_{853.21} = \text{N}[(810 \text{ ft}) \times 20.00 \frac{\text{Dollars}}{\text{ft}}]$$

$$\text{Out}[11] = 16200. \text{ Dollars}$$

$$\text{In}[12] := \text{Q}_{853.21} = \text{N}[\frac{\text{TC}_{853.21}}{20.00 \frac{\text{Dollars}}{\text{ft}}}]$$

$$\text{Out}[12] = 810. \text{ ft}$$

■ 859 REFLECTORIZED DRUM (UD) - Quantity x Unit Price = Total Item Cost

$$\text{In}[13] := \text{TC}_{859} = \text{N}[(850 \times 40 \text{ UD}) \times 0.60 \frac{\text{Dollars}}{\text{UD}}]$$

$$\text{Out}[13] = 20400. \text{ Dollars}$$

$$\text{In}[14] := \text{Q}_{859} = \text{N}[\frac{\text{TC}_{859}}{0.60 \frac{\text{Dollars}}{\text{UD}}}]$$

$$\text{Out}[14] = 34000. \text{ UD}$$

■ 904.0 4000 PSI CEMENT CONCRETE - ABUTMENT REPAIRS (CY) - Quantity x Unit Price = Total Item Cost

$$\text{In}[15] := \text{TC}_{904.0} = \text{N}[(100 (2 \text{ ft}) \times (1.5 \text{ ft}) (\frac{12 \text{ in}}{12 \frac{\text{in}}{\text{ft}}})) \times (\frac{\text{cy}^3}{27 \text{ ft}^3}) \times (1000.00 \frac{\text{Dollars}}{\text{cy}^3})]$$

$$\text{Out}[15] = 11111.1 \text{ Dollars}$$

$$\text{In}[16] := \text{Q}_{904.0} = \text{N}[\frac{\text{TC}_{904.0}}{1000.00 \frac{\text{Dollars}}{\text{cy}^3}}]$$

$$\text{Out}[16] = 11.1111 \text{ cy}^3$$

■ 960.12 STRUCTURAL STEEL NEW STRINGERS - COATED STEEL: M270 GRADE 50 (LB) - Quantity x Unit Price = Total Item Cost

$$\text{In}[17] := \text{TC}_{960.12} = \text{N}[(820 \text{ ft} \times 34 \text{ ft}) \times (\frac{18 \text{ lbs}}{\text{ft}^2}) \times (6.00 \frac{\text{Dollars}}{\text{lbs}})]$$

$$\text{Out}[17] = 3.01104 \times 10^6 \text{ Dollars}$$

$$In[18] := Q_{960.12} = N\left[\frac{TC_{960.12}}{8.00 \frac{\text{Dollars}}{\text{lbs}}}\right]$$

$$Out[18] = 376\,380. \text{ lbs}$$

- 960.122 STRUCTURAL STEEL FLOORBEAM - COATED STEEL: M270 GRADE 50 (LB) - Quantity x Unit Price = Total Item Cost

$$In[19] := TC_{960.122} = N\left[\left((820 \text{ ft} \times 34 \text{ ft}) \times \left(\frac{9 \text{ lbs}}{\text{ft}^2}\right)\right) \times \left(7.00 \frac{\text{Dollars}}{\text{lbs}}\right)\right]$$

$$Out[19] = 1.75644 \times 10^6 \text{ Dollars}$$

$$In[20] := Q_{960.122} = N\left[\frac{TC_{960.122}}{10.00 \frac{\text{Dollars}}{\text{lbs}}}\right]$$

$$Out[20] = 175\,644. \text{ lbs}$$

- 960.123 STRUCTURAL STEEL NEW SPLICE CONNECTION PLATES AND GUSSET PLATES INCLUDING POST TENSIONING IF NEEDED : M270 GRADE 50 (LB) - Quantity x Unit Price = Total Item Cost

$$In[21] := TC_{960.123} = N\left[\left(50 (650 \text{ lbs})\right) \times \left(16.00 \frac{\text{Dollars}}{\text{lbs}}\right)\right]$$

$$Out[21] = 520\,000. \text{ Dollars}$$

$$In[22] := Q_{960.123} = N\left[\frac{TC_{960.123}}{60 \frac{\text{Dollars}}{\text{lbs}}}\right]$$

$$Out[22] = 8666.67 \text{ lbs}$$

- \*992.311 TEMPORARY SUPPORTS FOR ALL UTILITY PIPES (LS) - Quantity x Unit Price = Total Item Cost

$$In[23] := TC_{992.311} = N\left[\left(1 \text{ ls} \right) 200\,000.00 \frac{\text{Dollars}}{\text{ls}}\right]$$

$$Out[23] = 200\,000. \text{ Dollars}$$

$$In[24] := Q_{992.311} = N\left[\frac{TC_{992.311}}{200\,000.00 \frac{\text{Dollars}}{\text{ls}}}\right]$$

$$Out[24] = 1. \text{ ls}$$

■ \*961.210 PAINTING EXISTING STEEL TRUSSES (SF) - Quantity x Unit Price = Total Item Cost

$$\text{In}[25] := \text{TC}_{961.210} = \text{N}[(8000 \text{ sf}) 10.00 \frac{\text{Dollars}}{\text{sf}}]$$

$$\text{Out}[25] = 80000. \text{ Dollars}$$

$$\text{In}[26] := \text{Q}_{992.311} = \text{N}[\frac{\text{TC}_{961.210}}{10.00 \frac{\text{Dollars}}{\text{ls}}}]$$

$$\text{Out}[26] = 8000. \text{ ls}$$

## TOTAL CONSTRUCTION COST ESTIMATE FOR - OPTION 1

$$\text{In}[27] := \text{TotalCost} = \text{AccountingForm}[(\text{TC}_{114.1} + \text{TC}_{107.95} + \text{TC}_{472} + \text{TC}_{851} + \text{TC}_{852} + \text{TC}_{853.21} \\ + \text{TC}_{859} + \text{TC}_{904.0} + \text{TC}_{960.12} + \text{TC}_{960.122} + \text{TC}_{960.123} + \text{TC}_{992.311} + \text{TC}_{961.210}) 1.15, 12]$$

$$\text{Out}[27] // \text{AccountingForm} = \\ 10955637.2778 \text{ Dollars}$$

**STEPHEN F. HINCHMAN**  
ATTORNEY AT LAW

April 11, 2018

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RE: Supplemental Comments, Environmental Assessment Frank J.  
Wood Bridge, STP-2260(300)

Dear Ms. Martin and Mr. Gardiner:

On behalf of the Friends of the Frank J. Woods Bridge (“Friends”), please accept these comments supplementing the Friends other submissions in response to the above referenced Environmental Assessment regarding the Frank J. Wood Bridge improvement project.

**I. FRIENDS OF THE FRANK J. WOOD BRIDGE.**

The Friends of the Frank J Wood Bridge is a Maine non-profit corporation dedicated to the preservation of the historic Frank J. Wood Bridge between Brunswick and Topsham, Maine. The board and membership of the Friends is made up of residents and business owners of both towns who feel strongly that preservation of the bridge is important to the identity, economy, and quality of life of our communities. The Friends members use the bridge and are concerned that the proposed action will significantly affect their uses, interests and businesses.

The Friends are concerned that FHWA and MDOT are failing to meet their requirements under the National Environmental Policy Act (“NEPA”) by segmenting the Section 106 and 4F analyses from the direct, indirect and cumulative analyses required under the Endangered Species Act review and consultations, Essential Fish Habitat review, FERC relicensing issues related to fish passage failures, Clean Water Act requirements under sections 401 and 404, and the analysis of impacts based on the (as yet not-) final design and cost of each alternatives.

**II. BACKGROUND ON NEPA.**

The purpose of NEPA is twofold: to ensure agencies consider the environmental impacts of their proposed actions early in the decision-making process and to alert the public to the environmental impacts of proposed agency action. As the Supreme Court noted in **Winter v. Natural Resources Defense Council**, the purpose of NEPA’s environmental impact statement requirement is to ensure that “important [environmental] effects will not be overlooked or underestimated only to be discovered after resources have been committed or the die otherwise

cast,” that “an agency has indeed considered environmental concerns”, and to “provide[] a springboard for public comment... [and] afford[] other affected governmental bodies notice of the expected consequences and the opportunity to plan and implement corrective measures in a timely manner.” *Id.* 129 S. Ct. 365, 389–90 (2008) (internal quotation marks and citations omitted). By requiring the consideration of environmental impacts early in the agency decision-making process, NEPA ensures that agencies are aware of the environmental impacts of an action before they have committed to that action. Further, by announcing the environmental impacts of a proposed action early in the agency decision-making process, the public is able to act on that information through the administrative process before a decision is made.

NEPA’s purpose is achieved through its Environmental Impact Statement (EIS) requirement. NEPA requires the preparation of an EIS for any proposed major federal action that will “significantly affect[] the quality of the human environment.” 42 U.S.C.A. § 4332(C). An agency must follow the Council on Environmental Quality’s (CEQ) regulations to determine if an action they are proposing will trigger NEPA’s EIS requirement by having a significant effect on the environment. 40 C.F.R. § 1500 et seq. The CEQ regulations require the preparation of an Environmental Assessment (EA) to make this determination. To be useful in making a decision about whether or not an EIS should be prepared, EAs are required to have the same “scope” as the potential EIS. *Id.* § 1508.9(b).

An agency is arbitrary and capricious in fulfilling its NEPA procedural obligation if that agency fails to take a “hard look” at the environmental consequences of the action it is proposing. **US v. Coalition for Buzzards Bay**, 644 F. 3d 26, 31 (1st Cir. 2011). An agency takes a hard look when it identifies information that allows both the agency and the public to evaluate the environmental impacts of the proposed action. Segmenting a proposed action into many smaller actions for NEPA review can defeat NEPA’s dual purposes by minimizing the perceived environmental impacts of the action. The Council on Environmental Quality (CEQ) regulations prevent segmentation through mandating the combined analysis of smaller actions that are part of a larger proposed action, and proposed actions that are “connected,” “similar,” and/or have “cumulative impacts.” 40 C.F.R. § 1508.25.

Segmentation minimizes the environmental consequences of a larger proposed action by dividing it into several proposals for analysis in separate NEPA statements. Thus, segmentation defeats NEPA’s dual purpose of requiring agencies to consider environmental impacts and disseminating information about environmental impacts to the public. This division of the analysis allows agencies to avoid confronting the totality of the environmental impacts of their actions, and the piecemealed presentation of the information prevents the public from having a complete understanding of the action’s environmental impacts. **Sierra Club v. Marsh**, 769 F. 2d 868, 881 (1st Cir. 1985).

To prevent segmentation, the CEQ regulations define the required “scope” of analysis for NEPA statements. The regulations require that a NEPA statement analyze the entirety, rather than a segment, of proposed single actions. Further, the regulations require a single combined analysis for proposed actions that are “similar,” “cumulative,” 40 C.F.R. § 1508.25. A cumulative environmental impact is “the impact on the environment which results from the incremental

impact of the action when added to other past, present, and reasonably foreseeable future actions.” **Id.** § 1508.25(a)(1)(ii).

### III. Discussion

The EA violates the above provisions in a number of ways. For example, the EA was released prior to and without the Essential Fish Habitat (“EFH”) Consultation with NOAA Fisheries (due to start January 2018), lacks a final EFH Assessment Report, EFH determination and EFH conservation recommendations. (EA at 11). This is, **per se**, impermissible segmentation. All impacts of a single action must be addressed together in a single NEPA document. 40 C.F.R. §§ 1500.5(g), 1502.25. Further, it is especially problematic because the EA notes that the preferred alternative has the potential to cause permanent impacts on the upstream fish passage at the Brunswick Dam operated by Brookfield Renewable Energy Partners (“Brookfield”) and that the fish passage issue is still under evaluation. (EA at 14.) The EA appears to suggest that this concern will be evaluated and resolved during the “final design process.”

That is not how NEPA works. The totality of the potential environmental impacts, including indirect, cumulative and reasonably foreseeable future effects, must be analyzed and disclosed to the public and to agency decision makers NOW, before the die is cast and it becomes too late to implement corrective measures. **Winter v. Natural Resources Defense Council**,” 129 S. Ct. 389. The problem is especially acute in this case because the annual data collected by Maine Department of Marine Resources conclusively indicates that the Brunswick fish passage is failing to effectively pass shad and the dam owner and state and federal wildlife agencies have all acknowledged that corrective action will be necessary at the next relicensing proceeding (which the EA notes but impermissibly fails to adequately analyze – see EA at 21, 27).

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Second, the EA makes the same mistake with respect to the failure to analyze impacts under the Clean Water Act – which it attempts to defer to a future application to the Army Corps of Engineers based on the final selected design. (EA at 12). As an initial matter, the NEPA document must be based on the final design. Publishing the EA prior to developing a final design (and final cost) is premature. Second, even if this were the final design, while FHWA may be correct that the CWA § 404 permit is typically obtained after completion of NEPA, it is wrong to defer the discussion of impacts under § 404 to a future application to the Army Corps of Engineers. That would force two different NEPA analyses of the same project, which is unlawful. All impacts of a single action must be addressed together in a single NEPA document. 40 C.F.R. §§ 1500.5(g), 1502.25.

A third area of concern is the failure of the EA to fairly and fully disclose and analyze visual impact concerns related to the preferred alternative. (In addition to the Section 106 and 4 f review process, aesthetic and visual impacts are also subject to state permitting pursuant to 35 M.R.S.A. § 480-D(1); 06-096 C.M.R. Ch. 315). For example, the EA does not include a profile view of Alternative 2. Indeed, based on the administrative record, it appears the agency intentionally directed consultants not to publicly disclose elevations, making it impossible to determine the height of the proposed alternative above the river or the thickness of the bridge inclusive of the steel support beams, bridge deck and sidewalks, and rails. Without a visual portrayal or the technical cross-sectional information, it is impossible for the public or agencies to assess potential visual impacts as they relate to Section 106 and 4f properties, or to other criteria including the cumulative overall aesthetic impact. For instance, the public, including members of the Friends, have repeatedly asked how the proposed alternative would affect the view of the Androscoggin River falls and the historic sites on each side of the river. A new bridge that is 10 to 15-feet thick (1 and ½ stories) would have major visual impacts and such impacts must be fully disclosed – not intentionally hidden from public review.

Likewise, the administrative record indicates that the sponsoring agencies may have also attempted to impact public opinion by selecting images that portray the current bridge and current conditions in the worst possible light while spending significant sums on renderings to portray the preferred alternative in the best possible light. Another example would be the graphic at the public hearing comparing the width of vehicle, bicycle and pedestrian lanes for alternatives 2 and 3, which used different scales for each resulting in a skewed presentation. These actions are quite disappointing and violate both the spirit and the letter of the law.

#### **IV. Conclusion**

In light of the violations of NEPA noted above and in the Friends other submissions, the EA must be withdrawn and redone correctly.

Sincerely,



Stephen F. Hinchman, Esq., counsel for  
Friends of the Frank J. Wood Bridge

Cheryl Martin  
Assistant Division Administrator  
Federal Highway Administration – Maine Division  
40 Western Ave  
Augusta, ME 04330

April, 11 2018

David Gardiner  
Maine DOT  
16 State House Station  
Augusta, ME 04333-0016

To Whom Ever is actually listening,

Since early 2016 the community has been at odds with a small fraction of town employees (civil servants) who are hell bent on destroying the Frank J Wood Bridge. The reasoning behind this is unclear. I walk the bridge all the time and there is never a problem with too much pedestrian traffic, nor has MDOT provided any studies that show differently. Once the bridges deck is replaced bicyclists can have 5 foot bike lanes. The only thing stopping this is not the bridge's deck width it is MDOT's refusal to shrink lane widths! All studies show 10 foot lane widths are preferable in an urban setting as this bridge certainly is.

I want to say luckily there are Federal Laws that protect historical structures... unfortunately it appears that MDOT beats to its own drum and decides which laws it wants to apply and once they are called out on it they "cook the books". It is blatantly obvious that this is what has been done.

Mr Gardiner, you signed the 2003 Historical Bridge Plan on the FJW. How can you now draft a 4f saying the opposite? You have been in your job too long if you have forgotten that you are a Civil Servant. The public expects- even demands- you to keep your word. If funding is an issue, ask. Every time a transportation bond is placed on the ballet it passes overwhelmingly. All you are doing is wasting tax payers dollars on an alternative that does not fit the surroundings, and goes against every study on traffic calming and urban street design.

It is not too late to correct the wrong you all have done, by being dishonest to the public you serve, the historic structures you are in charge of maintaining and preserving, and the reputation of the Agency that you work for; preserve the Frank J Wood Bridge! Find the best alternative to make it last indefinitely into the future and do it now.

Penninah Graham  
Topsham

April 11, 2018

Cheryl Martin  
Assistant Division Administrator  
Federal Highway Administration – Maine Division (“FHWA”)  
40 Western Ave  
Augusta, ME 04330

David Gardiner  
Maine Dep’t of Transportation (“MDOT”)  
16 State House Station  
Augusta, ME 04333-0016

RE: Supplemental Comments, Environmental Assessment Frank J.  
Wood Bridge, STP-2260(300)

Dear Ms. Martin and Mr. Gardiner:

On behalf of the Friends of the Frank J. Woods Bridge (“Friends”), please accept these comments supplementing the Friends other submissions in response to the above referenced Environmental Assessment regarding the Frank J. Wood Bridge improvement project.

## **I. FRIENDS OF THE FRANK J. WOOD BRIDGE.**

The Friends of the Frank J Wood Bridge is a Maine non-profit corporation dedicated to the preservation of the historic Frank J. Wood Bridge between Brunswick and Topsham, Maine. The board and membership of the Friends is made up of residents and business owners of both towns who feel strongly that preservation of the bridge is important to the identity, economy, and quality of life of our communities. The Friends members use the bridge and are concerned that the proposed action will significantly affect their uses, interests and businesses.

The Friends are concerned that FHWA and MDOT are failing to meet their requirements under the National Environmental Policy Act (“NEPA”) by segmenting the Section 106 and 4F analyses from the direct, indirect and cumulative analyses required under the Endangered Species Act review and consultations, Essential Fish Habitat review, FERC relicensing issues related to fish passage failures, Clean Water Act requirements under sections 401 and 404, and the analysis of impacts based on the (as yet not-) final design and cost of each alternatives.

## **II. BACKGROUND ON NEPA.**

The purpose of NEPA is twofold: to ensure agencies consider the environmental impacts of their proposed actions early in the decision-making process and to alert the public to the environmental impacts of proposed agency action. As the Supreme Court noted in **Winter v. Natural Resources Defense Council**, the purpose of NEPA’s environmental impact statement requirement is to ensure that “important [environmental] effects will not be overlooked or underestimated only to be discovered after resources have been committed or the die otherwise

cast,” that “an agency has indeed considered environmental concerns”, and to “provide[] a springboard for public comment... [and] afford[] other affected governmental bodies notice of the expected consequences and the opportunity to plan and implement corrective measures in a timely manner.” *Id.* 129 S. Ct. 365, 389–90 (2008) (internal quotation marks and citations omitted). By requiring the consideration of environmental impacts early in the agency decision-making process, NEPA ensures that agencies are aware of the environmental impacts of an action before they have committed to that action. Further, by announcing the environmental impacts of a proposed action early in the agency decision-making process, the public is able to act on that information through the administrative process before a decision is made.

NEPA’s purpose is achieved through its Environmental Impact Statement (EIS) requirement. NEPA requires the preparation of an EIS for any proposed major federal action that will “significantly affect[] the quality of the human environment.” 42 U.S.C.A. § 4332(C). An agency must follow the Council on Environmental Quality’s (CEQ) regulations to determine if an action they are proposing will trigger NEPA’s EIS requirement by having a significant effect on the environment. 40 C.F.R. § 1500 et seq. The CEQ regulations require the preparation of an Environmental Assessment (EA) to make this determination. To be useful in making a decision about whether or not an EIS should be prepared, EAs are required to have the same “scope” as the potential EIS. *Id.* § 1508.9(b).

An agency is arbitrary and capricious in fulfilling its NEPA procedural obligation if that agency fails to take a “hard look” at the environmental consequences of the action it is proposing. **US v. Coalition for Buzzards Bay**, 644 F. 3d 26, 31 (1st Cir. 2011). An agency takes a hard look when it identifies information that allows both the agency and the public to evaluate the environmental impacts of the proposed action. Segmenting a proposed action into many smaller actions for NEPA review can defeat NEPA’s dual purposes by minimizing the perceived environmental impacts of the action. The Council on Environmental Quality (CEQ) regulations prevent segmentation through mandating the combined analysis of smaller actions that are part of a larger proposed action, and proposed actions that are “connected,” “similar,” and/or have “cumulative impacts.” 40 C.F.R. § 1508.25.

Segmentation minimizes the environmental consequences of a larger proposed action by dividing it into several proposals for analysis in separate NEPA statements. Thus, segmentation defeats NEPA’s dual purpose of requiring agencies to consider environmental impacts and disseminating information about environmental impacts to the public. This division of the analysis allows agencies to avoid confronting the totality of the environmental impacts of their actions, and the piecemealed presentation of the information prevents the public from having a complete understanding of the action’s environmental impacts. **Sierra Club v. Marsh**, 769 F. 2d 868, 881 (1st Cir. 1985).

To prevent segmentation, the CEQ regulations define the required “scope” of analysis for NEPA statements. The regulations require that a NEPA statement analyze the entirety, rather than a segment, of proposed single actions. Further, the regulations require a single combined analysis for proposed actions that are “similar,” “cumulative,” 40 C.F.R. § 1508.25. A cumulative environmental impact is “the impact on the environment which results from the incremental

impact of the action when added to other past, present, and reasonably foreseeable future actions.” **Id.** § 1508.25(a)(1)(ii).

### III. Discussion

The EA violates the above provisions in a number of ways. For example, the EA was released prior to and without the Essential Fish Habitat (“EFH”) Consultation with NOAA Fisheries (due to start January 2018), lacks a final EFH Assessment Report, EFH determination and EFH conservation recommendations. (EA at 11). This is, **per se**, impermissible segmentation. All impacts of a single action must be addressed together in a single NEPA document. 40 C.F.R. §§ 1500.5(g), 1502.25. Further, it is especially problematic because the EA notes that the preferred alternative has the potential to cause permanent impacts on the upstream fish passage at the Brunswick Dam operated by Brookfield Renewable Energy Partners (“Brookfield”) and that the fish passage issue is still under evaluation. (EA at 14.) The EA appears to suggest that this concern will be evaluated and resolved during the “final design process.”

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#### **IV. Conclusion**

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Sincerely,

A handwritten signature in black ink that reads "Stephen F. Hinchman". The signature is written in a cursive, slightly slanted style.

Stephen F. Hinchman, Esq., counsel for  
Friends of the Frank J. Wood Bridge

DRAFT

RICHARD NEMROW  
 155 PARK ROW  
 BRUNSWICK, MAINE 04011

Date

Name Cheryl Martin, Asst. Division Administrator  
 Address Federal Highway Commission  
 Address 2 Edmund F. Muskie Building  
 40 Western Ave. Room 614  
 Augusta ME - 04330

Dear Ms. Martin.

As a former member of the Executive Committee of the Brunswick Downtown Association, I am writing in support of restoring and preserving the Frank J. Wood Bridge as an historic part of our community. I am sorry I could not attend the recent public hearings regarding the future of the bridge because of my age and health.

The Town of Brunswick voted in recent years to designate the downtown area as an historic district but now has voted to replace the Frank J. Wood Bridge. This decision is in opposition to the Town's previous vote to preserve its historic structures. The Town needs to be consistent in its vision. Preserving the Bridge will be in keeping with the two mill buildings on either end of the bridge, Fort Andross in Brunswick and the Pejepscot Mill in Topsham.

The Town of Topsham has decided that tearing down the old bridge will benefit their traffic flow without considering the major increase in traffic congestion that will occur on the Brunswick side. The new proposed bridge is not a bridge but a major highway that is almost twice the width of the present bridge. This proposed structure includes everything except a cattle crossing. Topsham has no village just a shopping mall.

I have lived in Maine over 40 years and have restored seven buildings in downtown Brunswick to preserve their historic character. Today all of these buildings are economically viable. Over the years, several historic buildings have been demolished in Brunswick including the Town Hall on Maine Street and the old Brunswick High School. Let's not lose another treasure.

Sincerely,

*Richard Nemrow*

RECEIVED  
 APR 11 2018  
 FHWA  
 Maine Division