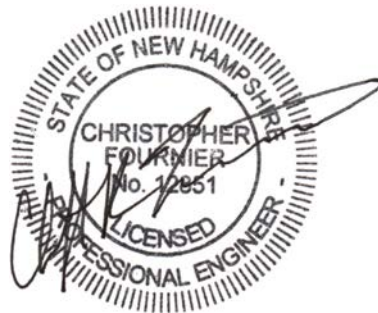


STRUCTURAL ASSESSMENT
MUNICIPAL BRIDGES
EFFINGHAM, NEW HAMPSHIRE

Prepared for:
Town of Effingham

December 1, 2015

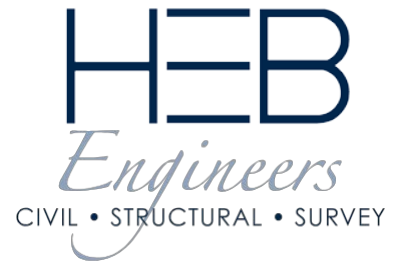


Prepared by:
HEB Engineers, Inc.

Project #2015-084

December 1, 2015

Board of Selectmen
Tim Eldridge, Chairman
Town of Effingham
68 School Street
Effingham, NH 03882



**Re: Municipal Bridge Assessment
HEB Project #2015-084**

Dear Tim,

This Structural Assessment Letter Report has been prepared to assist the Town with planning regarding future bridge projects. On November 4, 2015, Christopher Fournier, PE and Jason Ross, PE met with you to visit four of the Town's most deteriorated bridges. Presented in this Letter Report are summaries of the background, observations, conclusions, and recommendations for planning. The reference documents utilized are the latest NHDOT Bridge Inspection Reports and the NHDOT State Aid Bridge (SAB) Program Summary. It is understood that the Town has a Bridge Capital Reserve Fund (CRF) with a current balance of approximately \$96,000.

Stevens Road Bridge over Unnamed Brook

Background

According to the NHDOT, this bridge has a Federal Sufficiency Rating (FSR) of 24.2% and is on the Municipal "Red List". The bridge is currently posted "Weight Limit 6 Tons".

The Town has begun the process to replace the bridge at the full expense of the Town. On August 11, 2015, the Town engaged Stoney Ridge Environmental, LLC to handle the permitting activities who subconsulted with Prospect Mountain Survey to complete the field survey and with Bacon Civil Design to engineer the bridge replacement. Based on the May 15, 2015 proposal by Stoney Ridge this scope of work only covers applying for the Wetland Permit.

Observations

The bridge superstructure consists of a masonry slab with three steel beams and a gravel-wearing surface. The substructure consists of stone masonry abutments and wingwalls. There is steel guardrail on both sides of the roadway. The superstructure of the bridge appears to be in fair condition and the masonry slab is not visibly fractured, but some of the steel beam flanges are heavily rusted. The substructure is in serious condition with mortar missing and voids along the base. The wingwalls have been undermined and have settled. The guardrail has minor damage.

Conclusions

This bridge is in danger of destabilization due to the undermining at the wingwalls and should be monitored closely by Town staff. The agreement with Stoney Ridge does not include the development of Construction Documents, that is, documents required for Contractor's to bid and/or build the project. Additionally, bidding and Construction Administration services are also not included in the Stoney Ridge proposal to observe the construction for compliance with the Construction Documents.

Immediate Recommendations

- Request a project update with an anticipated schedule from Stoney Ridge Environmental, LLC. As of November 30, 2015, the NHDES Wetland Permit Application has not been processed.
- Consider engaging HEB to monitor the progress of all Town bridge projects. HEB can also provide services to prepare Construction Documents, manage Bidding, and perform Construction Administration services, which are not part of Stoney Ridge's scope of work.
- Bid the project for construction prior to the development of the 2016 Town Warrant Article.
- Vote in favor on the article for at least 100% of the anticipated project costs at the 2016 Town Meeting for construction in 2016. It is recommended to not utilize the Bridge CRF at this time.

Long-Term Recommendations

- Yearly maintenance should be performed on the new bridge structure. HEB can develop a specific maintenance plan should the Town request it.

Granite Road Bridge over South River

Background

According to the NHDOT this bridge has a Federal Sufficiency Rating (FSR) of 36.0% and is on the Municipal "Red List." Granite Road is currently closed due to the condition of the bridge. The bridge cannot safely support any vehicular traffic.

Observations

The bridge is comprised of two 14-foot spans, each with eight steel stringers, a cast-in-place concrete slab, and gravel-wearing surface. There are reinforced concrete abutments and a pier at the midspan of the bridge. Both sides of the bridge are lined with a steel bridge rail. The stringers are in critical condition with significant rust and section loss at the bridge abutments. The abutments and pier have cracks, are delaminating, and the concrete is spalled in several locations. The pier appears to be scoured at the nose. The bridge rail is damaged, with some of the posts broken and bent away from the bridge.

Conclusions

On November 4, 2015, Chris Fournier went to NHDOT's office to examine their files on this bridge. Specifically, to understand the feasibility of narrowing the traveling width and opening the bridge to one lane of traffic. Through a brief analysis of this information, it was concluded that the closure is permanent without significant repairs.

In 2014, NH RSA 234:5-1 was created and offers an avenue for municipalities to immediately address bridges closed due to safety concerns through the NHDOT State-Aid Bridge program. While at NHDOT, Chris Fournier met with Nancy Mayville, administrator of the NHDOT SAB program. At that time, she confirmed that the Granite Road Bridge is eligible for advanced design and construction as part of the NHDOT SAB program through this RSA.

The first step in this process is to submit an Application for Preliminary Estimate to NHDOT. However, this process can often take months to complete. To expedite this, HEB has prepared a Preliminary Estimate for the Town's use utilizing the NHDOT method. HEB determined the project cost to be approximately \$1,020,000.00 for a complete bridge replacement. Based on this estimate the NHDOT SAB program would cover 80% of these costs, which would leave the Town with a replacement cost of \$204,000.00. Utilizing this, the Town can move to the next step in the SAB process and submit an Application for Construction. This application requires that the Town appropriate their share of the project costs, but in the case of advanced design and construction, the full amount is not needed at this time.

Immediate Recommendations

- Appropriate \$60,000 of the Town's Bridge CRF to the Granite Road Bridge.
- Submit HEB Preliminary Estimate and Application for Construction to NHDOT.
- Submit letter requesting advanced design and construction based on RSA 234:5-1 for fiscal year 2018 construction and fiscal year 2023 reimbursement through SAB program.

Long-Term Recommendations

- Investigate municipal borrowing to fund fiscal year 2018 construction.
- Replace the bridge under the NHDOT SAB program.

Snow Road Bridge over South River

Background

According to the NHDOT this bridge has a Federal Sufficiency Rating (FSR) of 70.0% and is on the Municipal "Red List". The bridge is currently posted "E-2."

Observations

The bridge consists of four 6-foot diameter corrugated steel culverts. There are stone masonry wingwalls and a metal bridge rail on both sides of the roadway. The culverts are heavily corroded, with approximately 30% section loss. The bridge rails have minor rust and have been damaged by snowplows.

Conclusions

On November 4, 2015, Chris Fournier went to NHDOT's office to examine their files on this bridge. Specifically, to understand the trend of future load postings. Through a brief analysis of this information, the load posting is likely to be reduced in the near future, affecting transfer station hauling activities.

The first step in the NHDOT SAB process is to submit an Application for Preliminary Estimate to NHDOT. However, this process can often take months to complete. To expedite this, HEB has prepared a Preliminary Estimate for the Town's use utilizing the NHDOT method. HEB determined the project cost to be approximately \$900,000.00 for a complete bridge replacement. Based on this estimate the NHDOT SAB program would cover 80% of these costs, which would leave the Town with a replacement cost of \$180,000.00. Utilizing this, the Town can move to the next step in the SAB process and submit an Application for Construction. This application requires that the Town appropriate their share of the project costs, but since the project would not be scheduled for funding until FY 2024, a lower amount should be acceptable.

Immediate Recommendations

- Appropriate \$30,000 of the Town's Bridge CRF to the Snow Road Bridge.
- Continue to monitor the culverts and review NHDOT Bridge Inspection Reports with HEB.
- Repair guardrail and pavement as necessary.
- Continue debris removal and culvert maintenance.
- Submit HEB Preliminary Estimate and Application for Construction to NHDOT.

Long-Term Recommendations

- Continue using bridge until section loss no longer allows the culverts to support the demands of the vehicle traffic.
- Consider planning for the use of a temporary bridge if current load demands need to be sustained until replacement can be funded and completed.
- Replace the bridge under the NHDOT SAB program.

Drake Road Bridge over Wilkinson Brook

Background

According to the NHDOT this bridge has a Federal Sufficiency Rating (FSR) of 32.1% and has recently been placed on the Municipal "Red List". The bridge is currently posted "Weight Limit 6 Tons." The bridge and road to the south is closed in the winter.

Observations

The bridge has a Jack Arch Superstructure with steel stringers, cast-in-place concrete deck, and gravel-wearing surface. The substructure is stone masonry. There is a steel rail on both sides of the roadway. The bridge is skewed at 20 degrees. The superstructure is in fair condition, with minor rusting and section loss of the beams. The concrete deck has fine cracks, minor spalls, and is leaking. The substructure is in good condition, with a few cracked stones and mortar missing in some locations. The stone has settled on the northeast end of the bridge.

Conclusions

The bridge's low use has helped extend its life, however it is redlisted and if the crossing is to be maintained it will need to be replaced.

Immediate Recommendations

- Continue to close the bridge during the winter months.
- Continue to monitor the culverts and review NHDOT Bridge Inspection Reports with HEB.
- Post a "Weight Limit 6 Tons" sign.

Long-Term Recommendations

- Consider municipal agreement with the Town of Ossipee to provide access to southern end of the bridge.
- Consider abandoning bridge due to low use.

We would be happy to meet with the Select Board to discuss this report and your infrastructure programs in greater detail. Please do not hesitate to contact me with any questions or if you would like additional information.

Sincerely,
HEB Engineers, Inc.



Christopher R. Fournier, PE
Vice President / Lead Structural Engineer

ATTACHMENTS: Appendix A – Granite Road Bridge Documents
 Appendix B – Snow Road Bridge Documents

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APPENDIX A

Granite Road Bridge Documents

Preliminary Estimate

Project: Granite Road Bridge of South River
Location: Effingham, NH
Date: December 1, 2015
HEB Project: 2015-084



<u>Preliminary Estimate</u>			
Built:	1920, rebuilt 1950	Length:	36'-0"
Type:	I-Beams with concrete deck	Width:	18'-6"
ADT:	60 / 0% Trucks (1985) 89 / 0% Trucks (2035)	Skew:	0°
Detour:	2.0 miles	FSR:	36%
Historical:	Potentially, due to age. Age = 95 years (exceeds 50-year threshold)	Posting:	Closed
		Bridge and Approach Rail:	Substandard
		Utilities:	Overhead (north)
		Hydraulic Data:	n/a Q ₅₀ = n/a Q ₁₀₀ = n/a

<u>Proposed Bridge Replacement Structure</u>	
The estimate below is based on the following data:	
Type:	Single Span
Est. Span:	40'-0"
Bridge Width:	27'-0"
Skew:	0°
Phased Const.:	No
Sidewalk:	None
Temporary Bridge:	Assumed none required (short detour).
Approx. Vert. Height:	15'-0" (Streambed to finished grade.)
Rail Face/Face:	24'-0"
Width Curb/Curb:	23'-0"
Approaches:	400'-0" Total Length (Appr 1: 200' North - Appr 2: 200' South)

<u>Summary of Estimated Cost</u>					
	<u>Structure Cost</u>	<u>Cofferdam</u>	<u>Bridge Removal</u>	<u>Estimate (rounded)</u>	
Bridge Cost:	$[40' + 3(15')] \times 24' \times \$250/\text{sf} =$	\$510,000	\$50,000	\$50,000	\$610,000
Approach Cost:	$[400' \times \$200/\text{lf} \times 1.08] + [0.08 \times 610,000] =$	\$135,200			\$140,000
Contingencies:					\$60,000
Temporary Detour:					\$0
Subtotal:					\$810,000
Preliminary Engineering:					\$130,000
Environmental and Cultural Reviews/Permitting:					\$15,000
Construction Engineering:					\$60,000
Right-of-Way Costs:					\$5,000
Subtotal:					\$210,000
GRAND TOTAL (Engineering, ROW, Bridge, and Road Construction Costs)					\$1,020,000

Notes:

1. This estimate is based on current prices. The Town should allow 5% increase per year for inflation.
2. The required waterway area for the proposed bridge was estimated. A Hydraulic Study has not been done.
3. A stream crossing assessment has not been completed. Assumed Bank Full Width = 36'.

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION**

APPLICATION FOR STATE BRIDGE AID CONSTRUCTION

TO THE COMMISSIONER:

The municipality of Effingham has raised or appropriated \$ 60,000 as its share of the cost for replacing/rehabilitating Bridge No. 166/082 on Granite Road (name of highway), and hereby requests State Bridge Aid.

Date: _____

Chairman, Mayor, Town/City Manager

Selectman

Selectman

RETURN TO: Municipal Highways Engineer
Bureau of Planning and Community Assistance
NH Department of Transportation
PO Box 483, Concord, NH 03302-0483

NOTE: *Applications shall be considered in the order received by the Commissioner and shall be programmed for construction on the basis of projected funding availability, anticipated design schedule, and other such parameters as the Commissioner may prescribe for scheduling bridge aid projects (RSA 234:6).*

APPENDIX B

Snow Road Bridge Documents

Preliminary Estimate

Project: Snow Road Bridge of South River
Location: Effingham, NH
Date: December 1, 2015
HEB Project: 2015-084



<u>Preliminary Estimate</u>			
Built:	1972	Length:	32'-0"
Type:	I-Beams with wood deck	Width:	20'-0"
ADT:	90 / 0% Trucks (2012) 133 / 0% Trucks (2035)	Skew:	0°
Detour:	2.0 miles	FSR:	70%
Historical:	No Age = 43 years	Posting:	E-2
		Bridge and Approach Rail:	Substandard
		Utilities:	Overhead (south)
		Hydraulic Data:	n/a Q ₅₀ = n/a Q ₁₀₀ = n/a

<u>Proposed Bridge Replacement Structure</u>	
The estimate below is based on the following data:	
Type:	Single Span
Est. Span:	36'-0"
Bridge Width:	27'-0"
Skew:	0°
Phased Const.:	No
Sidewalk:	None
Temporary Bridge:	Assumed none required (short detour).
Approx. Vert. Height:	10'-0" (Streambed to finished grade.)
Rail Face/Face:	24'-0"
Width Curb/Curb:	23'-0"
Approaches:	400'-0" Total Length (Appr 1: 200' North - Appr 2: 200' South)

<u>Summary of Estimated Cost</u>				
	<u>Structure Cost</u>	<u>Cofferdam</u>	<u>Bridge Removal</u>	<u>Estimate (rounded)</u>
Bridge Cost:	$[36' + 3(10')] \times 24' \times \$250/\text{sf} =$	\$50,000	\$50,000	\$500,000
Approach Cost:	$[400' \times \$200/\text{lf} \times 1.08] + [0.08 \times 500,000] =$			\$130,000
Contingencies:				\$60,000
Temporary Detour:				\$0
Subtotal:				\$690,000
Preliminary Engineering:				\$130,000
Environmental and Cultural Reviews/Permitting:				\$15,000
Construction Engineering:				\$60,000
Right-of-Way Costs:				\$5,000
Subtotal:				\$210,000
GRAND TOTAL (Engineering, ROW, Bridge, and Road Construction Costs)				\$900,000

Notes:

1. This estimate is based on current prices. The Town should allow 5% increase per year for inflation.
2. The required waterway area for the proposed bridge was estimated. A Hydraulic Study has not been done.
3. A stream crossing assessment has not been completed. Assumed Bank Full Width = 36'.

**STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION**

APPLICATION FOR STATE BRIDGE AID CONSTRUCTION

TO THE COMMISSIONER:

The municipality of Effingham has raised or appropriated
\$ 30,000 as its share of the cost for replacing/rehabilitating Bridge No.
165/112 on Snow Road (name of highway),
and hereby requests State Bridge Aid.

Date: _____

Chairman, Mayor, Town/City Manager

Selectman

Selectman

RETURN TO: Municipal Highways Engineer
Bureau of Planning and Community Assistance
NH Department of Transportation
PO Box 483, Concord, NH 03302-0483

NOTE: Applications shall be considered in the order received by the Commissioner and shall be programmed for construction on the basis of projected funding availability, anticipated design schedule, and other such parameters as the Commissioner may prescribe for scheduling bridge aid projects (RSA 234:6).