STATE OF VERMONT
AGENCY OF TRANSPORTATION

Scoping Report
FOR
Brattleboro BF 2000(26)

TH 446 (Elliot Street), BRIDGE 31OVER WHETSTONE BROOK

November 17, 2015

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I. Site Information

Bridge 31 is a town owned bridge located on Elliot Street (TH 446) in District 2, Windham County, Brattleboro VT. The Bridge is located between two intersections, on the Southern end Elliot St intersects Holden St and Frost PL, and on the Northern side intersects Williams St, Frost St, and Union St. The bridge has a sidewalk that provides pedestrian access through the site location.

Roadway Classification	
Elliot St	Major Collector
Bridge Type	Rolled Beam
Bridge Length	88 feet
Year Built	1946
Ownership	Town Owned

Need

The following is a list of deficiencies of Bridge 31:

1. The deck is rated a '3' (serious) and a full depth hole has already been observed and repaired. A traffic control device was placed over the repair area limiting the bridge to one lane of alternating traffic.

2. The width of the bridge is substandard.

3. The Bridge Rail including approach rail is substandard.

Traffic

Estimated AADT for 2015.

	Elliot Street	
TRAFFIC DATA	2015	2035
AADT	4800	4900
DHV	640	650
ADTT	60	90
%T	1.4	2.1
%D	54	54

Design Criteria

The design standards for this roadway are indicated below; for the situations that the Vermont State Standards do not apply.

1. AASHTO. *A Policy on Geometric Design of Highways and Streets.* Association of State Highway and Transportation Officials, Washington, DC, 2011. (The Green Book)

2. AASHTO. *Roadside Design Guide.* Association of State Highway and Transportation Officials, Washington, DC, 2011.

3. Minimum Standards are based on the Vermont State Design Standards: http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/publications/VermontStateDesignStandards.pdf

Minimum standards are based on commentary from the Vermont State Design Standards for Lane and Shoulder widths for Urban Collectors.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Bridge Lane and Shoulder Widths	Green Book Chapter 8.2	0'-10'-10'-0'	2'-9'-9'-2'	Substandard
Speed		25 mph (Posted)	25 mph (Design)	
Pedestrian Criteria		5' Sidewalk	5' Sidewalk	
Bridge Railing	Structures Design Manual Section 13	Concrete/Steel Tube	TL-2	

Inspection Report Summary

Deck Rating 3 Serious
Superstructure Rating 7 Good
Substructure Rating 6 Satisfactory

5/4/2015 Deck is in poor condition with a full depth hole on the downstream side at abutment#1. Deck should be replaced soon. Tube rail should be repaired and painted along with all the steel beams. Approach rail and post should be replaced. Full depth hole on the downstream side has been temporarily repaired with a steel plate that should be set into the pavement. ~FRE/TJB

11/25/2014 Large hole has formed on abutment #2 downstream side in the flared section of the deck. Town has placed 4x8 steel plates over the hole and on the sidewalk as a temp fix. Deck should be reconed soon. FRE/TJB

6/19/2014 Deck will need rehab in the near future. Both laid up stone abutments could use some mortar work. Beams should be cleaned and painted. Tubing rail should be repaired and repainted. ~ FRE/TJB

6/28/2015 Structures deck will need to be rehabbed in the near future. Beams and diaphragms should be cleaned and painted soon. Spalling in the sidewalk should be cleaned and patched. Due to the voids in abutment #1 abutment should be monitored after high water. ~FRE/SJH

Utilities
The existing utilities are as follows:

Municipal Utilities

- A municipal water or sewer is attached to the girders however will be out of the way for a deck replacement.
- Overhead Fire Alarm Cable

Public Utilities

Aerial:

- There are aerial electric and telephone facilities which run near the edge of the entire project area. These facilities may need to be relocated or abandoned/re-routed around adjacent streets in order to facilitate the placement of the new bridge approach rail.

It is anticipated that overhead utilities may have to be relocated for construction.

Right Of Way
The existing Right-of-Way is plotted on the Layout Sheet. No additional Right-of-Way acquisition will be necessary.

Resources

Historic:

Bridge 31 is a historic structure.

Safety

The bridge is not in a High Crash location. Even though it is in an area where it averages over one crash per year, the Actual Critical Ratio is less than one and isn't identified in the Policy, Planning, and Intermodal development Division's High Crash Location Report.

II. Alternatives Discussion

This Project was identified by Asset Management along with 8 other structures as a candidate for the 2016/2017 Bridge Deck Replacement Program. The objective of the program was to identify structures that could benefit from a bridge deck rehabilitation or replacement in order to extend the years of service of the bridge's superstructure and substructure. The scope is limited to the decks exclusively, therefore only three alternatives were evaluated as follows:

Alternative 1: No Action

This alternative would involve leaving the bridge in its current condition. The deck is in serious condition, so something will have to be done to improve this bridge in the near future. In the interest of safety to the traveling public, the No Action alternative is not recommended.

Alternative 2: Bridge Rehabilitation

The bridge deck on this structure has long since passed being salvaged. With full depth failures the reinforcement in the concrete has corroded to such an extent it is no longer intact. Additionally any repairs made would be very short lived and would not improve the functionality or structural deficiencies of the bridge.

Alternative 3: Deck Replacement
This alternative would involve removing the existing deck in its entirety and placing a new deck on the existing steel beams.

The existing substructure is in satisfactory condition, and it is reasonable to assume that it can safely carry anticipated traffic loads for an additional 40 years. No repairs would be recommended to the existing substructure at this time. However future projects may consider

repointing the existing substructure as needed at that time. Additionally, some slope stabilization may need to take place in the future as there is evidence of erosion most likely caused by runoff.

Advantages: This alternative would address the structural deficiencies of the existing bridge, with minimum upfront costs. This option would have minimal impacts to adjacent properties and resources.

Maintenance of Traffic: Traffic could be maintained on an offsite detour or with phased construction. It generally does not make economic sense to construct a temporary bridge for a rehabilitation project.

Bridge Width

The existing bridge width is substandard. Given this is a maintenance project meeting new design standards may not be possible. However the scope of the project will be to improve the bridge width as much as possible given the site constraints. Additionally the current bridge approach railing is substandard or nonexistent. It is unlikely that the proposed approach railing will meet the new design standards given site constraints. However in each case the new approach rail will be an improvement over existing conditions.

III. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, Right-of-Way, and faster construction of projects in the field. One practice that helps this endeavor is to close bridges for portions of the construction period, rather than provide temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives to contractors to complete projects sooner. The Agency will consider the closure option on most projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges also expedites construction schedules. This can apply to decks, superstructures and substructures. Accelerated bridge construction and short term road closures creates a safer working environment for construction personnel while minimizing traffic impacts. The following maintenance of traffic options have been considered:

Option 1: Off-Site Detour

Elliot Street:
This option would close the bridge and reroute traffic onto an offsite detour. Since the bridge is located on a Town Highway, it would be the responsibility of the Town of Brattleboro to choose, design and manage the preferred detour route and traffic control plan. The Town would also be responsible for management of emergency services throughout the closure period. A possible detour that may be considered by the Town is as follows:

1. Frost Street (TH 444), to Elm Street (TH 11), to US Route 5 (TH 1), to Bridge Street (TH 428), to Holden Street (TH 418) back to Elliot Street (TH 446) (1.0 mi end-to-end)

A map of this detour route can be found in the Appendix.

Advantages: The costs associated with signing the detour are much lower than the construction costs associated with other maintenance of traffic options. By detouring traffic away from construction activities, it creates a safer working environment for the construction workers. By

not constructing the structure in phases, there will be no vibrations or deflections from adjacent traffic to affect the quality of the closure pours joining the phases. By not requiring the construction and removal of temporary approaches, temporary bridges and temporary crossovers, the length of construction can be reduced over those other options. This is the safest traffic control option since the traveling public is detoured away from the construction site.

Disadvantages: Traffic will not be maintained along the existing corridor for a limited portion of construction. Through traffic will see an increase in travel times during the closure period.

Option 2: Phasing

Another method of maintaining traffic along the corridor during construction is to build a new structure one lane at a time, or in phases. This allows the road to stay open to traffic during construction, while having minimal impacts to adjacent property and environmental resources.

While the time required to develop a phased construction project would remain the same, the time required to complete a phased construction project increases because some of the construction tasks have to be performed multiple times. In addition to the increased design and construction costs mentioned above, the costs also increase for phased construction because of the inconvenience of working around traffic and the effort involved in coordinating the joints between the phases. Another negative aspect of phased construction is the decreased safety of the workers and vehicular traffic, which is caused by increasing the proximity and extending the duration that workers and moving vehicles are operating in the same confined space. Phased construction is usually considered when the benefits include reduced impacts to resources and decreased costs and development time by not requiring the purchase of additional ROW.

Advantages: Traffic would be maintained along the existing corridor during construction.

Disadvantages: While the time and cost required to construct a phased project may be less than that required to construct a project with a temporary bridge, the time required to construct a phased construction project is still longer than a project constructed without phasing, because some of the construction tasks have to be performed multiple times and cannot be performed concurrently. The costs of construction also increases over un-phased work because of this increase in the length of time, the additional inconvenience of working around traffic, and the effort involved in coordinating the joints between the phases. Once again, while the corridor will be open to traffic during construction, traffic will still be delayed and disrupted by the reduction in the number of lanes and by construction vehicles and equipment entering and exiting the site. The construction workers and equipment will still be in close proximity to vehicular traffic increasing the probability of accidents.

Option 3: Temporary Bridge

A temporary bridge was not considered feasible for this site given the proximity of adjacent buildings and intersections.

Maintenance of Traffic Conclusion

Elliot Street:
Due to the availability and close proximity of local roads to detour traffic phasing will not be considered further in this report. Phasing would be more expensive, take longer to construct, and produce a lower quality final product at the completion of construction. Thus an Off-Site Detour

would be the best maintenance of traffic option at this location and will only be considered in the cost matrix.

IV. Cost Matrix[1]

Brattleboro Elliot Street		Alt 1 Do Nothing	Alt 3 Deck Replacement
			a. Conventional
COST	Bridge Cost	$0	$195,000
	Removal of Structure	$0	$54,000
	Roadway (Includes Mobilization)	$0	$111,000
	Traffic Control	$0	$34,000
	Construction Costs	$0	$394,000
	Construction Engineering + Contingencies	$0	$118,2000
	Total Construction Costs w CEC	**$0**	**$512,200**
	Preliminary Engineering[2]	**$0**	**$83,000**
	Right of Way	**$0**	**$0**
	Total Project Costs	$0	$595,200
	Annualized Costs	$0	$0
TOWN SHARE	Towns total Share (2.5%)		**$14,880**
SCHEDULING	Project Development Duration[3]		1 years
	Construction Duration		1 years
	Closure Duration (If Applicable)		60 Days
ENGINEERING	Typical Section –		
	Typical Section –		
	Typical Section – Bridge (feet)	0’-10’-10’-0’ (20’)	2’-9’-9’-2’ (22)
	Geometric Design Criteria	No Change	No Change
	Traffic Safety	No Change	No Change
	Alignment Change	No Change	No Change
	Bicycle Access	No Change	No Change
	Vertical Clearance	No Change	No Change
	Pedestrian Access	No Change	No Change
	Utility	No Change	Relocation Possible
OTHER	ROW Acquisition	No	No
	Road Closure	No	Yes
	Design Life	<5 years	40 years

[1] Costs are estimates only, used for comparison purposes.
[2] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.
[3] Project Development Durations are starting from the end of the Project Definition Phase.

V. Conclusion

We recommend **Alternative 3**; to replace the existing deck using a road closure.

Structure:
The recommended alternative includes replacing the existing deck with a cast-in-place deck using conventional construction methods. The new structure will feature a 5' sidewalk and new concrete bridge rail to mitigate removal of the historic bridge deck. New approach rail will also be installed as part of the project. The proposed improvements should extend the life expectancy of this structure an additional 40 years.

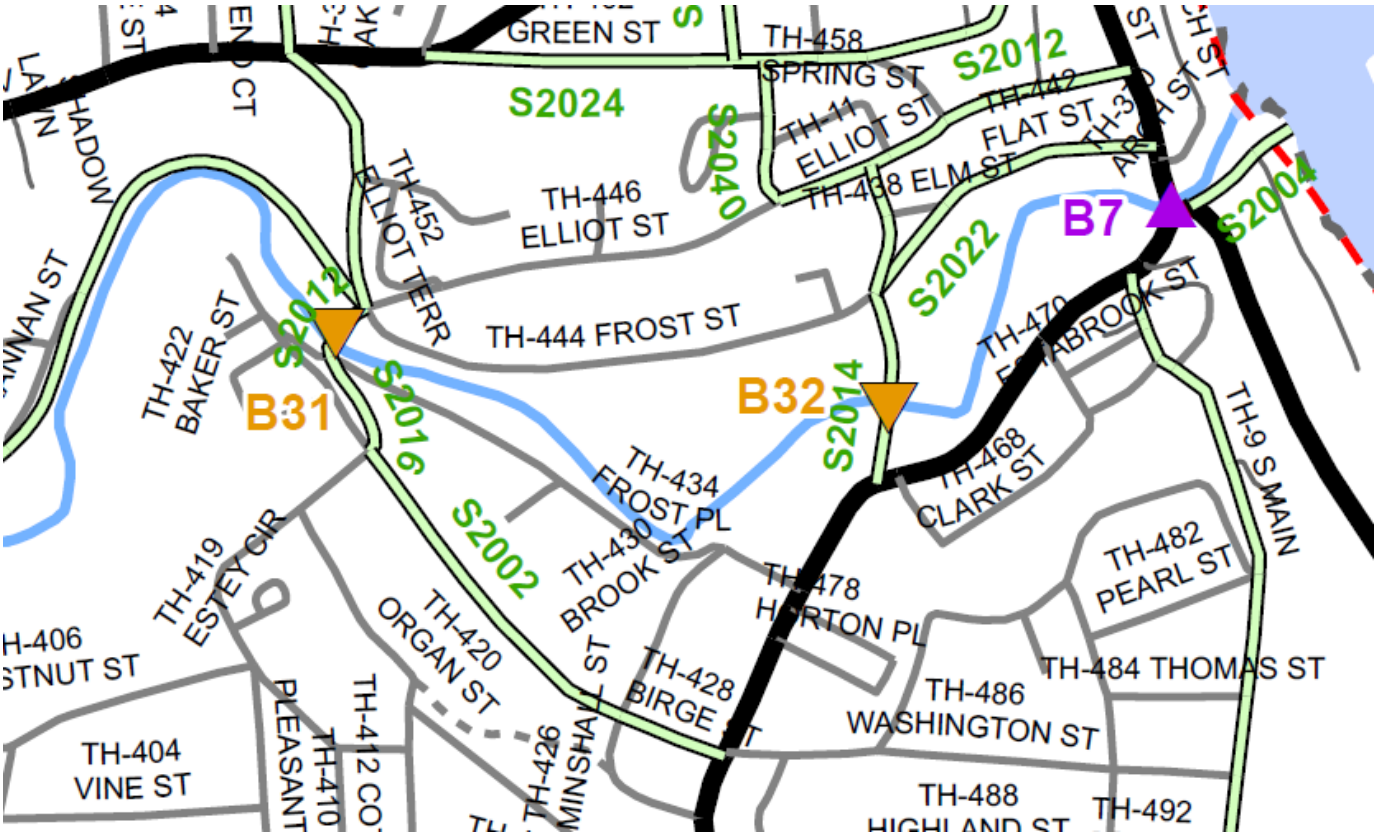
Traffic Maintenance:
It is recommended that traffic be maintained on an offsite detour. There are several reasonable detour routes that could be signed by the Town of Brattleboro. Therefore, it is reasonable to close the road and reroute traffic while the new bridge deck is constructed. By not providing a temporary bridge, both the project development time and the project cost are significantly reduced. Additionally, in accordance with Act 153, by closing the bridge to traffic during construction, the local share is reduced by 50% from a 5% town share to a share of only 2.5% of the project costs.

VI. Appendices

- Site Pictures
- Town Map
- Detour
- Bridge Inspection Report

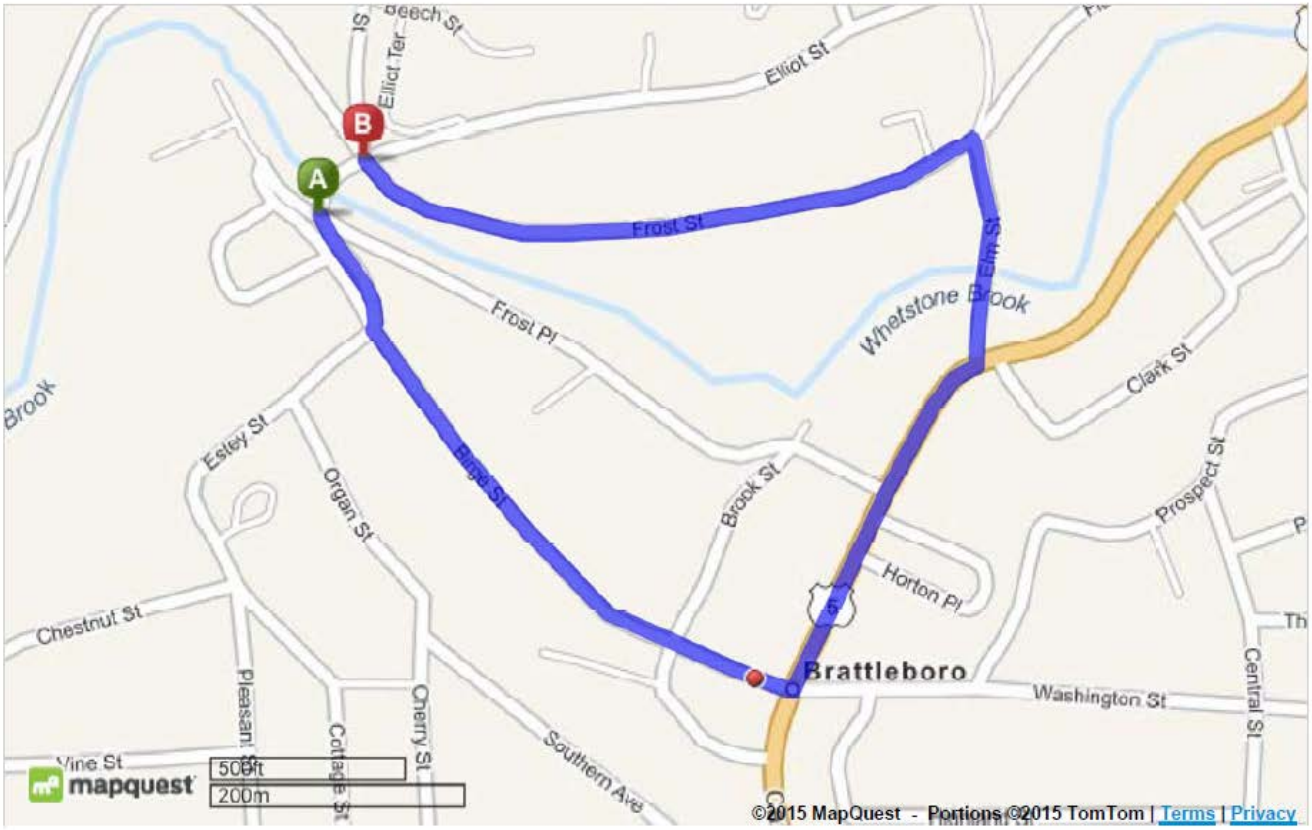
Site Pictures

Town Map


GREEN ST
TH-458
SPRING ST
S2012
S2024
S2040
TH-11
ELLIOT ST
TH-442
FLAT ST
TH-438 ELM ST
TH-446
ELLIOT ST
TH-452
ELLIOT TERR
B7
S2004
S2022
TH-444 FROST ST
TH-422
BAKER ST
S2012
B31
S2016
B32
S2014
TH-434
FROST PL
TH-430
BROOK ST
TH-468
CLARK ST
TH-9 S MAIN
S2002
TH-419
ESTEY CIR
TH-420
ORGAN ST
TH-478
HORTON PL
TH-482
PEARL ST
TH-484 THOMAS ST
TH-486
WASHINGTON ST
TH-428
BIRGE ST
TH-404
VINE ST
TH-488
TH-492

Detour

Total Travel Estimate: **1.04 miles - about 3 minutes**



Bridge Inspection Report

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET

Vermont Agency of Transportation – Structures Section – Bridge Management and Inspection Unit

Inspection Report for BRATTLEBORO bridge no.: 00031 District: 2

Located on: CITY ELLIOT ove WHETSTONE BROOK approximately ELLIOT ST Owner: 04 CITY-OWNED

CONDITION

Deck Rating: 3 SERIOUS

Superstructure Rating: 7 GOOD

Substructure Rating: 6 SATISFACTORY

Channel Rating: 8 VERY GOOD

Culvert Rating: N NOT APPLICABLE

Federal Str. Number: 202012003113022

Federal Sufficiency Rating: 066.7

Deficiency Status of Structure: SD

AGE and SERVICE

Year Built: 1946 Year Reconstructed: 0000

Service On: 5 HIGHWAY-PEDESTRIAN

Service Under: 5 WATERWAY

Lanes On the Structure: 02

Lanes Under the Structure: 00

Bypass, Detour Length (miles): 00

ADT: 004500 % Truck ADT: 03

Year of ADT: 1997

GEOMETRIC DATA

Length of Maximum Span (ft): 0088

Structure Length (ft): 000090

Lt Curb/Sidewalk Width (ft): 1

Rt Curb/Sidewalk Width (ft): 5

Bridge Rdwy Width Curb-to-Curb (ft): 25.9

Deck Width Out-to-Out (ft): 28.1

Appr. Roadway Width (ft): 024

Skew: 00

Bridge Median: 0 NO MEDIAN

Min Vertical Clr Over (ft): 99 FT 99 IN

Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD

Min Vertical Underclr (ft): 00 FT 00 IN

STRUCTURE TYPE and MATERIALS

Bridge Type: ROLLED BEAM

Number of Approach Spans 0000 Number of Main Spans: 001

Kind of Material and/or Design: 3 STEEL

Deck Structure Type: 1 CONCRETE CIP

Type of Wearing Surface: 6 BITUMINOUS

Type of Membrane 0 NONE

Deck Protection: 0 NONE

APPRAISAL *AS COMPARED TO FEDERAL STANDARDS

Bridge Railings: 0 DOES NOT MEET CURRENT STANDARD

Transitions: 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail 0 DOES NOT MEET CURRENT STANDARD

Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD

Structural Evaluation: 6 EQUAL TO MINIMUM CRITERIA

Deck Geometry: 2 INTOLERABLE, REPLACEMENT NEEDED

Underclearances Vertical and Horizontal: N NOT APPLICABLE

Waterway Adequacy: 8 SLIGHT CHANCE OF OVERTOPPING ROADWAY

Approach Roadway Alignment: 4 MEETS MINIMUM TOLERABLE CRITERIA

Scour Critical Bridges: 8 STABLE FOR SCOUR

DESIGN VEHICLE, RATING, and POSTING

Load Rating Method (Inv): 1 LOAD FACTOR (LF)

Posting Status: A OPEN, NO RESTRICTION

Bridge Posting: 5 NO POSTING REQUIRED

Load Posting: 10 NO LOAD POSTING SIGNS ARE NEEDED

Posted Vehicle: POSTING NOT REQUIRED

Posted Weight (tons):

Design Load: 0 OTHER OR UNKNOWN

INSPECTION and CROSS REFERENCE

X-Ref. Route:

Insp. Date: 052015 Insp. Freq. (months) 12 X-Ref. BrNum:

INSPECTION SUMMARY and NEEDS

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Friday, July 10, 2015