HARTGEN
archeological associates inc

ARCHITECTURAL RECONNAISSANCE SURVEY

Middleton Bridge over Schroon River

Towns of Horicon, Chester, Bolton, and Warrensburg
Warren County, New York

HAA # 5407-61
OPRHP 18PR03304

Submitted to:
Foit-Albert Associates, Architecture, Engineering and Surveying, P.C.
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Prepared by:
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November 2019

MANAGEMENT SUMMARY

SHPO Project Review Number: *18PR03304*
Involved State and Federal Agencies: *New York State Department of Transportation (NYSDOT)*
Survey type: *Architectural Reconnaissance Survey*

LOCATION INFORMATION

Municipality: *Town of Horicon*
County: *Warren County*

SURVEY AREA

Length: *447 meters (1,467 ft)*
Width: *136 meters (447 feet)*
Acres: *10.8 acres*

RESULTS OF ARCHITECTURAL SURVEY

Number of structures in APE: *9*
Number of structures 50 years or older: *3*
Number of known NR listed/eligible structures: *0*
Number of structures recommended as eligible: *2*

RECOMMENDATIONS

Two structures are recommended for listing on the National Register.

Report Author: *Walter R. Wheeler*
Date of Report: *November 4, 2019*

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ARCHITECTURAL RECONNAISSANCE SURVEY

1 Introduction

Hartgen Archeological Associates, Inc. (Hartgen) conducted an Architectural Reconnaissance Survey for the proposed Middleton Bridge over Schroon River (Project) located in the Towns of Horicon, Chester, Bolton, and Warrensburg, Warren County, New York. The Project involves Locally Administered Federal Aid funds and requires approvals by the New York State Department of Transportation (NYSDOT). This investigation was conducted to comply with Section 106 of the National Historic Preservation Act and will be reviewed by the New York State Office of Parks, Recreation and Historic Preservation (OPRHP).

Hartgen completed a Phase I Archeological Investigation for the Project, the results of which are presented in a separate volume ((2019)).

2 Project Information

The project entails the construction of a new bridge over the Schroon River and the demolition of an existing bridge and stream gauge station. The proposed new bridge and the existing bridge are at noncontiguous locations.

The proposed location for the construction of the new Middleton Bridge is located on a strip of land running roughly east to west from near Ridin-Hy Ranch to the east side of Schroon River. The bridge's access road will connect to North Sherman Lake Road near its intersection with Burnt Hill Road and cross to the east side of the river where the new bridge will connect to Schroon River Road (Map 1). The new bridge project area encompasses 10.8 acres (Map 2a).

The existing bridge over the Schroon River connects East Schroon River Road and Schroon River Road. The project area for the demolition of the existing bridge encompasses 0.8 acres (Map 2b).

3 Background Information

3.1 Known Historic Properties within the APE

An examination of CRIS identified no NR properties, no NRE properties, no properties previously determined to be ineligible, and no properties of undetermined status within the Project Area.

3.2 Historical Context

Prior to the arrival of European settlers, the region under study was occupied by members of the Algonquin nation. Moses Stickney, a lumber man purchased a large parcel of land including much of what is now the Town of Horicon in the late 1700's. Stickney constructed a damn on the creek draining Brandt Lake, forming a mill pond where he constructed a saw and grist mill. A number of businesses grew up around the pond, mainly catering to men working for the lumber operation. Lumber harvested from the area was floated downstream on Schroon River to the Hudson. The town got its first post office in 1831, the same year that Stickney's nephew Judson Barton, moved to town from Warrensburg where he was born. The labors of Barton and his sons led to the construction of new housing (much still present today) and a general store which was lost to a fire in 2006. The community also got its first church, Baptist Church of Brant Lake, in 1831. The town itself was incorporated on March 29, 1838 and included territory that had previously been parts of Bolton and Hague. Abundant hemlock bark in the area allowed for the founding of several leather tanneries as the town continued to grow into the mid-1800s. As industry expanded, so did the local population. Around the same time, the first lakeside hotel was constructed along Brant Lake by Benjamin Hayes, signaling the beginning of Adirondack tourism, with guests drawn by hunting and fishing. Over time the tourism industry has replaced earlier logging and tanning as the main economic engine for the community (Murtagh 2019; Smith 1885).

A series of historic maps dating back to 1802 were consulted to reconstruct the history of the Project Area. DeWitt depicted the area at the beginning of the 19th century with the Town of Bolton extending all the way to the Schroon River (DeWitt 1802). Much of the territory that is now Horicon remained unpopulated wilderness. However, a number of parcels with named owners line the river. Two maps by Burr show the formation of the Town of Horicon (Burr 1829; Burr 1840). The earlier version shows the boundaries of Bolton and Hague, each containing roughly half of the territory that became Horicon in 1838 and the later map, drawn two years after the incorporation shows boundaries that persist today. Both show the entire area divided into individual parcels of land. Maps by Beers and Stoddard show the development of the major roads in the area, most of which are still being used today (Beers 1876; Stoddard 1888). The Beers map provides the most detail, depicting individual structures and giving the names of owners. Topographic maps of the area show the addition of North Sherman Lake Road as of 1958 and numerous structures lining the shore of the lake itself (NYSDOT 1992; USGS 1897; 1958, 1966). All of the available maps show the APE of the proposed Schroon River Bridge to be unoccupied and undeveloped with the exception of roads.

The historical maps from 1802 through 1966 depict no structures within or adjacent to the project area for the proposed new bridge. In contrast, there are several map-documented structures in the vicinity of the existing Old Schroon River Bridge, located 1.8 miles to the southeast of the proposed location of the new bridge (Map 3). The 1858 map by Chace is the first depiction of the Old Schroon River Bridge and surrounding structures, near the Old River Bank School is a plot of land is attributed to W. Middleton (Chace 1858). The Beers atlas provides further detail depicting the Old Schroon River Bridge in the township of Warrensburg and the first appearance of the Old River Bank School, adjacent to W. Middleton (Beers 1876). Topographic maps of the area show the addition of the USGS gaging station on Schroon River and that several structures surrounding the Old Schroon River Bridge have been razed (USGS 1958). The available maps show the APE around the Old Schroon River Bridge was occupied for more than 160 years.

3.3 Pre-1908 Non-Standardized Pratt Truss Bridges

Truss bridges were first constructed for railroads in the early 1800s, but were subsequently adapted for other types of crossings including pedestrian bridges and carriage crossings (Mead & Hunt 1999:31). Pratt truss bridges were first produced in 1844 using timber with iron diagonals. By 1852, the first all-iron Pratt truss bridge was built (Mead & Hunt 1999:20). Of twenty-one truss types used in New York State bridges, the Warren and Pratt were the most commonly used in road bridge construction by the late 1800s (Mead & Hunt 1999:31).

The most commonly used materials in the construction of truss bridges evolved throughout the 19th century. Wood predominated in the earliest truss bridges. Eventually, cast iron elements were incorporated into wood trusses before cast iron began to replace wood completely. Wrought iron began to be favored over cast iron in the mid-19th century. By the 1890s, steel became a more common material choice for trusses (Mead & Hunt 1999:31).

The Middleton Bridge over the Schroon River was constructed by the Groton Bridge and Manufacturing Company of Groton, New York (1887-99).

> The Groton Iron Bridge Company was a result of a merger between an agricultural machine manufacturing company (Groton Separator Works) with an iron foundry (Groton Iron Works). Groton Separator Works, founded by Daniel Spencer in 1847, operated in partnership with William Perrigo after 1859. Groton Iron Works was founded by Charles and Lyman Perrigo in 1849. Soon after, the merger between the brothers occurred and the two companies organized under the new name Groton Iron Bridge Company. From 1877 to 1882, the company produced an average of 25 bridges a year, including many simple Pratt trusses in Upstate New York. Awarded bridge contracts in 27 states around the country, the following years proved even more productive for the company. The company went through another reorganization in 1887, becoming the Groton Bridge and Manufacturing Company. In 1899 the American Bridge Company absorbed the Groton Bridge and Manufacturing Company. The Groton shop continued for 1 year and then in 1901, the plant was closed and dismantled. The former proprietors repurchased the plant in 1902, and with new equipment, began their

business under the name Groton Bridge Company. By 1920 the business of bridge building had diminished to the point that the Groton Bridge Company sold its equipment to the American Bridge Company and went out of business.

4 Architectural Survey

Hartgen completed an architectural reconnaissance survey to identify properties that are potentially eligible for listing on the National Register of Historic Places. The field survey was performed on August 12, 2019.

Table 1. Architectural properties within or adjacent to the current Project

Structure #	Address/Name	Date	Description	USN	Status	Photo #
1a	2459 Schroon River Road	c. 1970	One-story log-faced wood-frame home with inset porch			1-2
1b	2459 Schroon River Road	c. 1970	A wood-frame garage.			3
2	Horse Trail Cabin	c. 1995	One-story log-framed single family home with gable-entry roof.			4-5
3	Old Schroon River Bridge aka "Middleton Bridge"	1896	A cast iron Pratt truss bridge, manufactured by the Groton Bridge & Mfg. Co.	11311.00337	Previously undetermined. Recommended NRE.	6-10
4	USGS Gaging Station 01317000	c. 1925	A wood-framed gage house with pyramidal roof, on a high board-formed concrete foundation.		Recommended NRE.	10-11
5	2039 Schroon River Road	2019	A wood-frame single family dwelling with gable roof and gable-roofed porch.			12
6a	2057 Schroon River Road/ Old Riverbank School	1858	A one-story wood-framed single family dwelling with side-gable roof. Extensively remodeled in the mid-20th century and later with window alterations and addition of a garage and breezeway; formerly the "Old Riverbank School, Middleton District until 1902" according to a plaque.	11311.00317	Not Eligible	13-15
6b	2057 Schroon River Road	c. 1975	A wood frame shed with vertical panel siding.			16
7	2067 Schroon River Road	2004	A wood-frame single family dwelling with side-gable roof, sheathed with clapboards.			17

4.1 Methodology

All structures within the APE over 50 years old were identified; photographs and identification information for those structures have been uploaded into the CRIS system. Each structure 50 or more years in age was evaluated for its ability to satisfy one or more of the four National Register criteria for significance: (A) by association with events that have made a significant contribution to the broad patterns of history; (B) by association with the lives of persons significant in the past; (C) by embodying the distinctive characteristics of a type, period, or method of construction; or (D) by potentially yielding information important to history (Shrimpton 1997).

4.2 Summary

A total of nine structures on seven separate parcels, were identified by this survey. Two structures (#3 and #6a) had been previously surveyed (USN 11311.00337); one of which, the 1858 Riverbank Schoolhouse (structure #6a), was previously determined to be not eligible for listing on the National Register, due to loss of integrity. The present survey concurs with those findings.

Table 2. Summary of architectural survey of the APE

Total no. of structures	9
No. of structures 50 years or older	3
No. of known NR/NRE structures	0
No. of structures recommended eligible	2

4.2.1 1896 Groton Bridge Company thru-truss bridge (BIN 3305150, structure #3) known as the Middleton Bridge

The National Register eligibility of the other structure that was previously surveyed, the 1896 Groton Bridge Company thru-truss bridge (BIN 3305150, structure #3) known as the Middleton Bridge, was left undetermined by that same survey. The bridge was included in the statewide survey of pre-1961 bridges, was included in the pre-1961 statewide bridge survey but the item code indicates that it was not given a determination because it "needs individual review."

The bridge retains a high level of integrity to its period of construction, and is an intact representative example of a type of bridge—the small cast iron pin-connected Pratt pony truss bridge—which although constructed in large numbers at the time, survives in rapidly-diminishing numbers at present. More than 30 years of personal field survey work, which has included documentation of a number of such structures that have been taken down, makes the scale of the loss of this particular resource type abundantly clear. Bridgehunter.com (Bridgehunter.com/category/builder/Groton-bridge-co/exhibit) cites the locations of 79 bridges manufactured by the firm (including the Middleton Bridge), 38 of which have been destroyed. Seven of the 79 bridges are of the Pratt pony-truss type, like the Middleton Bridge; three are closed to traffic, one is only accessible to pedestrians, and one has been razed. Because these structures were built in the late-19th or early 20th century, previous to modern traffic requirements, it has frequently been deemed advantageous to remove them in favor of new bridges that are capable of handling modern design loads, and which permit wider lanes of traffic. It is eligible for listing on the National Register under Criterion C.

Character-defining features of a Groton Bridge Company Pratt thru-truss bridge include structural steel members comprised of riveted components arranged in a configuration that corresponds to, or is a recognizable variation of, the bridge framing system (in wood or metal) patented in 1844 by Thomas and Caleb Pratt., stone or poured concrete abutments and piers, and decks of either wood or metal. The original decks for these bridges frequently do not survive, and their loss is not typically considered a significant impact on the integrity of the structure. Occasionally decorative façade elements or bridge plaques are affixed to the frame of the bridge. These bridges were popular because of their ability to span moderate distances, and are frequently found in rural or remote areas.

The Middleton Bridge retains its original cut stone abutments and its iron superstructure remains intact. It embodies all of the character-defining features associated with a bridge of its type and period. Its setting continues to be rural in nature. It retains high levels of integrity of location, setting, materials, workmanship, association, design, and feeling.

4.2.2 c. 1925 USGS gage house

In addition to the two structures previously surveyed, one additional structure, a USGS gage house constructed in c. 1925, was identified. A gaging station was located on this site as early as 1908, with recording activities expanding significantly in 1925; it is believed that the present structure was constructed in the latter year. A one-story wood-frame structure with pyramidal roof on an elevated foundation of board-formed concrete, this structure retains a high level of integrity to its period of construction and is an intact representative example of its type and form. It is considered to be eligible for listing on the National Register under Criterion C.

Character-defining features of a USGS gage house include the siting of the structure near the edge of a body of water, frequently with a bridged access due to vagaries of local terrain. Examples constructed in the early 20th century typically make use of detailing and construction techniques taken from the contemporary regional domestic vernacular. Examples include rough-cut stone with slates, brick masonry, and wood frame faced with wood shingles or clapboards with cornerboards and wood shingle roofs (as in this example). Examples associated with early-20th century canals and dams were sometimes constructed of poured concrete. Roof types include single-slope, pyramidal and gable roofs. The plan of these structures is typically square in shape; typically a door is located on one face of the building (away from the body of water) and a small window is located on the opposite wall, or one of the side walls. Later 20th century gaging stations are typically more utilitarian in design, with plywood, corrugated pipe, and sheet steel enclosures all being common. The present structure typifies the character-defining features of an early 20th century gauging station, and retains a high level of integrity to its period of initial construction.

The c. 1925 USGS gage house retains a high level of integrity to its period of construction, with materials, details, siting, scale, form and other aspects of its construction reflecting its original (and continuing) use as a gaging station; it retains details and materials that associate it with the region's vernacular architecture of the early 20th century.

5 Recommendations

Two structures (structures #3 and #4) are recommended for listing on the National Register.

6 Bibliography

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1876 *County Atlas of Warren, New York*. F.W. Beers and Co., New York.

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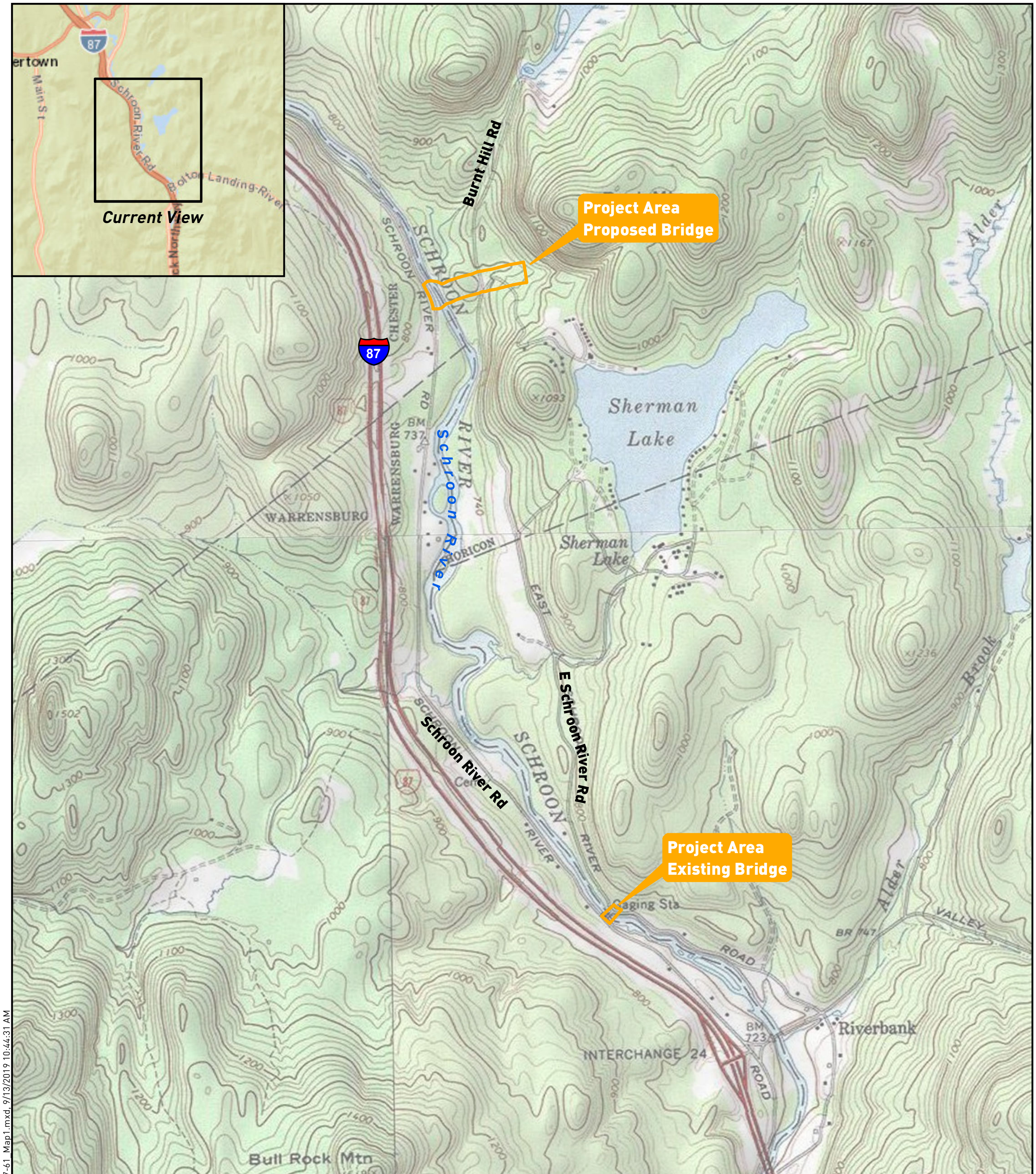
Maps



N

1,000 0 1,000 2,000 Feet

300 0 300 600 Meters

Note: Contour interval is 20 feet.

Project Location

GIS Services Accessed 9/16/2019: Environmental Systems Research Institute, Inc., World Street Map; National Geographic Society USA Topo Maps Layer

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Map 1

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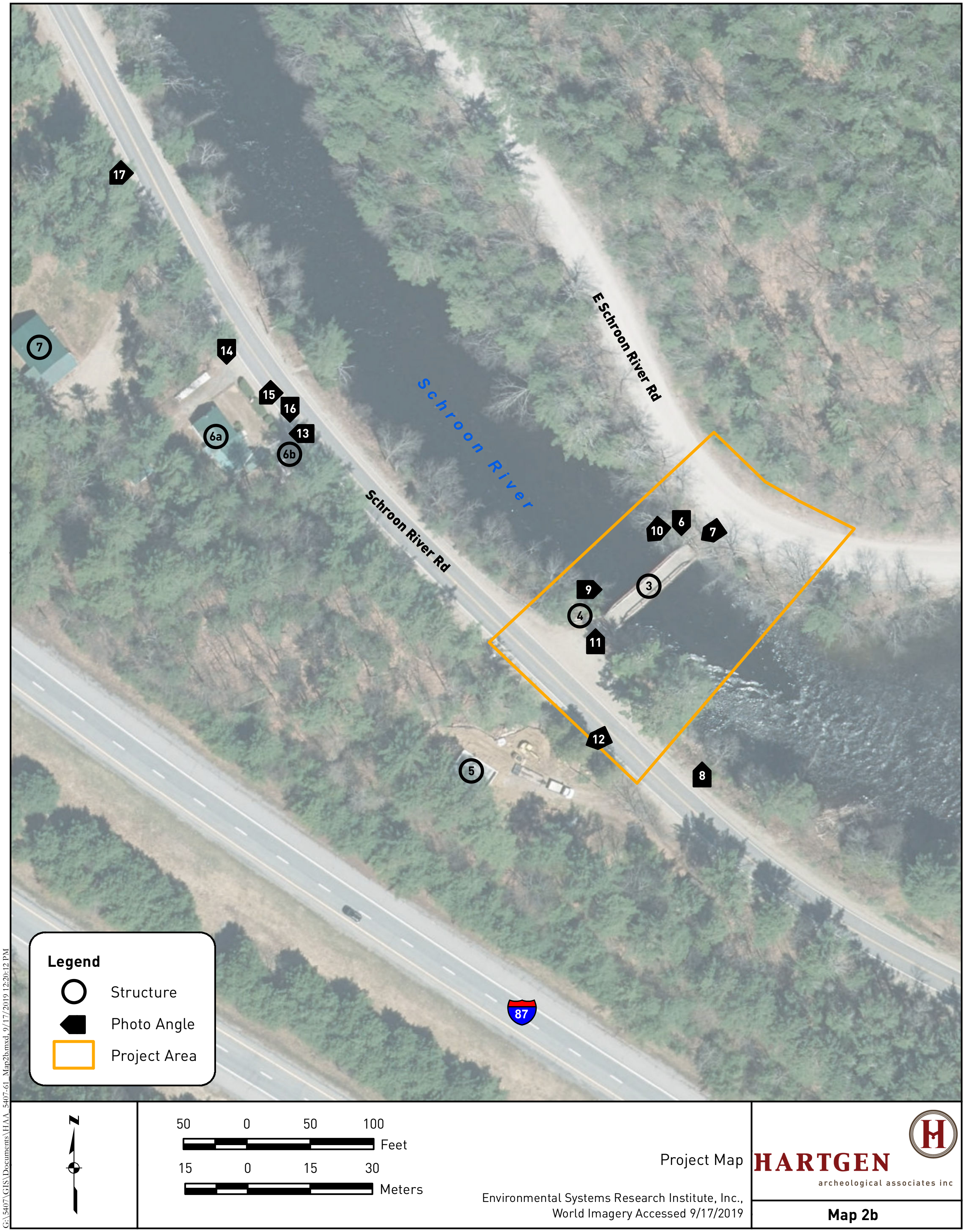
Project Map-Proposed Bridge

Environmental Systems Research Institute, Inc., World Imagery Accessed 9/16/2019

HARTGEN archeological associates inc

Map 2a



Project Map

Environmental Systems Research Institute, Inc., World Imagery Accessed 9/17/2019

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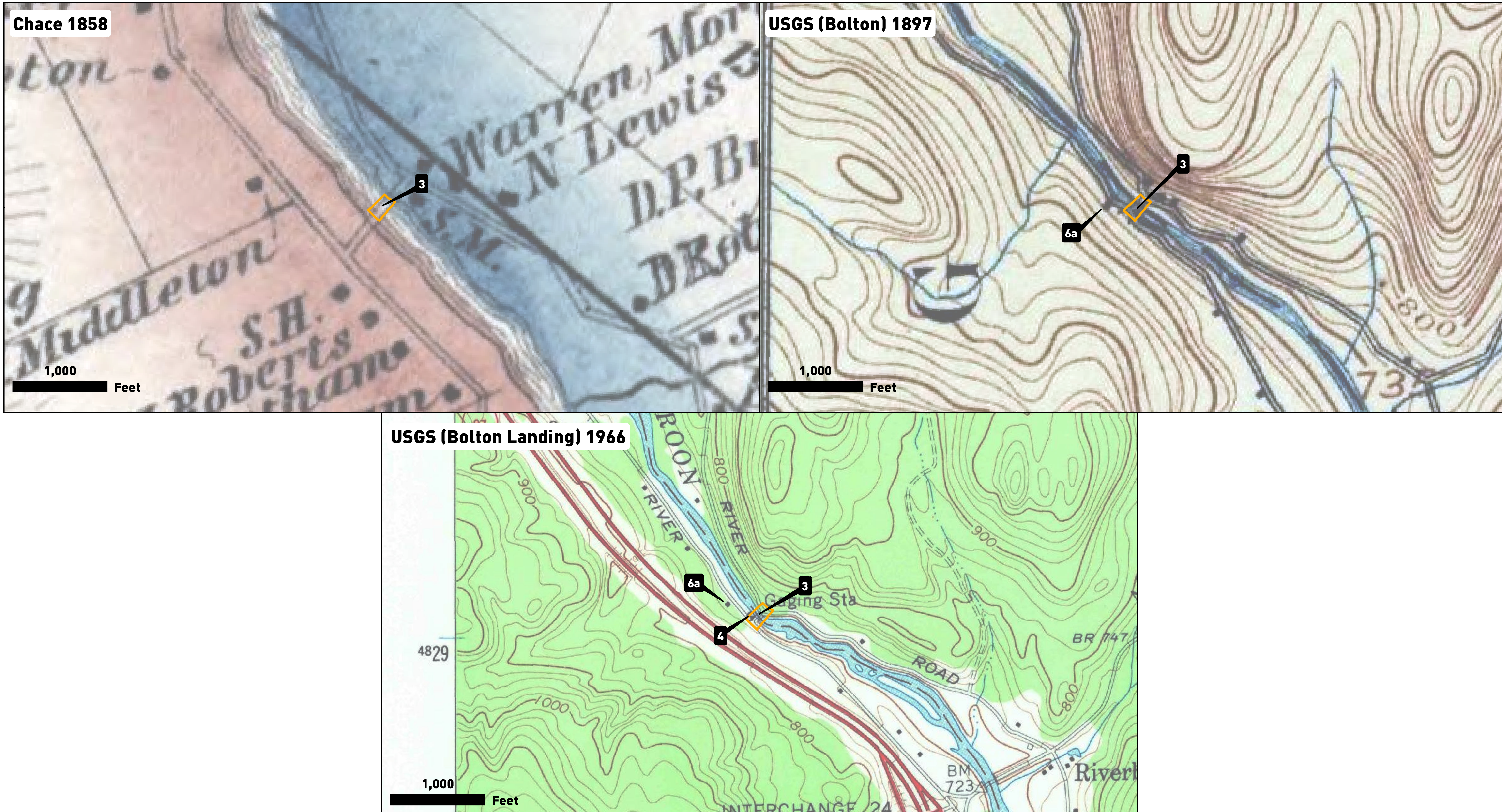
Map 2b



Legend

Project Area

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Historical Maps 1858-1966

Map 3

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Photographs


Photo 1. 2549 Schroon River Road, Structure 1a. View northwest.


Photo 2. 2549 Schroon River Road, Structure 1a. View west.

Photo 3. 2549 Schroon River Road garage, Structure 1b. View west.

Photo 4. Horse Trail Cabin, Structure 2. No address. View south.

Photo 5. Horse Trail Cabin, Structure 2. No address. View west.

Photo 6. Old Schroon River Bridge to be replaced, Structure 3. View south.

Photo 7. Old Schroon River Bridge to be replaced, Structure 3. View southwest.

Photo 8. Old Schroon River Bridge to be replaced, Structure 3. View southwest.

Photo 9. Old Schroon River Bridge to be replaced, Structure 3. View east.

Photo 10. Old Schroon River and USGS gaging station gage house, Structures 3 and 4. View southwest.

Photo 11. USGS gage house, Structure 4. View southwest.

Photo 12. 2039 Schroon River Road, Structure 5. View west.

Photo 13. 2057 Schroon River Road, Structure 6a. View west.

Photo 14. 2057 Schroon River Road, Structure 6a. View south.

Photo 15. Sign on 2057 Schroon River Road, Structure 6a. View west.


Photo 16. 2057 Schroon River Road garage, Structure 6b. View south.

Photo 17. 2067 Schroon River Road, Structure 7. View southwest.

November 5, 2019

Mr. Michael F. Lynch, P.E. AIA
Division Director
New York State Division for Historic Preservation
New York State Office of Parks,
Recreation and Historic Preservation
Peebles Island, P.O. Box 189
Waterford, New York 12188-0189

RE: PIN 175722 BIN 3305150
Middleton Bridge Removal and
Stream Bank Restoration in the
Towns of Warrensburg and Bolton;
New Bridge and Road Construction in
Towns of Chester and Horicon, Warren Co.

Dear Mr. Lynch:

The follow questions were asked by Daniel Bagrow of the NYS Office for Parks, Recreations and Historic Preservation in response to the Cultural Resources Survey Report 10/3/19. The remaining questions will be addressed in an updated report to follow this correspondence. This project is a locally administered project to construct a new crossing and remove a historic bridge at a separate crossing closed to traffic.

Response to SHPO Question #2:

Q: Please provide a more detailed physical description of the bridge and any alterations that have been made to it.

A: Attachment No. 1 is report completed by Greenman Pedersen in December 1979 that provides a detailed description of the existing structure at that time. In 1989/1990 repairs were made to the steel stringers and floor beams, abutments and deck. Attachment No. 2 provides a brief description of the work completed and a transverse section detail of the work completed.

Response to SHPO Question #5:

Q: What is the purpose/function of the gaging station? Was it only used by the USGS? Please provide some sources for the information provided and additional context.

A: The Schroon River at Riverbank, NY Gage Station (01317000) is a water-stage recorder and crest-stage gage (USGS National Water Information System: Web Interface). Water-stage recorders are a group of instruments that produce a record of water surface elevation with respect to time (courtesy of the USBR Water Measurement Manual). A crest-stage gage is an instrument used to determine the water surface elevation of a peak stage at a specific location. This station data is primarily used for flood frequency analyses (courtesy USGS O&M of a Crest-Stage Gaging Station). This station is managed by the NY Water Science Center in Troy, NY.

Enclosed for your review please find two documents provided by the County. The first is an Inspection Report of the bridge from 1979. The other report shows some repairs performed in 1989. If there are any questions or additional information required, please contact Andrea Becker by telephone at (518) 457-9937 or by email at Andrea.Becker@dot.ny.gov.

Sincerely,

Andrea J. Becker
Regional Cultural Resources Coordinator

Enclosures: Inspection Report and Repair Report

cc: T. O'Donoghue, FHWA *(e-mail)*
L. Distefano *(e-mail)*
M. Santangelo, Office of the Environment, *(CRIS)*

WARREN COUNTY DEPARTMENT OF PUBLIC WORKS
WARRENSBURG, NEW YORK 12885

REPORT ON INSPECTION and STRUCTURAL ANALYSIS

MIDDLETON BRIDGE CONNECTING ROAD FROM C.R. 10 TO RIVER ROAD

over

SCHROON RIVER

TOWN OF WARRENSBURG

STATE BRIDGE IDENTIFICATION NO. 3-30515-0

DECEMBER 1979

GREENMAN PEDERSEN ASSOCIATES P.C.
245 LARK ST.
ALBANY, NEW YORK 12210

Greenman-Pedersen, Associates, P.C.
CONSULTING ENGINEERS
245 Lark Street, Albany, New York 12210 • Tel. (518) 434-3103

December 11, 1979

Fred W. Austin, P.E.
Superintendent of Highways
Warren County Department of
Public Works
Warrensburg, New York 12885

Re: Warren County Bridge Inspections
MIDDLETON BRIDGE
BIN 3-30515-0
GPA Job No. 79-910

Dear Mr. Austin:

We are pleased to submit our report on the results of our detailed inspection and analysis of the Middleton Bridge over the Schroon River done in accordance with our agreement dated July 27, 1979.

You will note that we have recommended that the posted loading be reduced to two tons. The posted loading of this bridge could be increased to eight tons by adding additional stringers in the wheel tracks.

If you should have any questions regarding this report, please feel free to contact us.

Very truly yours,

GREENMAN-PEDERSEN, ASSOCIATES, P.C.

John G. Ruby, P.E.
Project Manager

JGR:kak
Enclosure

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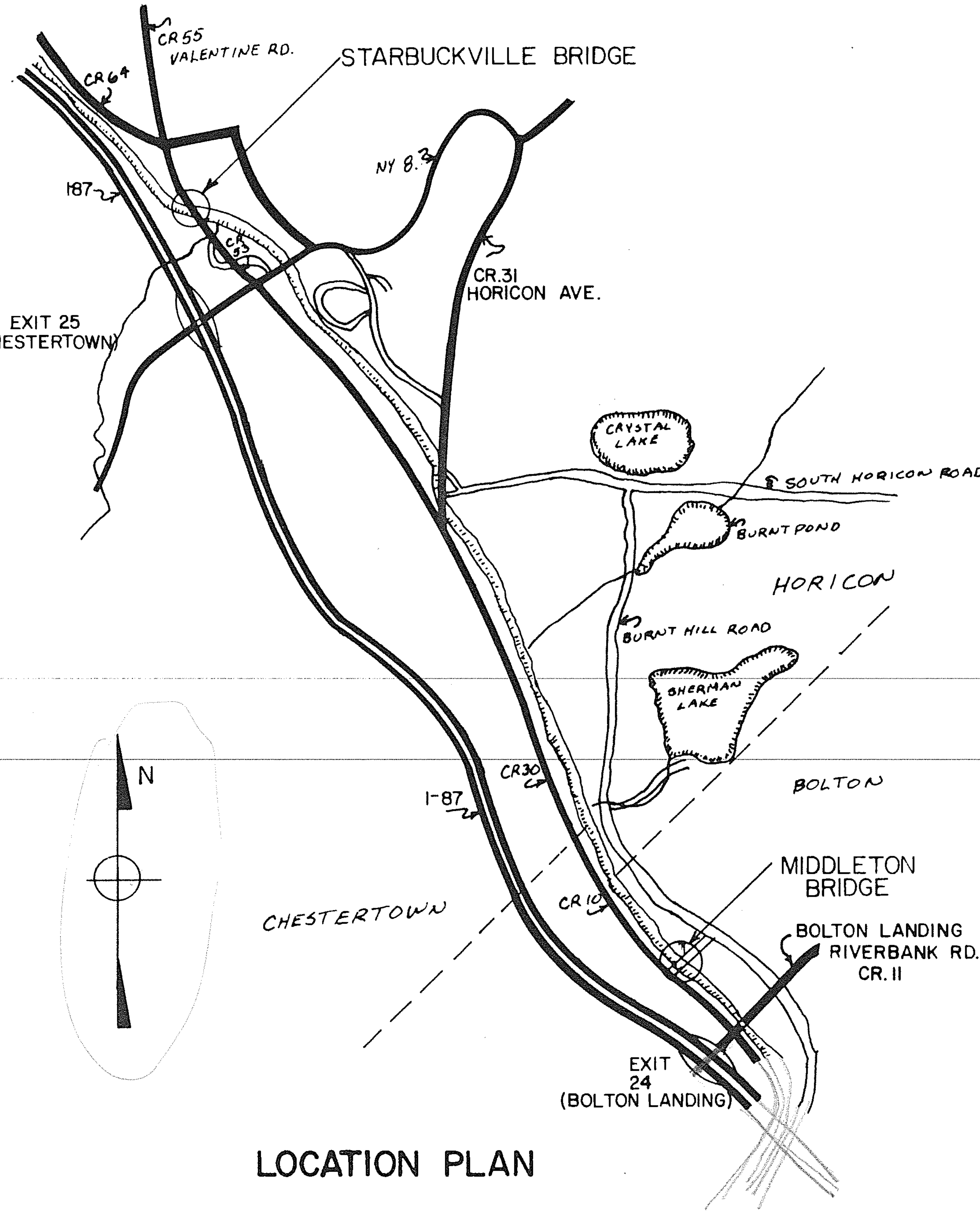


LOCATION PLAN

I N T R O D U C T I O N

The Middleton Bridge carries a connecting road from County Road 10 to River Road, in the Towns of Warrensburg and Bolton, across the Schroon River. This bridge is owned and maintained by the Warren County Department of Public Works and is presently posted for a maximum load of 4 tons.

The bridge was originally constructed in 1896 by the Groton Bridge Co. It has a single span of approximately 87 feet. The main supporting members are two pin connected pony trusses of constant depth, spaced 13-feet 1-inch center to center. Rolled I-section floor beams at a spacing of 14-feet 6-inches are attached to the lower chord pins with U-bolt connections. They in turn, support two 5-inch channel stringers and five 5-inch I-beam stringers. This bridge deck consists of laminated treated timber 2"x4"s which support a timber plank wearing surface about 2-inches thick in the wheel tracks.

The ends of the trusses are supported on cut stone masonry abutments. The approach embankments are retained by stone masonry wing walls.

Both abutments are located at "T" intersections where the connecting road meets County Road 10 and River Road. Therefore, due to turning movements onto and off the bridge, traffic proceeds across the bridge at relatively low speeds.

The beginning abutment is located in the Town of Warrensburg. Reference to the left and right side of the bridge is from the point of view of an observer standing on this abutment and looking across the bridge.

INSPECTION

The Middleton Bridge was inspected on October 5, 1979. The results of this inspection follow:

ABUTMENTS

The abutments are in generally good condition and show no signs of distress. There is no evidence of undermining of the foundations. Due to the massive construction of the abutments, they appear to be in satisfactory condition to continue supporting the bridge.

TRUSSES

The bridge was repainted in 1969. The trusses are generally in good condition, with only minor loss of paint and surface rusting. The diagonal designated U_1L_2 on the attached sheet in the right truss has been damaged by collision.

FLOOR BEAMS

The floor beams are generally in good condition with minor loss of paint and surface rusting.

STRINGERS

The seven stringers are all generally in fair condition, suffering only minor loss of paint and surface rusting.

TIMBER DECK

The timber deck is built of 2"x4"s, and edge spanning over the stringers at approximately 2-foot 1-inch centers. It is in generally good condition having been replaced in 1969. The 2-inch timber plank overlay is badly deteriorated in some areas, and many of the boards are loose.

RESULTS OF STRUCTURAL ANALYSIS

LIVE LOADING

Live loading used for the analysis of this structure was a standard H-type vehicle as designated in Article 1.2.5 of the AASHTO Standard Specifications For Highway Bridges. This vehicle is a two-axle vehicle having a 14-foot wheel base with 80 percent of its load on the back axle and 20 percent on the front axle. The results of this analysis will probably be on the conservative side since it is recognized that lighter weight vehicles usually have a more equal distribution of load to the axles.

ALLOWABLE STRESSES

The allowable stresses used to determine the safe load carrying capacity of the bridge are based on the assumed age of the various components of the structure using allowable stresses and yield strengths as specified in the AASHTO Manual For Maintenance Inspection Of Bridges.

TIMBER DECK

Assuming that wheel loads will be distributed in accordance with AASHTO Article 1.3.4, the timber deck presently on the bridge is adequate to support a 12-ton vehicle.

STRINGERS

Assuming that the wheel loads will be distributed to the stringers in accordance with AASHTO Article 1.3.1, the stringers are adequate for a 2-ton vehicle load.

FLOOR BEAMS

The floor beams have an adequate capacity to support the rear axle of an 8-ton vehicle, assuming that the connection of the stringers to the floor beams will continue to provide adequate support to prevent lateral buckling of the compression flange.

TRUSSES

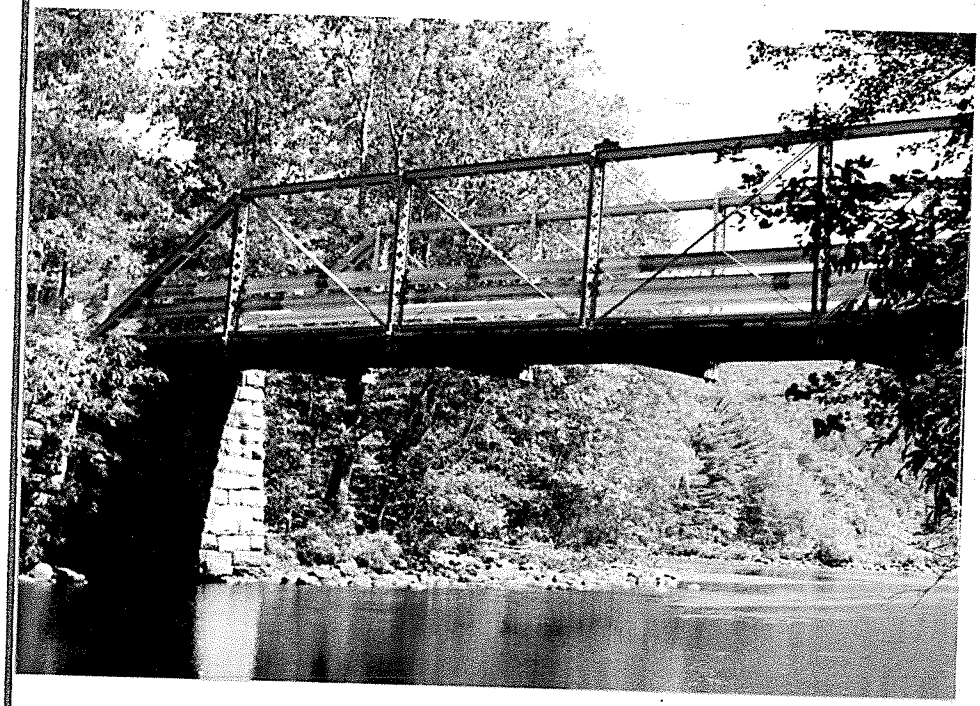
Structural analysis of the trusses indicates that they have adequate capacity to support an 8-ton vehicle. The critical section is the diagonal in the third panel of the span, designated L_2U_3 on the attached sketch. Analysis for the equivalent lane load specified in AASHTO Article 1.2.5 would indicate a further reduction. However, in view of the nature of the traffic at this crossing, it is felt that this loading which simulates a design vehicle, preceded and followed by vehicles of 3/4 of that weight, is too severe to be considered.

R E C O M M E N D A T I O N S

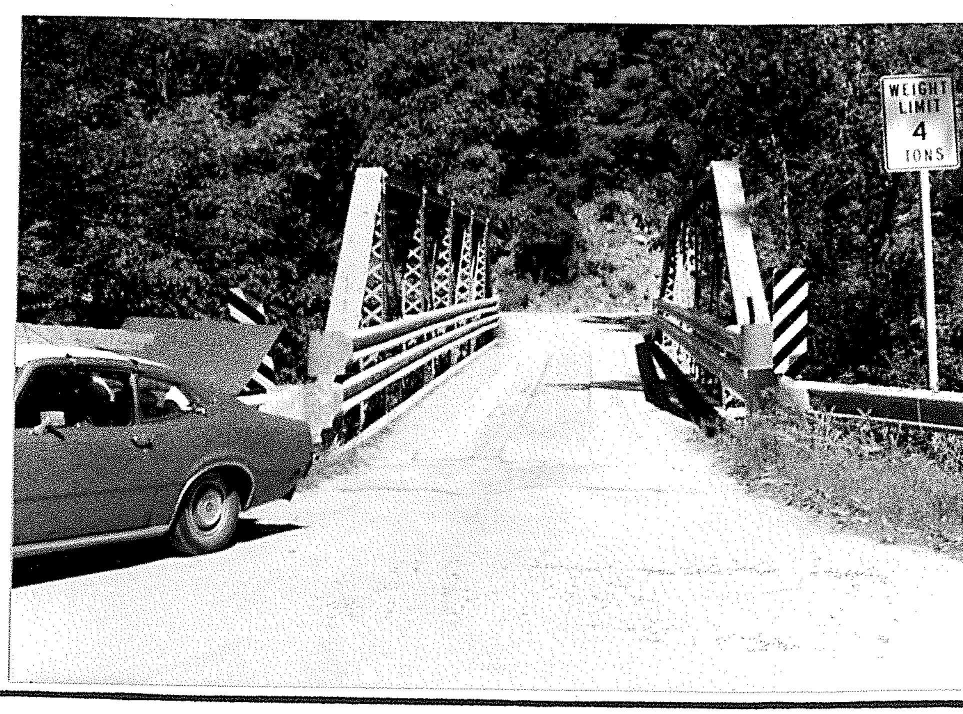
Based on the preceding structural analysis which indicates that the very light steel stringers are the most critical element of the bridge, and considering that light vehicles have a more equal distribution of load to their axles, it is recommended that the present posted loading of 4 tons be further reduced to 2 tons.

If a higher posted loading were required, it would be possible to increase the loading to 8 tons by installing an additional stringer under each wheel track. This would reduce the percentage of the wheel load carried by each stringer, to the point where bending in the stringers would not be critical. This installation could be accomplished without removing the existing deck.

PHOTOGRAPHS
MIDDLETON BRIDGE



Upstream elevation looking south shows laid up stone abutments.

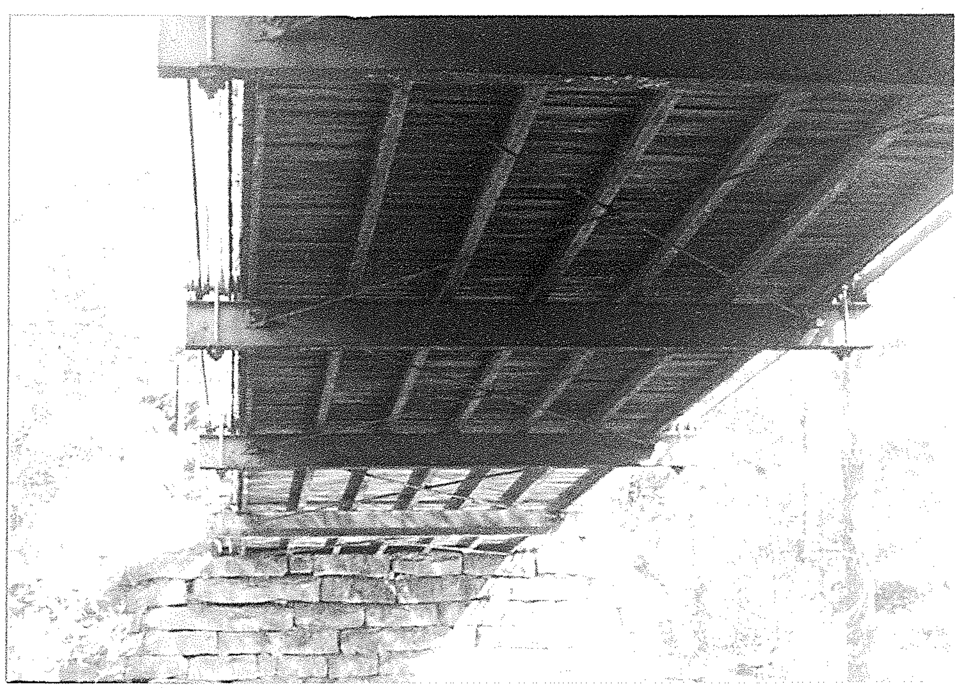


Beginning roadway approach looking east on connecting road.

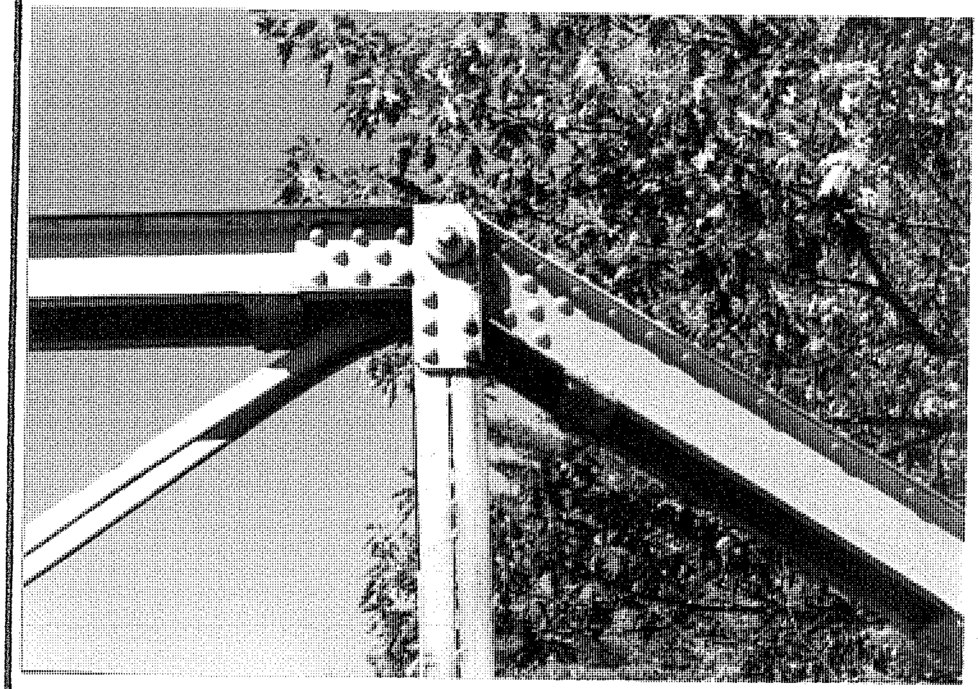
PHOTOGRAPHS
MIDDLETON BRIDGE

End roadway approach looking west on connecting road.

Underside of the deck taken from the beginning to the end.



PHOTOGRAPHS
MIDDLETON BRIDGE

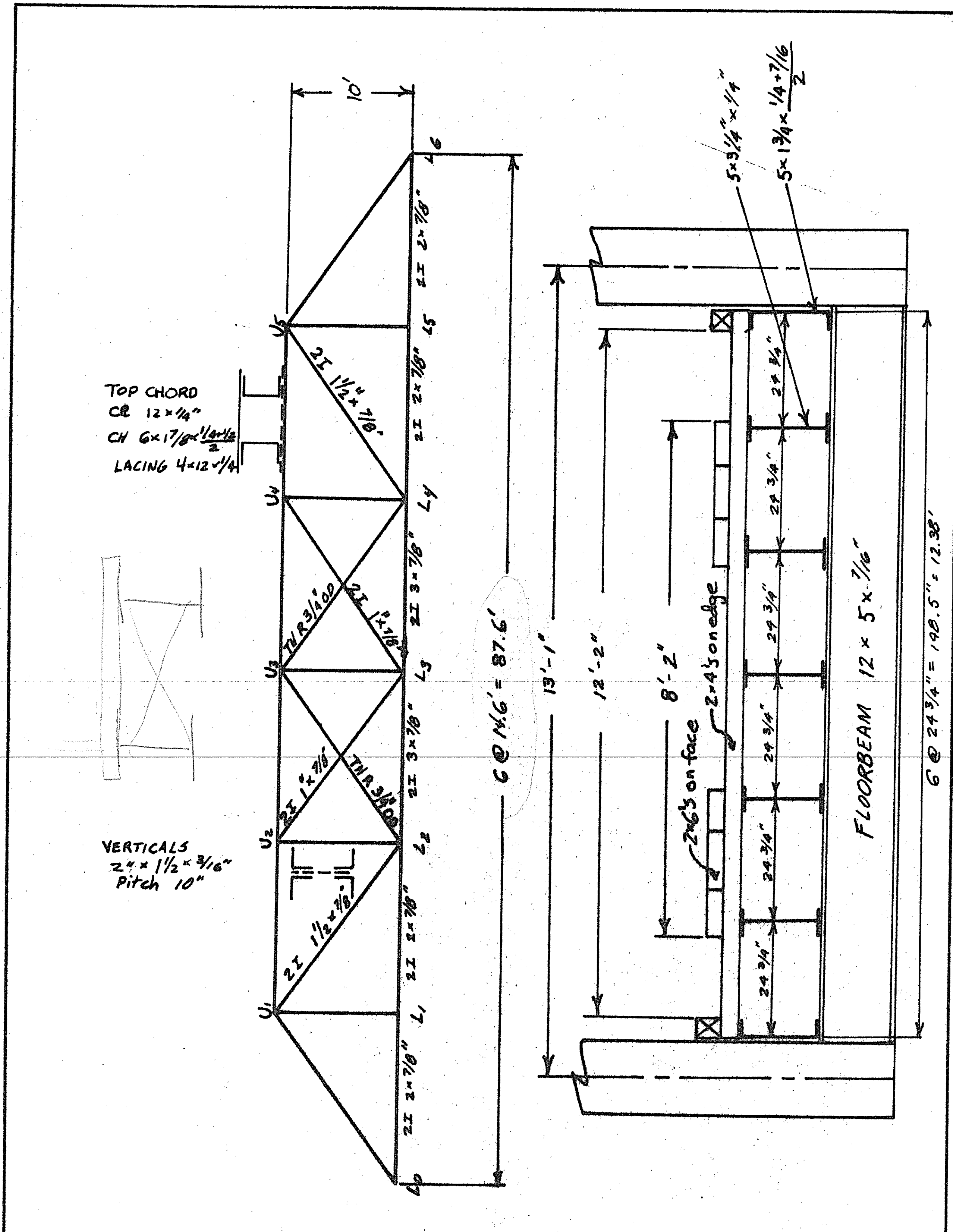


Gusset plate and pin at U_1.

Gusset plate and pin at U_2 typical of U_3 and U_4.

PHOTOGRAPHS
MIDDLETON BRIDGE

U_1L_2 showing bend in diagonal due to collision seven feet above bridge deck.



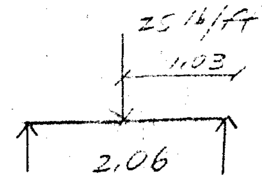
10'
TOP CHORD
CR 12 × 1/4"
CH 6 × 1 7/8 × (1/4+1/2)/2
LACING 4 × 12 × 1/4
VERTICALS
2" × 1 1/2 × 3/16"
Pitch 10"
U1
U2
U3
U4
U5
L0
L1
L2
L3
L4
L5
L6
2I 2 × 7/8"
2I 1 1/2 × 7/8"
2I 1" × 7/8"
THR 3/4 OD
2I 3 × 7/8"
6 @ 14.6' = 87.6'
13'-1"
12'-2"
8'-2"
2×4's on edge
2×6's on face
5×3 1/4" × 1/4"
5×1 3/4 × (1/4+7/16)/2
24 3/4"
FLOORBEAM 12 × 5" × 7/16"
6 @ 24 3/4" = 198.5" = 12.38'

DECK

$50\ lb/ft^3 \times 4\ in \times \frac{1\ ft}{12\ in} = 16.67$

$50\ lb/ft^3 \times 2\ in \times 1/12 = \underline{8.33}$

$25\ lb/ft^2$



spacing between stringers = 2.06 ft

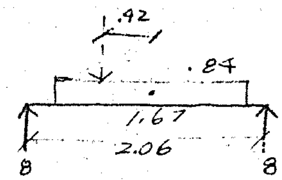
$DLM = \frac{25.0 \times 2.06^2}{10} = 10.61 \times 1.25 = 13.3$

ASSUME POINT LOAD

H_{20} - Distribution in accordance with AASHTO 1.3.4.

$LLM = 8 \times 1.03 - 8 \times .42 = 4.88$

$S = \frac{15 \times 3.75^2}{6} = 35.1 \qquad f_{act.} = \frac{4.89 \times 12}{35.1} = 1.67$

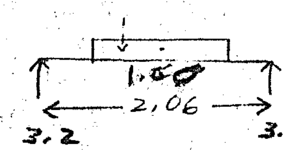


$f_{all.} = 1.25$

$LL.\ cap. = 1.25 - \frac{.013 \times 12}{35.1} = 1.24$

$m = \frac{1.24 \times 35.1}{12} = 3.63$

Try H12



$LLM = 4.8 \times 1.03 - 4.8 \times .25 = 3.74$

Okay

STRINGERS

Span - 14.6'

$LLM = \frac{16\ lb/ft \times 1.3 \times 14.6\ ft}{4} \times \frac{2.06}{4} = 39.1$

$DLM = 25 \times 2.06 = 51.5$

STEEL = 10

$\frac{.0615 \times 14.6^2}{8} = 1.64$

40.7

$f = \frac{40.7 \times 12}{4.95} = 98.76 > 16$

$DL\ f = \frac{1.64 \times 12}{4.95} = 3.98$ (14)

10.02

$LLM\ cap = \frac{10.02 \times 4.13}{12} = 4.96$

$Hs_{20}\ rating = \frac{4.13}{39.1} \times 20 = 2.1$

Assume 2 stringer support of wheel load

$LLM = \frac{16 \times 1.3 \times 14.6}{4} = \frac{76}{2} = 38.0$

$Hs_{20}\ rating = \frac{4.13}{38} \times 20 = 2.2$

BL 10/74

✓ JR 10/74

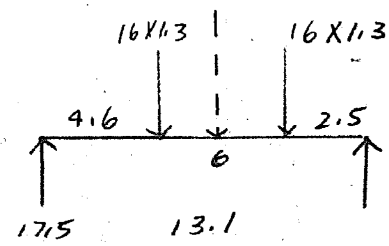
MIDDLETON BRIDGE
PANEL DEAD LOAD

DECK - $50\ ^{lb}/ft^3 \times 14.6ft \times (18in \times 1/12)2 \times 2in \times 1/12$	= 365
$50\ ^{lb}/ft^3 \times 14.6ft \times 12.38ft \times 4in \times \frac{1}{12}$	= 3012.47
STRINGERS - $6 \times 14.6 \times 10\ ^{\#}/ft$	= 876.0
TRUSS - TC $7.8in^2 \times 3.403 \times 14.6 \times 2$	= 775.07
verticals $.621in^2 \times 4 \times 3.403 \times 2 \times 10ft$	= 169.6
diagonals $[2(7/8\ in^2) \times 3.403 + .44in^2 \times 3.403]\ 17.7ft \times 2$	= 263.82
I-bar $2(2.63in^2) \times 3.403 \times 14.6 \times 2$	= 522.67
FLOORBEAM - $31.7\ ^{lb}/ft \times 13.1ft$	= 415.3
	$\frac{6.4}{2} = 3.2\ ^{k}/pan$

FLOORBEAM

$$DLM = 4.67 \times \frac{13.1}{8} = 7.65$$

$$DLf = \frac{7.65 \times 12}{34.9} = 2.6$$



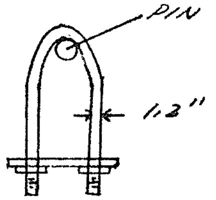
$$R = \frac{32 \times 1.3 \times 5.5}{13.1} = 1$$

$$f = \frac{80.5 \times 12}{34.9} = 27.7$$

$$m = 17.5 \times 4.6 = 80.$$

$$HS_{20}\,rating = \frac{14 - 2.6}{27.7} \times 20 = 8.2$$

U-BARS



PIN

BEARING - $2.5 \times 1.2 \times .8 \times 25 = 60$

Shearing - $\pi\left(\frac{2.5}{2}\right)^2 \times .4 \times 14 = 27.5$

Bolts

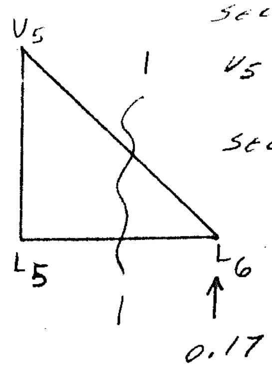
Tension - $\pi\left(\frac{1.2}{2}\right)^2 \times 13.5 = 15.3\ ^{k}/bolt \times 2 = 30.5K$

$$HS_{20}\,rating = 60 - \frac{3.35}{2} = \frac{58.3}{41.6} \times 20 = 28$$

BL 10/79

✓ JR 10/79

MIDDLETON BRIDGE
TRUSS ANALYSIS
LOAD PT. 1



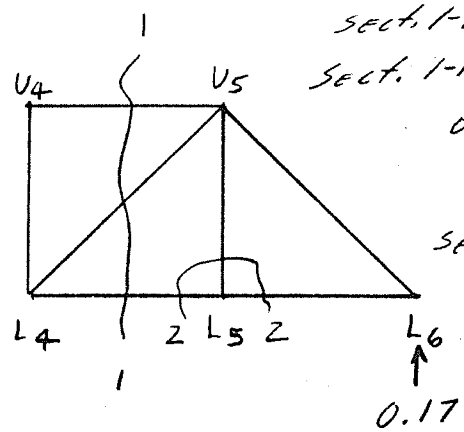
Sect. 1-1 $V = 0.17$

$U_5L_6 = \frac{0.17 \times 17.7}{10} = -0.30$

Sect. 1-1 ΣM about U_5

$0.17 \times 14.6 = L_5L_6 \times 10$

$L_5L_6 = 0.25$



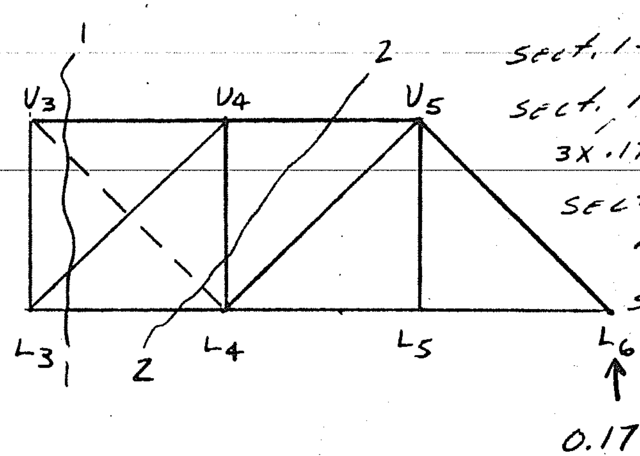
Sect. 1-1 $V = 0.17$ $L_4U_5 = \frac{0.17 \times 17.7}{10} = 0.30$

Sect. 1-1 ΣM about L_4

$0.17 \times 14.6 \times 2 = U_4U_5 \times 10$ $U_4U_5 = -0.50$

Sect. 2-2 $L_4L_5 = L_5L_6 = 0.25$

$U_5L_5 = 0$



Sect. 1-1 $V = 0.17$ $L_3U_4 = \frac{0.17 \times 17.7}{10} = 0.30$

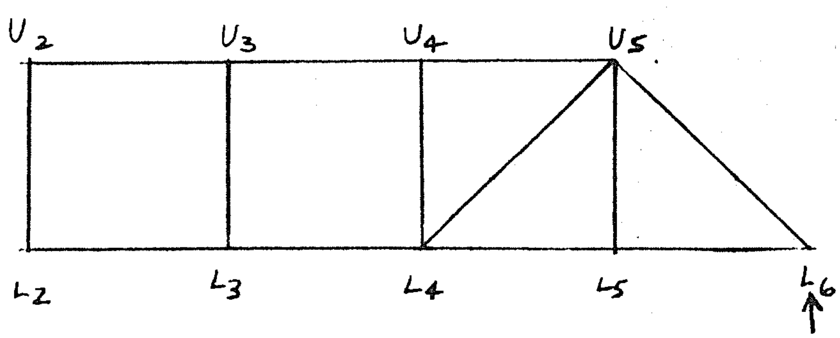
Sect. 1-1 ΣM about L_3

$3 \times .17 \times 14.6 = U_3U_4 \times 10$ $U_3U_4 = -0.75$

Sect. 1-1 ΣM about U_4

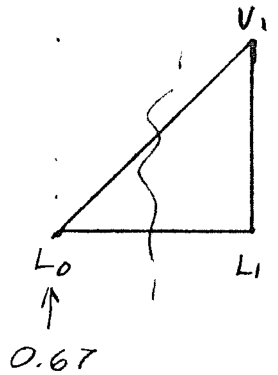
$.17 \times 14.6 \times 2 = L_3L_4 \times 10$ $L_3L_4 = 0.5$

Sect. 2-2 $V = 0.17$ $U_4L_4 = -0.17$



BL 11/74
JR 11/74

MIDDLETON BRIDGE
TRUSS ANALYSIS
LOAD PT. 2

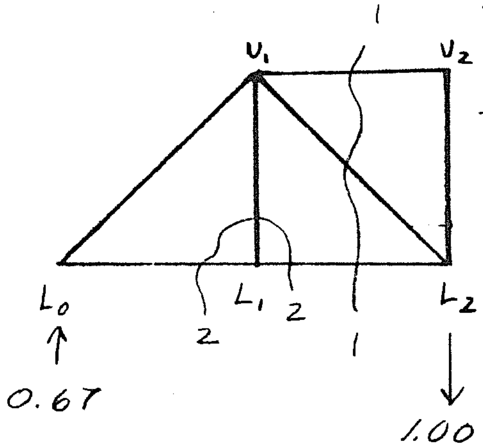


Sect. 1-1 $V = .67$

$L_0U_1 = \frac{0.67 \times 17.7}{10} = -1.19$

Sect. 1-1 $\Sigma M_{about}\ U_1$

$0.67 \times 14.6 = 10 \times L_0L_1$ $\quad L_0L_1 = 0.98$



Sect. 1-1 $V = 0.67$ $\quad U_1L_2 = \frac{0.67 \times 17.7}{10} = 1.19$

Sect. 1-1 $\Sigma M_{about}\ U_1$

$0.67 \times 14.6 = 10 \times L_1L_2$ $\quad L_1L_2 = 0.98$

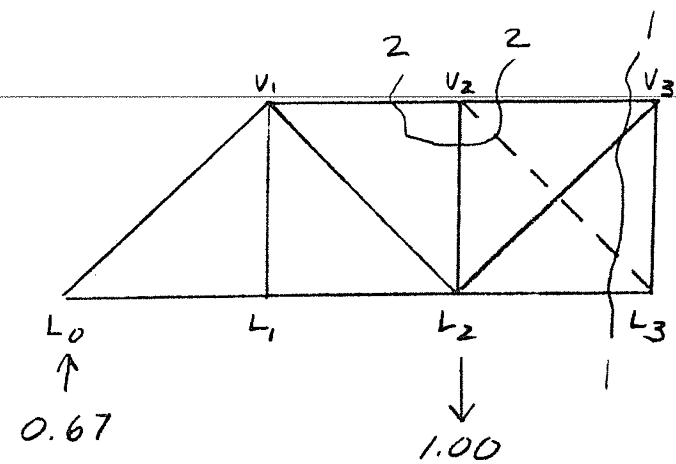
Sect. 1-1 $\Sigma M_{about}\ L_2$

$.67 \times 2 \times 14.6 = U_1U_2 \times 10$ $\quad U_1U_2 = -1.96$

Sect. 2-2 $U_1L_1 = 0$

Sect. 1-1 $V = 0.67 - 1 = -0.33$

$L_2U_3 = \frac{0.33 \times 17.7}{10} = 0.58$



Sect. 1-1 $\Sigma M_{about}\ U_3$

$0.67 \times 3 \times 14.6 = 1 \times 14.6 \times 1 + L_2L_3 \times 10$

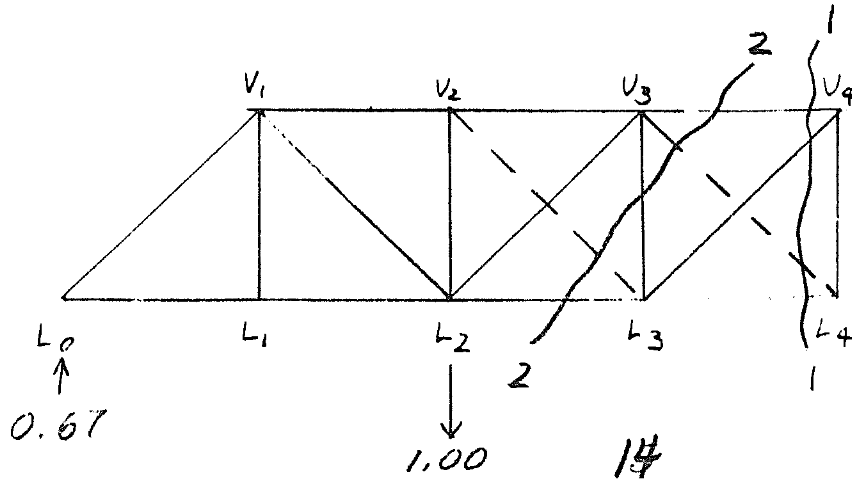
$L_2L_3 = 1.47$

Sect. 1-1 $\Sigma M_{about}\ L_2$

$0.67 \times 14.6 \times 2 = U_2U_3 \times 10$

$U_2U_3 = -1.96$

Sect. 2-2 $U_2L_2 = 0$



Sect. 1-1 $V = 0.67 - 1 = -0.33$

$L_3U_4 = \frac{0.33 \times 17.7}{10} = 0.58$

Sect. 1-1 $\Sigma M_{about}\ U_4$

$1 \times 2 \times 14.6 + L_3L_4 \times 10 = .67 \times 4 \times 14.6$

$L_3L_4 = 0.99$

Sect. 1-1 $\Sigma M_{about}\ L_3$

$0.67 \times 14.6 \times 3 = 1 \times 14.6 \times 1 + U_3U_4 \times$

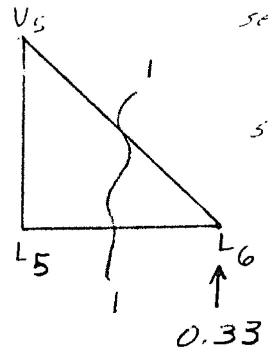
$U_3U_4 = -1.47$

Sect. 2-2 $V = 0.67 - 1 = .33$

$U_3L_3 = -0.33$

BL 7..
✓ DR ../..

MIDDLETON BRIDGE
TRUSS ANALYSIS
LOAD PT. 2

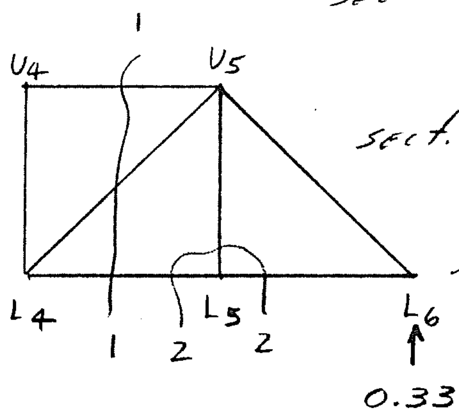


sect. 1-1 $V = 0.33$

$U_5L_6 = \frac{0.33 \times 17.7}{10} = -0.58$

sect. 1-1 $\Sigma M_{about\ U_5}$

$0.33 \times 14.6 = 10\, L_5L_6$ $L_5L_6 = 0.48$



sect. 1-1 $V = 0.33$

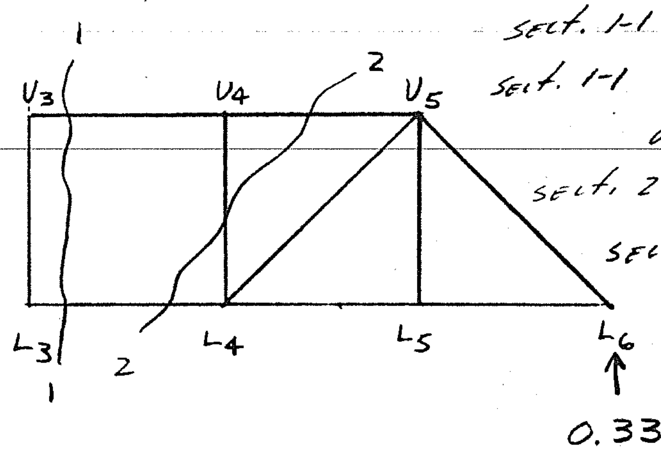
$L_4U_5 = \frac{0.33 \times 17.7}{10} = 0.58$

sect. 1-1 $\Sigma M_{about\ L_4}$

$0.33 \times 14.6 \times 2 = U_5U_4 \times 10$ $U_4U_5 = -0.96$

sect. 2-2 $L_4L_5 = L_5L_6 = 0.48$

sect. 2-2 $U_5L_3 = 0$



sect. 1-1 $V = 0.33$ $L_3V_4 = \frac{17.7 \times .33}{10} = 0.58$

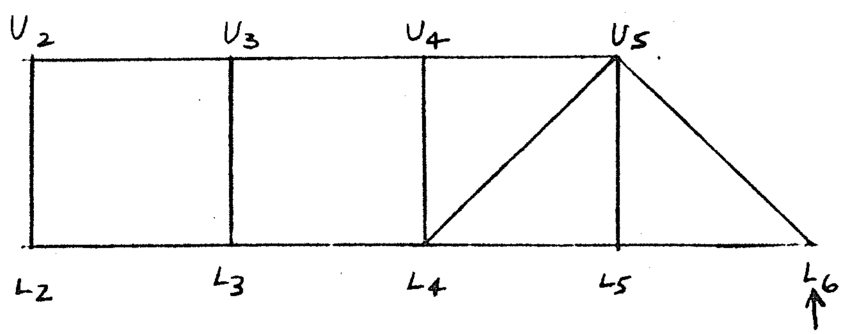
sect. 1-1 $\Sigma M_{about\ L_3}$

$0.33 \times 3 \times 14.6 = 10\, U_3U_4$ $U_3U_4 = -$ ~~1.96~~ 1.47

sect. 2-2 $V = 0.33$ $U_4L_4 = -0.33$

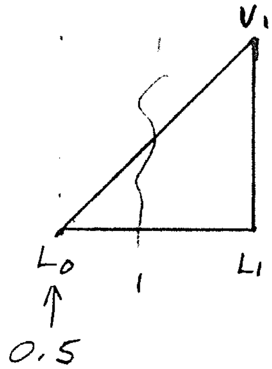
sect. 1-1 $\Sigma M_{about\ U_4}$

$0.33 \times 2 \times 14.6 = L_3L_4\, 10$ $L_3L_4 = 0.96$



BL 11/79
✓ BR 11/79

MIDDLETON BRIDGE
TRUSS ANALYSIS
LOAD PT. 3



SECT. 1-1 V = .5

$L_0U_1 = \frac{0.5 \times 17.7}{10} = -0.89$

SECT 1-1 ΣM about U_1

$0.5 \times 14.6 = L_0L_1 \times 10$ $L_0L_1 = 0.73$

SECT. 1-1 V = 0.5 $U_1L_2 = 0.89$

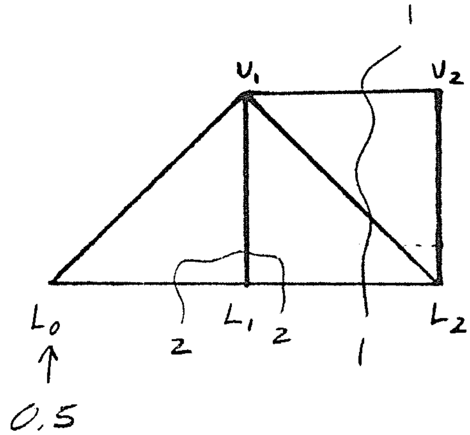
SECT 1-1 ΣM about U_1

$0.5 \times 14.6 = L_1L_2 \times 10$ $L_1L_2 = 0.73$

SECT. 2-2 $U_1L_1 = 0$

SECT. 1-1 ΣM about L_2

$0.5 \times 2 \times 14.6 = 10\ U_1U_2$ $U_1U_2 = -1.46$



SECT. 1-1 V = .5 $U_2L_3 = 0.89$

SECT. 1-1 ΣM about L_3

$0.5 \times 3 \times 14.6 = U_3U_2 \times 10$ $U_3U_2 = -2.1$

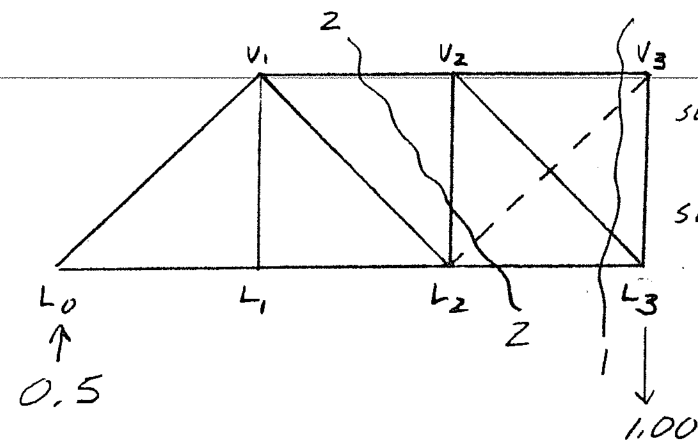
SECT 1-1 ΣM about U_2

$L_2L_3\ 10 = 0.5 \times 2 \times 14.6$ $L_2L_3 = 1.46$

SECT. 2-2 ΣM about L_3

$0.5 \times 14.6 \times 3 = 14.6 \times U_2L_2 + 10 \times 1.46$

$U_2L_2 = -0.5$



SECT. 1-1 V = 0.5 − 1 = −0.5

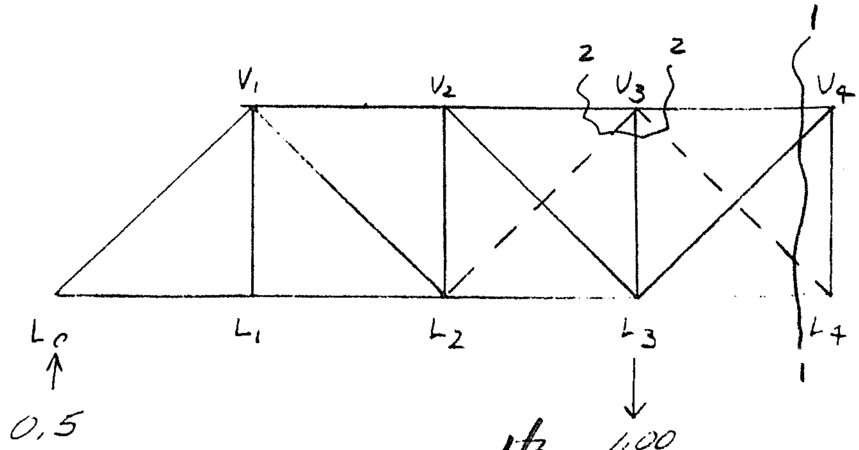
$L_3U_4 = \frac{0.5 \times 17.7}{10} = 0.89$

SECT. 1-1 ΣM about U_4

$0.5 \times 14.6 \times 4 = 1 \times 14.6 + 10\ L_3L_4$

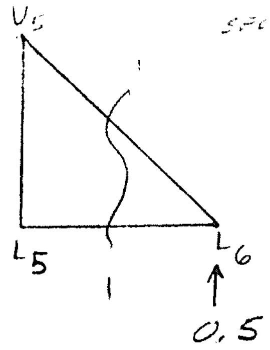
$L_3L_4 = 1.46$

SECT. 2-2 $U_3L_3 = 0$



BL 10/77

✓ JR 10/77

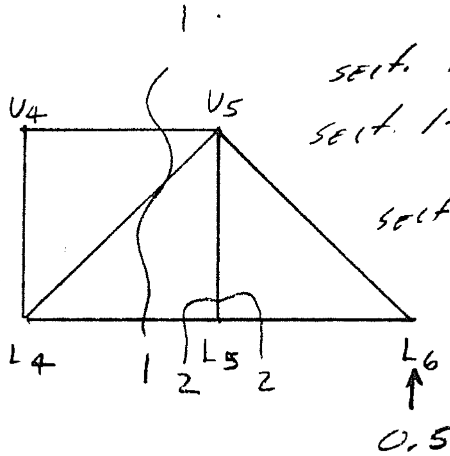


sect. 1-1 V = 0.5

$U_5L_6 = \frac{0.5 \times 17.7}{10} = -0.89$

sect. 1-1 $\Sigma M_{about\ U_5}$ $10 L_5L_6 = 0.5 \times 14.6$

$L_5L_6 = 0.73$



sect. 1-1 V = 0.5 $U_5L_4 = 0.89$

sect. 1-1 ΣM about U_5 $10 L_4L_5 = 0.5 \times 14.6$

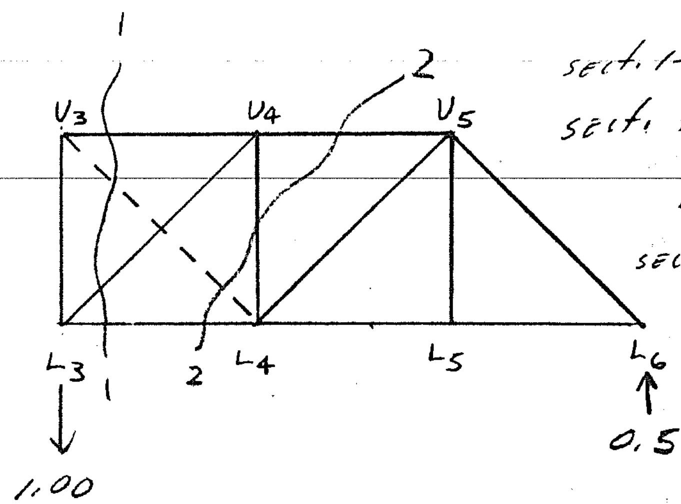
$L_4L_5 = 0.73$

sect. 2-2 $L_5U_5 = 0$

sect. 1-1 ΣM_{about} L_4

$U_4U_5 \times 10 = 0.5 \times 2 \times 14.6$

$U_4U_5 = -1.46$



sect. 1-1 V = 0.5 $U_4L_3 = 0.89$

sect. 1-1 ΣM_{about} L_3

$10\ U_3U_4 = 0.5 \times 14.6 \times 3$ $U_3U_4 = -2.19$

sect. 1-1 ΣM_{about} U_4

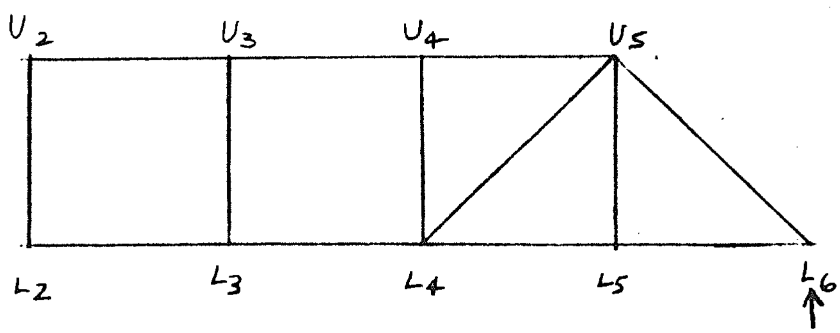
$10\ L_3L_4 = 14.6 \times .5 \times 2$

$L_3L_4 = 1.46$

sect. 2-2 ΣM_{about} U_5

$0.5 \times 14.6 = 14.6\ U_4L_4 + 10(1.46)$

$U_4L_4 = -0.5$



BL 11/79
✓ JR 11/79

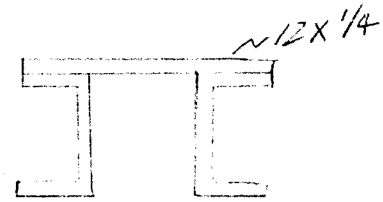
MIDDLETON BRIDGE

INFLUENCE MATRIX

LOAD PT.	1	2	3	4	5	ALL
MEMBER						
$L_0 L_1$	1.21	0.98	0.73	0.48	0.25	3.65
$L_1 L_2$	1.21	0.98	0.73	0.48	0.25	3.65
$L_2 L_3$	0.72	1.47	1.46	0.99	0.50	5.14
$L_3 L_4$	0.50	0.99	1.46	1.47	0.72	5.14
$L_4 L_5$	0.25	0.48	0.73	0.98	1.21	3.65
$L_5 L_6$	0.25	0.48	0.73	0.98	1.21	3.65
$L_0 U_1$	-1.47	-1.19	-0.89	-0.58	-0.30	-4.43
$U_1 U_2$	-0.96	-1.96	-1.46	-0.96	-0.50	-5.84
$U_2 U_3$	-0.96	-1.96	-2.19	-1.47	-0.75	-7.33
$U_3 U_4$	-0.75	-1.47	-2.19	-1.96	-0.96	-7.33
$U_4 U_5$	-0.50	-0.96	-1.46	-1.96	-0.96	-5.84
$U_5 L_6$	-0.30	-0.58	-0.89	-1.19	-1.47	-4.43
$U_1 L_1$	1.00	0	0	0	0	1.00
$U_2 L_2$	0	0	-0.5	-0.33	-0.17	-1.00
$U_3 L_3$	-0.17	-0.33	0	-0.33	-0.17	-1.00
$U_4 L_4$	-0.17	-0.33	-0.50	0	0	-1.00
$U_5 L_5$	0	0	0	0	1.00	1.00
$U_1 L_2$	-0.30	1.19	0.89	0.58	0.30	2.66
$U_2 L_3$	0	0	0.89	0.58	0.30	1.77
$U_3 L_2$	0.30	0.58	0	0	0	0.88
$U_3 L_4$	0	0	0	0.58	0.30	0.88
$L_3 U_4$	0.30	0.58	0.89	0	0	1.77
$L_4 U_5$	0.30	0.58	0.89	1.19	-0.30	2.66

BL 10/79
✓ JR 10/79

L₀U₁



⊏ 6 X 8.2
$A = 2.4$
$I_x = 13.1$
$x = 0.512$

X-X

A	d	m	y	Ay^2
3	.125 =	.38	1.92	11.06
2.4	3.25 =	7.8	1.2	3.46
2.4	3.25 =	7.8	1.2	3.46
7.8		15.98		17.97
				26.2
				44.17

$\frac{15.98}{7.8} = 2.05$

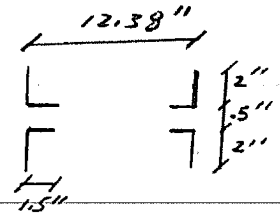
$r = \sqrt{\frac{44.17}{7.8}} = 2.38$

$f_a = 12260 - .28\left(\frac{17.7 \times 12}{2.38}\right)^2 = 10.0$

$U_1 - U_5$

$f_a = 12260 - .28\left(\frac{14.6 \times 12}{2.38}\right)^2 = 10.7$

$U_2 L_2$



2 X 1.5 X 3/16
$y = .641$
$.641 + .25 = .891$
$A = .621$

X-X

C.G. = 2.25 $\quad 4 \times .621 \times .891^2 = 1.97$

$I_x = .248 \times 4 = \underline{.99}$

2.96

$r = \sqrt{\frac{2.96}{2.48}} = 1.09$

$f_a = 12260 - .28\left(\frac{10 \times 12}{1.09}\right)^2 = 8.9$

$U_3 L_3$

$f_a = 8.9$

BL 1/79

VGR 1/79

PANEL LOAD CAPACITY

L.L. = 3.2 k/panel

Member	Area	Capacity	D.L.	L.L. Cap.	Max. Unif. Load	Max. Conc. Load
L_0L_1	3.50	49.00	11.7	37.3	10.2	30.8
L_1L_2	3.50	49.00	11.7	37.3	10.2	30.8
L_2L_3	5.25	73.5	16.5	57.0	11.1	38.9
U_1L_1	1.73	24.2	3.2	21.0	21.0	21.0
U_1L_2	2.63	36.8	8.5	28.3	10.6	23.8
U_2L_3	1.75	24.5	5.7	18.8	10.6	21.1
U_3L_2	0.44	6.2	0	6.2	7.0	10.7
L_0U_1	7.80	78.0	14.2	63.8	14.4	43.4
U_1-U_5	7.80	83.5	23.5	60.0	8.2	27.4
U_2L_2	2.48	22.1	3.2	18.9	18.9	37.8
U_3L_3	2.48	22.1	3.2	18.9	18.9	57.3

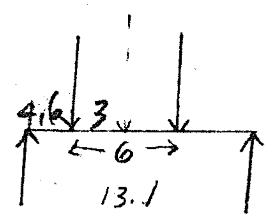
Maximum Wheel Load / Panel

ASSUME VEHICLE CANNOT MOVE MUCH OFF OF CENTER OF BRIDGE DUE TO WIDTH

Wheel – $\frac{16 \times 1.3 \times 2 \times 7.6}{13.1} = 24.1$ 20.8

Lane – $\frac{0.64 \times 14.6 \times 7.6 \times 1.3}{13.1} = 7.0$ 6.3

Conc. – $\frac{18 \times 1.3 \times 7.6}{13.1} = 13.6$ 23.4



Critical Members

U_3L_2 Wheel – $.58 \times 24.1 + .30 \times 6.0 = 15.8$ 13.6

H_{S20} rating $= \frac{6.2}{15.8} \times 20 = 7.7$ 9.1

L_1L_2 Lane – $3.65 \times 7.0 + 1.21 \times 13.6 = 42$ 64.0

BL 1/77

H_{S20} rating $= \frac{37.3}{42} \times 20 = 17.8$ 12 [illegible] 1/77

U_3L_2 Lane – $.88 \times 7.0 + .58 \times 13.6 = 14.1$ H_{S20} rating $= 8.8$

WARREN COUNTY DEPARTMENT OF PUBLIC WORKS

WARRENSBURG OFFICES
261 Main Street
Warrensburg, NY 12885
Tel. 518-623-4141
518-761-6556
FAX 518-623-2772

Superintendent's Office
Highway Division
Parks and Recreation
Airport Administration
Equipment Maintenance
Engineering
Hatchery Administration

FRED AUSTIN, P.E.
Supt. Public Works

ROGER GEBO
Dep. Supt. Public Works

MUNICIPAL CENTER OFFICES
Lake George, NY 12845

Civil Defense and Natural Disaster
Tel. 518-761-6490
Buildings and Grounds
Tel. 518-761-6494

WARREN COUNTY AIRPORT
Tel. 518-792-5995
RD#1 Box 573
Queensbury Avenue
Queensbury, NY 12804

Note: Stringers & deck replaced in 1990

8"WF25

November 2, 1989

State of New York
Dept. of Transportation
84 Holland Ave.
Albany, NY 12208

Attn: Paul W. Kuehn, Supervisor
Bridge Inventroy & Inspection Unit

RE: Safety Flag BIN 3-30515-0
County Rd. 10 to River Rd.
Over Schroon River
Warren County

Dear Mr. Kuehn:

The following repairs were completed on the above referred-to bridge on November 2, 1989:

A. Existing deck and stringers were replaced by the enclosed transverse section.
B. Existing floor beams and new stringers were painted.
C. Both abutment stems were pressure grouted.
D. Existing barrier beam was replaced on both approaches.
E. The right truss was straightened.

We will continue to post the bridge for 3 tons.

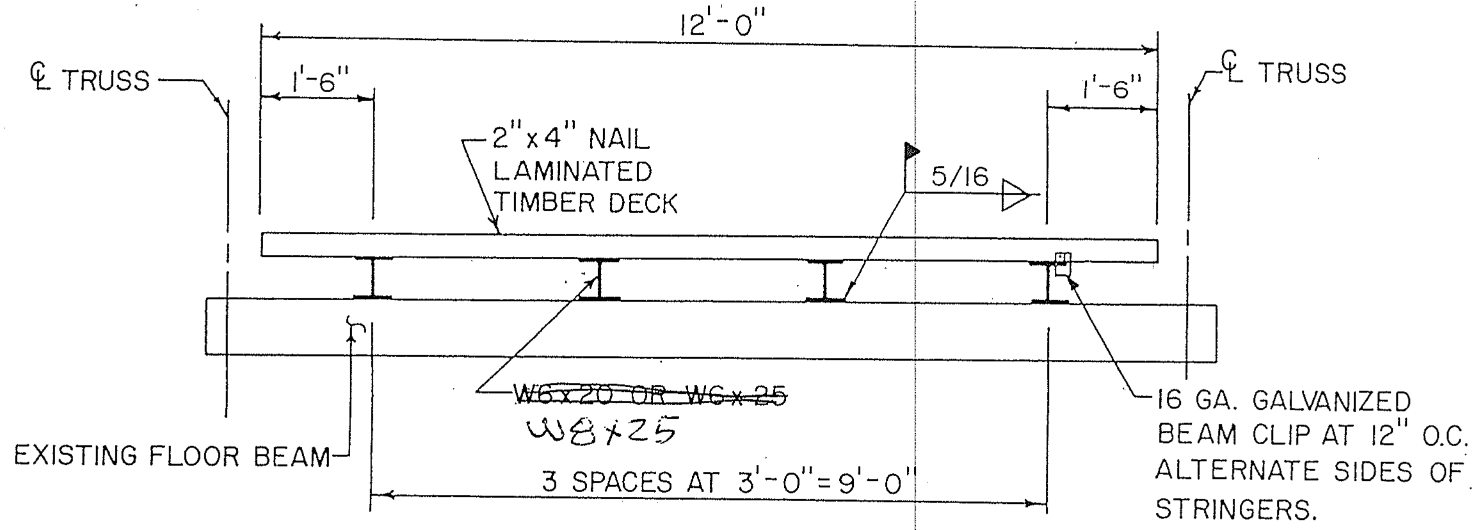
We await your inspection so that the safety flag can be removed.

Very truly yours,

Roger Gebo

Roger Gebo
Dep. Superintendent
Warren County DPW

RG:lb
encl.



TRANSVERSE SECTION

GENERAL NOTES

1. ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH NYSDOT SPECIFICATIONS DATED JANUARY 2, 1985 WITH ANY APPLICABLE ADDENDUM, UNLESS OTHERWISE NOTED.
2. LIVE LOADING: H-8
3. ALL NEW STEEL SHALL BE A588 UNLESS OTHERWISE NOTED.
4. ALL STRUCTURAL STEEL CONNECTIONS SHALL BE MADE WITH 5/16 CONTINUOUS FILLET WELD, UNLESS OTHERWISE NOTED.
5. THE TIMBER DECK SHALL BE CONSTRUCTED OF 2" x 4" NOMINAL BOARDS OF SOUTHERN YELLOW PINE, f_b=1,500 PSI, TO AWPA STANDARD C2(CCA 0.6 POUNDS/CUBIC FOOT RETENTION).

Designed For H-8 Loading, but 3 Ton Posted Loading will remain.
Completed 11/2/89
[signature]

WARREN CO. DEP. OF PUBLIC WORKS	
MIDDLETON BRIDGE	
TRANSVERSE SECTION	
SCALE: NO SCALE	DATE: JULY, 1989