Minnesota Department of Transportation (Mn/DOT)
Historic Bridge Management Plan

Bridge Number: 6679

Executive Summary

Bridge 6679 was built in 1949 to carry the vehicular traffic of Trunk Highway 76 over the South Fork of the Root River near Houston in Houston County. It has an overall structure length of 300 feet and an out-out width of 34.7 feet. It is a continuous/cantilevered, steel-beam design with three main spans, including a significant 100-foot center span and two approach spans. The reinforced-concrete railing is significant for its early use of a Modernist bi-rail design.

The concrete approach spans have marginal load capacity. The bridge deck has narrow shoulders and substandard railings. The original bridge railing is deteriorated and has been repaired in several locations. Aside from localized deterioration at the superstructure hinge locations, the rolled beams with intermittently welded cover plates are in good condition. The voids incorporated into the abutment design appear to be contributing to the settlement issues at the ends of the bridge. The river has migrated north from Span 2 to Span 3 leaving large silt deposits that are blocking the hydraulic opening in Spans 1 and 2.

The recommended future use of the bridge is rehabilitation for continued vehicular use on-site. The bridge should be rehabilitated based on the Secretary of the Interior's Standards for Rehabilitation (Standards) [36 CFR Part 67] and Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior's Standards (Guidelines).

Until the Federal Highway Administration (FHWA), State Historic Preservation Office (SHPO) and Minnesota Department of Transportation (Mn/DOT) have signed a historic bridge Programmatic Agreement, all proposed work on this bridge (including maintenance, preservation and stabilization activities) needs to be sent to the Mn/DOT Cultural Resources Unit (CRU) for formal review.

Minnesota Department of Transportation (Mn/DOT)
Historic Bridge Management Plan

Bridge Number: 6679

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Minnesota Department of Transportation (Mn/DOT)

Historic Bridge Management Plan

I - Project Introduction Bridge Number: 6679

The Minnesota Department of Transportation (Mn/DOT), in cooperation with the Minnesota State Historic Preservation Office (SHPO) and Federal Highway Administration (FHWA), has committed to preserve selected historic bridges in Minnesota that are owned by the state and managed by Mn/DOT. In consultation with SHPO and FHWA, Mn/DOT selected 24 bridges as candidates for long-term preservation. Mn/DOT's objective was to preserve the structural and historic integrity and serviceability of these bridges following the Secretary of the Interior's Standards for the Treatment of Historic Properties (Standards) [36 CFR Part 68], and their adaptation for historic bridges by the Virginia Transportation Research Council as Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior's Standards (Guidelines). The character-defining features of each bridge received special attention. Mn/DOT also hopes to encourage other owners of historic bridges to follow its model for preservation.

The Glossary in the Appendix explains historic preservation terms used in this plan, such as historic integrity and character-defining features, and engineering terms, such as serviceability and deficiency.

Mn/DOT's ongoing efforts to manage historic bridges are intended to comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and Section 4(f) of the U.S. Department of Transportation Act of 1966. This effort began with Robert M. Frame's 1985 study and list of significant and endangered bridges in Minnesota and incorporates Jeffrey A. Hess's 1995 survey and inventory of historic bridges in Minnesota that were built before 1956. That inventory identified the subject bridge as eligible for listing in the National Register of Historic Places. Using the results of the 1995 study, Mn/DOT selected individual historic bridges for long-term preservation.

To achieve its preservation objectives, Mn/DOT retained the consultant team of Mead & Hunt and HNTB to develop management plans for 22 of the 24 selected bridges. The remaining two bridges have been addressed through separate projects.

Mn/DOT requested that the team consider a full range of options for each bridge and present the option that the team judged to be best for long-term preservation with due consideration given to transportation needs and reasonable costs. For example, if two options are explored that both result in an equivalent level of preservation for the bridge (e.g., retention of historically significant features and projected life span), but one option costs significantly more than the other, the less costly option will be recommended. In cases where one option results in a significantly better level of preservation than any other reasonable options but costs more, it will be the recommended action.

Preservation objectives call for conservation of as much of the existing historic fabric of the bridge as possible. However, safety, performance and practical considerations may have dictated replacement of historic fabric, especially of a minor feature, if such action improved the overall life expectancy of a bridge.

Options that were considered for the 22 historic bridges, listed from most to least preferred, are:
1. Rehabilitation for continued vehicular use on-site
2. Rehabilitation for less-demanding use on-site, such as one-way vehicular or pedestrian/bicycle traffic
3. Relocation and rehabilitation for less-demanding use
4. Closure and stabilization following construction of bypass structure
5. Partial reconstruction while preserving substantial historic fabric

A recommended option was selected for each bridge through consultation among the consultant team, Mn/DOT and SHPO. Within the recommended option, the plan identifies stabilization, preservation and maintenance activities. Stabilization activities address immediate needs in order to maintain a bridge's structural and historic integrity and serviceability. Preservation activities are near-term or long-term steps that need to be taken to maintain a bridge's structural and historic integrity and serviceability for the foreseeable future. Preservation activities may include rehabilitation and replacement of components, as

needed, and remedial activities to address a deficiency. Maintenance activities, along with regular structural inspections and anticipated bridge component replacement activities, are routine practices directed toward continued serviceability. Mn/DOT is responsible for final decisions concerning activities recommended in the plan.

Recommendations are intended to be consistent with the Standards. The Standards are ten basic principles created to help preserve the distinctive character of a historic property and its site, while allowing for reasonable change to meet new needs. They recommend repairing, rather than replacing, deteriorated features when possible. The Standards were developed to apply to historic properties of all periods, styles, types, materials, and sizes. They also encompass the property's site and environment as well as attached, adjacent, or related new construction.

Because the Standards cannot be easily applied to historic bridges, the Virginia Transportation Research Council prepared Guidelines, which adapted the Standards to address the special requirements of historic bridges. The Guidelines, published in the Council's 2001 Final Report: A Management Plan for Historic Bridges in Virginia, provide useful direction for undertaking historic bridge preservation and are included in the Appendix to this plan.

The individual bridge management plan draws from several existing data sources including: PONTIS, a bridge management system used by the Mn/DOT Bridge Office to manage its inventory of bridges statewide; the current Mn/DOT Structure Inventory Report and Mn/DOT Bridge Inspection Report for each bridge (the complete reports are included in the Appendix); database and inventory forms resulting from the 1995 statewide historic bridge inventory; past maintenance reports (if available, copy included in the Appendix); and other information provided by Mn/DOT. Because PONTIS uses System International (metric) units, data extracted from PONTIS are displayed in metric units.

The plan is based on information obtained from Mn/DOT in 2005, limited field examinations completed in 2005 for the purpose of making a qualitative assessment of the condition of the bridge, and current bridge design standards. Design exceptions are recommended where appropriate based on safety and traffic volume. The condition of a bridge and applicable design standards may change prior to plan implementation.

This plan includes a maintenance implementation summary at the end. This summary can be provided as a separate, stand-alone document for use by maintenance staff responsible for the bridge.

The plan for this individual bridge is part of a comprehensive effort led by Mn/DOT to manage the statewide population of historic bridges. The products of this management effort include:
1. Minnesota Historic Bridge Management Plan
2. Individual management plans for 22 bridges
3. National Register of Historic Places (NRHP) nomination forms for 2 bridges
4. Minnesota Historical Property Record (MHPR) documentation for 46 bridges

The first product, the Minnesota Historic Bridge Management Plan, is a general statewide management plan for historic bridges in Minnesota that are owned by the state, local governments or private parties. It is intended to be a single-source planning tool that will help bridge owners make management and preservation decisions relating to historic bridges. Approximately 240 historic bridges owned by parties other than Mn/DOT survive in the state as of 2005. Mn/DOT is developing this product to encourage owners of historic bridges to commit to their long-term preservation and offer guidance.

This individual plan represents the second product. The third and fourth products will be prepared as stand-alone documents.

Date of Construction	1949
SHPO Inventory Number	HU-BRT-005
Common Name (if any)	6679

Location

Feature Carried:	TH 76		
Feature Crossed:	S. Fork of Root River		
Descriptive Location:	2.8 Miles South of W. Jct. TH 16		
UTM Zone:	15	NAD:	1927
Easting:	615555	Northing:	4843811
USGS Quad Name:	Sheldon		
Town or City:	Brownsville Township		
County:	Houston		

Structure Data

Main Span Type:	402	Steel Continuous	Stringer	Total Length:	300

Descriptive Information (or narrative as available)

Superstructure:	3-span, steel, continuous/cantilevered, rolled, I-beam stringer
Substructure:	concrete U-abutments; concrete solid piers
Floor/Deck:	concrete deck carried by 6 rolled I-beam stringers with channel bridging
Other Features:	railings: concrete bi-rail with concrete posts; rocker-type expansion bearings; cover plates welded to bottom of stringers; bridge plates: on southeast railing endpost ("Minnesota Highway Depart Bridge No. 6679"), on southwest railing endpost ("Fed. Aid Proj. FAS 46-2 Minn. 1949")
Narrative:	

Roadway Function:	Mainline
Ownership:	State
Custodian/Maint. Agency:	State

Contractor Leon Joyce, Rochester, Minnesota

Designer/Engineer Minnesota Highway Department

Significance Statement

Carrying Minnesota Trunk Highway 76 over the South Fork of the Root River, Bridge No. 6679 stands in a rural area about two miles south of the city of Houston in central Houston County. Supported by concrete U-abutments and concrete solid piers, the three-span superstructure consists of six lines of continuous/cantilevered, 36-inch-deep, rolled, I-beam stringers, laterally braced by channel-section bridging and stiffened by steel plates welded to their flanges. The structure's span profile is 80-100-80 feet. The main span includes a 65-foot suspended section pinned, at each end, to cantilever arms extending over the piers. The stringer system supports a bituminous-surfaced concrete deck, with a 30-foot-wide roadway between bi-rail concrete railings. The bridge has rocker-type expansion bearings. Metal plaques on the railing endposts identify the construction date as 1949.

With the conclusion of World War II, the Minnesota Highway Department resumed its legislatively mandated task of designing and constructing the state's trunk highway system. A high priority was to build several new routes designated by the legislature in 1933, but left unimproved for lack of funding during the Depression. These new routes included a section of graveled road designated as Trunk Highway 76, which traveled north-south through the center of Houston County. As part of the route's realignment and improvement, the highway department in 1947 completed site survey work for Bridge No. 6679, a new crossing of the South Fork of the Root River, about two miles south of the city of Houston. After completing plans for the structure in May 1948, the highway department a few months later awarded a low-bid contract for its construction, in the amount of $117,840, to contractor Leon Joyce of Rochester, Minnesota. Joyce began work in August, and had much of the concrete substructure in place by the fall of 1948, but the project was then delayed by steel shortages. In January 1949, the Illinois Steel Bridge Company of Jacksonville, Illinois, which was handling the fabrication work for Joyce, informed the highway department that "we do not expect to receive the structural steel for this job from the mills until April or May unless there is an easing up of the critical steel situation." The company's prognosis was optimistic, for it was not until the following July that fabrication got under way. According to a maintenance card on file with the Minnesota Department of Transportation, the contractor finally completed the superstructure in November 1949.

Bridge No. 6679 marked the emergence of a new type of bridge engineering in Minnesota, known as continuous/cantilevered steel-beam construction. On a national level, the type was introduced in the late 1920s by the Georgia State Highway Board, and it was strongly advocated in the 1930s by the Nebraska Department of Roads. The type's popularity partly resulted from the appearance on the market of new deep-section I-beams, with a maximum web depth of 36 inches. Even in simply supported spans, the new beams were suitable for clear openings up to 75 feet, which made them competitive with pony trusses. When used in continuous construction, which reduced stresses in load-bearing members, the new beams were feasible for clear spans exceeding 100 feet. Although continuous construction generally required unyielding foundations, engineers were able to apply the new I-beam technology to sites that might experience some foundation settlement by inserting a pinned suspended section into the main span, which allowed the superstructure to compensate for substructure movement. Technically, the resulting structure was of continuous/cantilever design -- since the suspended span was pinned to cantilever arms that were continuous over the piers.

The Minnesota Highway Department first experimented with continuous/cantilevered design in 1939 in the construction of an overhead grade separation in St. Paul (Bridge No. 5664). Although this structure was

well adapted to its site, it was a relatively modest piece of engineering, achieving a clear main span of only 66 feet. In Bridge No. 6679, however, the state highway department used continuous/cantilevered design for a 100-foot main span, which was, by twenty feet, the longest steel-stringer span yet built in Minnesota. Honored by a photograph in the highway department's biennial report for 1948-1950, Bridge No. 6679 was the prototype for at least ten other steel-stringer bridges, but none equalled its main span length of 100 feet. When the City of St. Paul Engineer's Office surpassed the 100-foot mark in 1954, it did so through the use of light-weight speciality steel (Bridge No. 90396).

As Minnesota's best example of continuous/cantilevered steel-stringer design, Bridge No. 6679 is eligible for the National Register in the area of engineering under Criterion C, within the historic context of "Historic Iron and Steel Bridges in Minnesota." The survey sample upon which this context was based did not include any steel-stringer examples. Consequently, the Registration Criteria outlined in the Multiple Property Documentation Form (MPDF) associated with this context do not specifically address such properties. However, in its general discussion of eligibility requirements, the MPDF does state that bridges may be eligible under Criterion C if "they embody distinctive characteristics of bridge engineering." Bridge No. 6679 satisfies this criterion.

Bridge No. 6679 is also eligible, under Criterion C, for the Modernist design of its bi-rail concrete railings. Although the Minnesota Highway Department prided itself on its bridge engineering, the agency was far less concerned with bridge aesthetics. As Chief Bridge Engineer M.J. Hoffman observed in 1931: "The engineer in general and the bridge engineer in particular have been very frequently criticized for the lack of beauty or aesthetics in their structural work. . . . In public undertakings of this kind, the economical aspects usually tend to outweigh the item of aesthetics, and in numerous instances, quite properly so." For the most part, the highway department restricted its architectural treatment of bridges to railing ornamentation, adopting whatever style was in vogue at the time. During the 'teens and 'twenties, Minnesota bridge railings tended to display Classical Revival detailing, and in the 'thirties, Art Deco detailing. In the early 1940s, however, the highway department began experimenting with a clean-lined Modernist aesthetic, which, for the first time, was in advance of architectural practice in Minnesota. Because of the suspension of highway projects during World War II, the new railing design was not fully elaborated until 1946, when the highway department released a new set of standardized bridge plans for county use. These plans featured a stark, bi-rail, concrete railing with simple rectangular posts. Without any of the usual ornamental devices -- reveals, setbacks, projections, or applied surface detailing -- the railing relied solely on its structural form for its bold and handsome aesthetic statement. In the best Modernist tradition, state bridge engineer E.J. Miller explained that in the new design "simplicity makes for improved appearance and results in lower maintenance costs." Designed in 1948 and constructed in 1949, Bridge No. 6679 was among the first structures to employ the new Modernist railings.

Historic Context Historic Iron and Steel Bridges in Minnesota

National Register Criteria C

References

Minnesota Department of Transportation Bridge Database; Bridge No. 6679 File (inspection reports, maintenance card), in Minnesota Department of Transportation, Waters Edge Building, St. Paul; Bridge No. 6679 Storage File (plans, contract, correspondence), in Minnesota Department of Transportation Records Center, St. Paul; Searcy B. Slack, "Experience with Girder-Beam Bridges in Georgia," Engineering News-Record 107 (16 July 1931): 100-101; Josef Sorkin, "Design of Highway I-Beam Bridges," University of Nebraska Civil Engineering Thesis, 1936; "New I-Beam and Column Sections Produced by Carnegie," Engineering News-Record 98 (3 March 1927): 362-363; "Elements of the New 33-In. Rolled Structural Sections," Engineering News-Record (5 July 1928): 16; Thomas J. Misa, A Nation of

Steel (Baltimore and London: Johns Hopkins University Press, 1995), 170; Herbert W. Ferris, ed., Historical Record, Dimensions and Properties, Rolled Shapes (New York: American Institute of Steel Construction, 1954), 36-48; Historic Bridge Inventory Form for Bridge No. 5664, in State Historic Preservation Office (SHPO), Minnesota Historical Society, St. Paul; Minnesota Highway Department, Biennial Report, 1948-1950, 68; Historic Bridge Inventory Form for Bridge No. 90396, in SHPO; E.J. Miller, "Standard Bridge and Culvert Plans," Better Roads (June 1947):23-24; Fredric L. Quivik, "Iron and Steel Bridges in Minnesota," Multiple Property Documentation Form, 1988, Sec. F, 8, 19, in SHPO; field inspection by Demian Hess, 24 October 1995.

Character-Defining Features

Character-defining features are prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include materials, engineering design, and structural and decorative details.

Feature 1. Design and construction of continuous/cantilever beam superstructure. At the time of completion in 1949, the 100-foot center span of Bridge 6679 was the longest of its type in Minnesota and was not exceeded until 1954. This feature includes the 36-inch-deep, continuous/cantilever rolled I-beams with pinned sections.

Feature 2. Reinforced-concrete Modernist railing. This design of a reinforced-concrete bi-rail with simple rectangular concrete posts was introduced as a standard plan in 1946. Bridge 6679 was one of the state's first structures to use the new design. It was considered significant for its low maintenance cost as well as its use of unornamented structural form as an aesthetic statement in the best Modernist architectural tradition.

Inspection Date	10/11/2004	*(Inspection and inventory data in this section was provided for this project by Mn/DOT in May 2005)*
Sufficiency Rating [1]	64.9	
Operating Rating [1,2]	15.78	
Inventory Rating [1,2]	10.07	
Posted Load [1]	2	
Design Load [1]	4	
Deficiency Rating Status [1]	A	
Condition Codes		
Deck:	5	
Superstructure:	6	
Substructure:	6	
Channel and Prot.:	5	
Culvert:	N	
Appraisal Ratings		
Struct. Eval.:	5	
Deck Geometery:	5	
Underclearances:	N	
Waterway Adequacy:	9	
Appr. Alignment:	8	
Smart Flag Data [1]	☐	*(A check indicates data items are listed on the Bridge Inspection Report)*
Fracture Critical [1]	Y	
Last Inspection Date		
Waterway Data		
Scour Code [1]:	Bridge 6679 is a scour-critical bridge with a scour code of R. A Scour Action Plan is necessary for this bridge.	
Roadway Data		
ADT Total:	1700	
Truck ADT Percentage:	7	
Bypass Detour Length [2]:	38.6232	
Roadway Clearances		
Roadway Width [2]:	9.144	
Vert. Clearance Over Rdwy [2]:	99.99	
Vert. Clearance Under Rdwy [2]:		
Lat. Under Clearance Right [2]:	0	
Lat. Under Clearance Left [2]:	0	
Geometry Characteristics		
Skew:	0	
Structure Flared:	0	

[1] These items are defined in the glossary in Appendix A. [2] These items are provided in metric units.

Roadway Characteristics

Lane Widths: 12'

Number of Lanes: 2

Shoulders
Width: 4'
Paved or Unpaved: 1' bit., 3' agg.
Comments: None

Guardrail
Length: 120'
Comments: Twisted end treatments on 3 ends, BCT on one end

Vertical Curves: N/A

Horizontal Curves: N/A

Sight distance: Good

Other information:
Development plans for this section of roadway, replacement in 2010
55 mph posted speed limit, weight limits posted at 24-40-40 tons

Floodplain Data

Available data indicates that Bridge 6679 will not be inundated with a Q100 event.

Accident Data

The Mn/DOT Accident Database reports four property-damage accidents associated with this bridge for the 15-year period of 1990-2004.

Location of Plans

District 6

Existing Conditions

Available information was reviewed prior to assessing the options for preservation of Bridge 6679 and visiting the bridge site. This information is cited in the Project Introduction section of this plan. A site visit was conducted to qualitatively establish the following:

1. General condition of structural members
2. Conformation to available extant plans
3. Roadway geometry and alignment
4. Bridge geometry and clearances

Serviceability Observations:

Bridge 6679 has concrete slab spans with marginal load capacity and substandard bridge railings. Shoulder widths barely satisfy the minimum required for bridge improvements. It has a deck width of 30 feet matching the requirement for a two lane trunk highway with an ADT of 1700. The railing is deteriorated and has been repaired in several locations. Cover plates on the rolled beam superstructure are fatigue-sensitive details. Concrete approach panels are not utilized to minimize vehicular impact on the bridge. Trucks cause the bridge to bounce, vibrate, and squeak. Settlement of the approach roadway has been repaired recently with asphalt. The bridge is scour critical and is to be monitored during high flow conditions.

Structural Condition Observations:

The original concrete deck is in fair condition, with scaling, isolated spalls, and extensive repairs near the expansion joints. The expansion joints at each end of the bridge are not sealed with a gland, thus permitting roadway drainage to damage elements at the abutments. The deck rotation joints at superstructure hinge locations are corroded and leaking, leading to accelerated corrosion at the hinges. Simple drop drain pipes and small scuppers in the deck appear to be functioning properly. Aside from localized deterioration at the hinge locations, the rolled beams appear to be in good condition. Two percent of the paint system was deemed unsound by Mn/DOT inspectors. The abutments have an integral concrete slab span. The concrete slab spans are currently the controlling elements for the load rating. The abutment design incorporated a void and treated piling well above the waterline behind the backwall. The void detail (and possibly deteriorated piling) is likely contributing to the settlement issues at the ends of the bridge.

Based on observed patches, approximately half of the existing railing has been repaired. Remaining original sections of railing are deteriorated (some corrosion-related) and are assumed to be chloride laden.

Non-Structural Observations:

Large silt deposits and vegetation are blocking the hydraulic opening in Spans 1 and 2, causing the river to migrate north from Span 2 to Span 3. The piling for the abutments terminates at a higher elevation than the pier foundation piling, making the abutments more susceptible to scour than the pier foundations. Large rip rap has been placed near the north abutment to function as a scour countermeasure.

Date of Site Visit

August 2, 2005

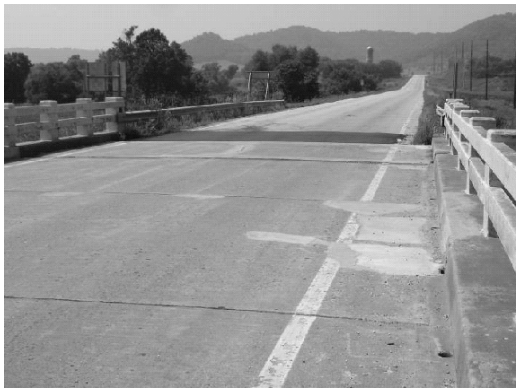

Figure 1. Asphalt repair on approach, deck repairs.

Figure 2. Tilted rocker bearing with corrosion.

Figure 3. Structural steel deterioration at an interior hinge location.

Figure 4. Typical bottom flange with a cover plate. Typical drop panels in the deck at interior joints.

Figure 5. Looking south at the east side of the bridge. The river has migrated from Span 2 to Span 3.

Figure 6. Railing corrosion on lower rail, typical curb repair below, scaling on top rail.

Overall Recommendations

Consideration was given to continued use of Bridge 6679 at its existing location with its low load rating, which is governed by the concrete slab spans. With rehabilitated slab spans to provide additional load capacity, it can meet anticipated transportation needs at its existing location for 20 years. Railings will need to be replaced. A remaining fatigue life assessment should be performed on the steel superstructure to ensure that the cover plate details do not lead to a serviceability issue associated with fatigue cracking.

Recommended Future Use:

Rehabilitation for continued vehicular use on-site, in consultation with SHPO and the Mn/DOT CRU.

Recommended Stabilization Activities:

1. Power wash the superstructure and substructure and flush with water.

2. Lubricate bearings and superstructure hinges with a petroleum product.

3. Reset expansion bearings to a nearly vertical position at a temperature of 45 degrees Fahrenheit.

4. Repair expansion joints at each abutment and over the superstructure hinge locations in accordance with standard Mn/DOT details.

Recommended Preservation Activities:

1. Conduct a remaining fatigue-life assessment on the steel beams to determine the service life of the intermittently welded cover plate details on the bridge. The assessment will be used as a planning tool for the 20-year planning window of this management plan and beyond.

2. Rehabilitate and modify the concrete slab spans, which are integral with the abutments, to provide a minimum inventory load capacity of HS20. Alternate concrete structural systems may be utilized in rehabilitating the slab spans. In compliance with the Standards, rehabilitated elements of the abutments should match the existing elements in design, color, texture, and materials to retain the historic character of the bridge.

3. Replace the existing deteriorated bridge railing with a reconstruction of the original concrete railing (see Minnesota Department of Highways, Bridge No. 6679, plan sheet 10, “Railing Details for Entire Bridge,” 1948), altered as necessary to meet current standards, and retaining general design, color, texture, and materials of the original. Similar TL-4 railings constructed of metal have been approved in Wyoming and New York State; designing railing components in concrete with comparable strengths to the metal should be achievable. Provide a roadway width of 30 feet.

4. Repair deteriorated steel elements of the superstructure. Hinge elements that cannot be repaired should be replaced in-kind to the extent possible. Repaint the entire steel superstructure.

5. Rivets that are corroded, damaged, or otherwise require replacement should be replaced with rivets of equal shank diameter. The replacement rivets should be hot-formed steel button-head rivets. Contemporary methods of rivet installation may be used. If replacement of rivets in-kind is deemed cost prohibitive, button head bolts of similar shank diameter should be used to replace those rivets which require replacement. It is likely that the rivets holes in the existing bridge will require reaming to ensure concentric holes in the joining members for bolting. Consideration should be given to the gage distance and physical access required for button head bolts because of the specialized equipment needed for

their installation. If use of button head bolts is not feasible due to physical constraints, conventional structural steel bolts may be used.

6. Use a concrete overlay for the new riding surface on the slab spans. Mill the concrete deck (supported by the steel beams) and place a new concrete overlay. Exercise caution during milling operations to avoid damaging the "C" channel composite connectors on the steel beams.

Projected Inspections to Monitor Bridge Condition

Routine:

Inspections after rehabilitation:

1. Routine annual inspections are recommended. Perform recommended maintenance activities identified as part of the inspection within a 12-month period.

2. Conduct in-depth arm's length inspections at 4-year intervals. Confirm integrity of hinge pins during in-depth inspections. Conduct maintenance and repair activities identified as part of the in-depth inspection within 24 months.

Special:

No special inspections are anticipated. Monitor fatigue hot spots during routine and in-depth inspections as indicated by fatigue life assessment.

Recommended Maintenance Activities

1. Power wash and flush the deck and power wash the fascia beams and substructure units with water annually, preferably in the spring.

2. Clean the drainage system of debris annually.

3. Lubricate the bearings and superstructure hinges with a petroleum product at 5-year intervals.

4. Spot paint the steel superstructure following standard Mn/DOT procedures at 5-year intervals.

5. Repaint the steel superstructure with standard Mn/DOT procedures at 40-year intervals.

Qualifier Statement

The opinions of probable costs provided below are in 2006 dollars. The costs were developed without benefit of preliminary plans and are based on the above identified tasks using engineering judgment and/or gross estimates of quantities and historic unit prices and are intended to provide a programming level of estimated costs. Refinement of the probable costs is recommended once preliminary plans have been developed. The estimated preservation costs include a 20% contingency and 5% mobilization allowance of the preservation activities, excluding soft costs (see Appendix D, Cost Detail, Item 5: Other). Actual costs may vary significantly from those opinions of cost provided herein.

For itemized activity listing and costs, see Appendix D.

Summarized Costs

Maintenance costs: $5,200 annualized

Stabilization activities (not annualized)
Superstructure: $14,000
Substructure: $800
Railing: $0
Deck: $23,200
Other: $0
Total: $38,000

Preservation activities
Superstructure: $175,000
Substructure: $40,000
Railing: $100,000
Deck: $275,000
Other: $170,000
Contingency: $148,000
Total: $908,000

Applicable Funding

The majority of funding for the rehabilitation and reuse of historic bridges in the state of Minnesota is available through federal funding programs. The legislation authorizing the various federal funding programs is the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

SAFETEA-LU programs include the Transportation Enhancement (TE) Fund, the Surface Transportation Program (STP), the Highway Bridge Replacement and Rehabilitation Program (HBRRP), National Highway System Funds, and the National Historic Covered-Bridge Preservation Program. A program not covered by SAFETEA-LU, the Save America's Treasures Program, is also available for rehabilitation and reuse of historic bridges that have national significance.

Other than the Save America's Treasures Program, the federal funds listed above are passed through Mn/DOT for purposes of funding eligible activities. While the criteria for determining eligible activities are determined largely by federal guidelines, Mn/DOT has more discretion in determining eligible activities under the TE fund.

The federal funding programs typically provide 80-percent federal funding and require a 20-percent state/local match. Typical eligible activities associated with these funds include replacement or rehabilitation of structurally deficient or functionally obsolete bridges for vehicular and, non-vehicular uses, painting, seismic retrofit, and preventive maintenance. If a historic bridge is relocated, the

estimated cost of demolition can be applied to its rehabilitation at a new site. It should be noted that the federal funds available for non-vehicular uses are limited to this estimated cost of demolition. However, TE funds can be applied to bridge rehabilitation for non-vehicular use.

State or federal bridge bond funds are available for eligible rehabilitation or reconstruction work on any publicly owned bridge or culvert longer than 20 feet. State bridge bond funds are available for up to 100 percent of the “abutment to abutment” cost for bridges or culverts longer than 10 feet that meet eligibility criteria.

A more in-depth discussion regarding funding can be found in the Minnesota Historic Bridge Management Plan.

Special Funding Note

N/A

Appendix A. Glossary of Preservation and Engineering Terms

Glossary

Appraisal ratings – Five National Bridge Inventory (NBI) inspection ratings (structural evaluation, deck geometry, under-clearances, waterway adequacy, and approach alignment, as defined below), collectively called appraisal ratings, are used to evaluate a bridge's overall structural condition and load-carrying capacity. The evaluated bridge is compared with a new bridge built to current design standards. Ratings range from a low of 0 (closed bridge) to a high of 9 (superior). Any appraisal item not applicable to a specific bridge it is coded N.

Approach alignment – One of five NBI inspection ratings. This rating appraises a bridge's functionality based on the alignment of its approaches. It incorporates a typical motorist's speed reduction because of the horizontal or vertical alignment of the approach.

Character-defining features – Prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include structural or decorative details and materials.

Condition rating – Level of deterioration of bridge components and elements expressed on a numerical scale according to the NBI system. Components include the substructure, superstructure, deck, channel, and culvert. Elements are subsets of components, e.g., piers and abutments are elements of the component substructure. The evaluated bridge is compared with a new bridge built to current design standards. Component ratings range from 0 (failure) to 9 (new); element ratings range from 1 (poor) to 3 (good). In rating a bridge's condition, Mn/DOT pairs the NBI system with the newer and more sophisticated Pontis element inspection information, which quantifies bridge elements in different condition states and is the basis for subsequent economic analysis.

Deck geometry – One of five NBI inspection ratings. This rating appraises the functionality of a bridge's roadway width and vertical clearance, taking into account the type of roadway, number of lanes, and Average Daily Traffic (ADT).

Deficiency – The inadequacy of a bridge in terms of structure, serviceability, and/or function. Structural deficiency is determined through periodic inspections and is reflected in the ratings that are assigned to a bridge. Service deficiency is determined by comparing the facilities a bridge provides for vehicular, bicycle, and pedestrian traffic with those that are desired. Functional deficiency is another term for functionally obsolete (see below). Remedial activities may be needed to address any or all of these deficiencies.

Deficiency rating – A nonnumeric code indicating a bridge's status as structurally deficient (SD) or functionally obsolete (FO). See below for the definitions of SD and FO. The deficiency rating status may be used as a basis for establishing a bridge's eligibility and priority for replacement or rehabilitation.

Design exception – A deviation from standard bridge design practices that takes into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. A design exception is used for federally funded projects where federal standards are not met. Approval requires appropriate justification and documentation that concerns for safety, durability, and economy of maintenance have been met.

Design load – The usable live-load capacity that a bridge was designed to carry, expressed in metric tons according to the allowable stress, load factor, or load resistance factor rating methods. An additional code was recently added to assess design load by a rating factor instead of tons. This code is used to determine if a bridge has sufficient strength to accommodate traffic demands. A bridge that is posted for load restrictions may not be adequate to accommodate present or expected truck traffic.

Fracture critical – Classification of a bridge having primary superstructure or substructure components subject to tension stresses and which are non-redundant. A failure of one of these components could lead to collapse of a span or the bridge. Tension members of truss bridges are often fracture critical. The associated inspection date is a numerical code that includes frequency of inspection in months, followed by year, and month of last inspection.

Functionally obsolete (FO) – The FHWA classification of a bridge that cannot meet current or projected traffic needs because of inadequate horizontal or vertical clearance, inadequate load-carrying capacity, and/or insufficient opening to accommodate water flow under the bridge.

Historic fabric – The material in a bridge that was part of original construction or a subsequent alteration within the historic period (e.g., more than 50 years old) that has significance in and of itself. Historic fabric includes both character-defining and minor features. Minor features have less importance and may be replaced more readily.

Historic bridge – A bridge that is listed in, or eligible for listing in, the National Register of Historic Places.

Historic integrity – The authenticity of a bridge's historic identity, evidenced by the survival and/or restoration of physical characteristics that existed during the bridge's historic period. A bridge may have integrity of location, design, setting, materials, workmanship, feeling, and association.

Inspections – Periodic field assessments and subsequent consideration of the fitness of a structure and the associated approaches and amenities to continue to function safely.

Inventory rating – The load level a bridge can safely carry for an indefinite amount of time expressed in metric tons or by the rating factor described in design load (see above). Inventory rating values typically correspond to the original design load for a bridge without deterioration.

Maintenance – Work of a routine nature to prevent or control the process of deterioration of a bridge.

Minnesota Historical Property Record (MHPR) – A documentary record of an important architectural, engineering, or industrial site, maintained by the MHS as part of the state's commitment to historic preservation. MHPR typically includes large-format photographs and written history, and may also include historic photographs, drawings, and/or plans. This state-level documentation program is modeled after a federal program known as the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER).

National Bridge Inventory – Bridge inventory and appraisal data collected by the FHWA to fulfill the requirements of the National Bridge Inspection Standards (NBIS). Each state maintains an inventory of its bridges subject to NBIS and sends an annual update to the FHWA.

National Bridge Inspection Standards – Federal requirements for procedures and frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of state bridge inventories. NBIS applies to bridges located on public roads.

National Register of Historic Places – The official inventory of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture, which is maintained by the Secretary of the Interior under the authority of the National Historic Preservation Act of 1966 (as amended).

Non-vehicular traffic – Pedestrians, non-motorized recreational vehicles, and small motorized recreational vehicles moving along a transportation route that does not serve automobiles and trucks. Includes bicycles and snowmobiles.

Operating rating – Maximum permissible load level to which a bridge may be subjected based on a specific vehicle type, expressed in metric tons or by the rating factor described in design load (see above).

Posted load – Legal live-load capacity for a bridge usually associated with the operating or inventory ratings as determined by a state transportation agency. A bridge posted for load restrictions may be inadequate for truck traffic.

Pontis – Computer-based bridge management system to store inventory and inspection data and assist in other bridge data management tasks.

Preservation – Preservation, as used in this report, refers to historic preservation that is consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. Historic preservation means saving from destruction or deterioration old and historic buildings, sites, structures, and objects, and providing for their continued use by means of restoration, rehabilitation, or adaptive reuse. It is the act or process of applying measures to sustain the existing form, integrity, and material of a historic building or structure, and its site and setting. Mn/DOT's *Bridge Preservation, Improvement and Replacement Guidelines* (BPIRG) describe preservation differently, focusing on repairing or delaying the deterioration of a bridge without significantly improving its function and without considerations for its historic integrity.

Preventive maintenance – The planned strategy of cost-effective treatments that preserve a bridge, retard future deterioration, and maintain or improve its functional condition without increasing structural capacity.

Reconstruction – The act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location. Activities should be consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties.*

Rehabilitation – The act or process of returning a historic property to a state of utility through repair or alteration which makes possible an efficient contemporary use, while preserving those portions or features of the property that are significant to its historical, architectural, and cultural values. Historic rehabilitation, as used in this report, refers to implementing activities that are consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties*. As such, rehabilitation retains historic fabric and is different from replacement. However, Mn/DOT's *Bridge Preservation, Improvement and Replacement Guidelines* (BPIRG) describe rehabilitation and replacement in similar terms.

Restoration – The act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time. Activities should be consistent with the Secretary of the Interior's *Standards for the Treatment of Historic Properties.*

Scour – Removal of material from a river's bed or bank by flowing water, compromising the strength, stability, and serviceability of a bridge.

Scour critical rating – A measure of bridge's vulnerability to scour (see above), ranging from 0 (scour critical, failed, and closed to traffic) to 9 (foundations are on dry land well above flood water elevations). This code can also be expressed as U (unknown), N (bridge is not over a waterway), or T (bridge is over tidal waters and considered low risk).

Serviceability – Level of facilities a bridge provides for vehicular, bicycle, and pedestrian traffic, compared with current design standards.

Smart flag – Special Pontis inspection element used to report the condition assessment of a deficiency that cannot be modeled, such as cracks, section loss, and steel fatigue.

Stabilization – The act or process of sustaining a bridge by means of making minor repairs until a more permanent repair or rehabilitation can be completed.

Structurally deficient – Classification indicating NBI condition rating of 4 or less for any of the following: deck condition, superstructure condition, substructure condition, or culvert condition. A structurally deficient bridge is restricted to lightweight vehicles; requires immediate rehabilitation to remain open to traffic; or requires maintenance, rehabilitation, or replacement.

Structural evaluation – Condition of a bridge designed to carry vehicular loads, expressed as a numeric value and based on the condition of the superstructure and substructure, the inventory load rating, and the ADT.

Sufficiency rating – Rating of a bridge's structural adequacy and safety for public use, and its serviceability and function, expressed on a numeric scale ranging from a low of 0 to a high of 100. It is a relative measure of a bridge's deterioration, load capacity deficiency, or functional obsolescence. Mn/DOT may use the rating as a basis for establishing eligibility and priority for replacement or rehabilitation. Typically, bridges rated between 50 and 80 are eligible for rehabilitation and those rated 50 and below are eligible for replacement.

Under-clearances – One of five NBI inspection ratings. This rating appraises the suitability of the horizontal and vertical clearances of a grade-separation structure, taking into account whether traffic beneath the structure is one- or two-way.

Variance - A deviation from standard bridge design practices that takes into account environmental, scenic, aesthetic, historic, and community factors that may have bearing upon a transportation project. A design variance is used for projects using state aid funds. Approval requires appropriate justification and documentation that concerns for safety, durability and economy of maintenance have been met.

Vehicular traffic – The passage of automobiles and trucks along a transportation route.

Waterway adequacy – One of five NBI inspection ratings. This rating appraises a bridge's waterway opening and passage of flow through the bridge, frequency of roadway overtopping, and typical duration of an overtopping event.

Appendix B. Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior's Standards

Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior's Standards

1. The original character-defining qualities or elements of a bridge, its site, and its environment should be respected. The removal, concealment, or alteration of any historic material or distinctive engineering or architectural feature should be avoided.
2. All bridges shall be recognized as products of their own time. Alterations that have no historical basis and that seek to create a false historical appearance shall not be undertaken.
3. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
4. Distinctive engineering and stylistic features, finishes, and construction techniques or examples of craftsmanship that characterize an historic property shall be preserved.
5. Deteriorated structural members and architectural features shall be retained and repaired, rather than replaced. Where the severity of deterioration requires replacement of a distinctive element, the new element should match the old in design, texture, and other visual qualities and where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
6. Chemical and physical treatments that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the most environmentally sensitive means possible.
7. Significant archaeological and cultural resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
8. New additions, exterior alterations, structural reinforcements, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
9. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Source: Ann Miller, et al. *A Management Plan for Historic Bridges in Virginia*. Charlottesville, Va.: Virginia Transportation Research Council, 2001.

Appendix C. Current Mn/DOT Structure Inventory Report

Current Mn/DOT Bridge Inspection Report

Past Maintenance Reports (if available)

Other Reports (if available)

Mn/DOT STRUCTURE INVENTORY REPORT

Bridge ID: 6679 **TH 76 OVER S FK ROOT RIVER** Date: 01/04/2006

* IDENTIFICATION *

Agency Br. No. (RS 1) - 1
District 06 **Maint. Area** 6A
County 28 HOUSTON (55)
City
Township 28012 SHELDON
Placecode 59494
Desc. Loc. 2.8 MI S OF W JCT TH 16
Sect. 9 **Tnsp.** 103N **Range** 06W
Lat. 43d 44m 18s **UTM-Y** 4843820.06
Long. 91d 33m 51s **UTM-X** 615607.87
Toll Bridge (Road) NO
Custodian STATE
Owner STATE
Inspector DISTRICT 6
BMU Agreement No
Year Built 1948 **Yr Fed Rehab**
Year Remod.
Temp.
Skew 0 **Plan Avail.** OTHER

* STRUCTURE DATA *

Service On HIGHWAY
Service Under STREAM
MN Main Span 401 STL CNT/BM SPAN
MN MSpn Det Def
MN Appr. Span 109 CONC/SLAB SPAN
MN ASpn Det Def
Culvert Type
Barrel Length
No. Main Spans 3 **No. Appr.Span** 2
Total Spans 5 **NBI Len. (?)** YES
Main Span Length 100.0 ft
Structure Length 300.0 ft
Abut. Mat'l. CONCRETE
Abut. Fnd. Type FTNG/PILE
Pier Mat'l. CONCRETE
Pier Fnd. Type FTNG/PILE
Deck Width 34.7 ft
Deck Material CIP CONC
Wear Surf. Type MONO CONC
Wear Surf. Inst. Yr.
Wr. Crs/Fill Depth
Deck Membrane NONE
Deck Rebars NOT/APPL
Deck Rebars Inst. Yr.
Structure Area 10,453 sq ft
Roadway Area 9,418 sq ft
Swk Width L/R
Curb Ht. L/R 0.8 ft 0.8 ft
Rail L/R/FHWA 31 31 NO
Ped. Fencing
Hist. Significance NATL REG ELEG
Bird Nests (?) YES

* ROADWAY DATA *

Route System (Fed) MNTH
Mn. Route System MNTH
Route Number 76
Roadway Name MN 76
Roadway Function MAINLINE
Roadway Type 2 WAY TRAF
Control Section 2807
BDG. Reference Point 020+00.319
Date Opened to Traffic 01-01-1949
Detour Length 24 mi
Lanes 2 ON BRIDGE (1)
ADT 1,800 **HCADT** 126
ADT Year 2004
Functional Class RUR/MAJOR COLL
Nat'l. Hwy. System NOT NHS
STRAHNET NOT STRAHNET
Truck Net NOT TRUCKNET
Fed. Lands Hwy. N/A
OnBaseNet NOT BASENET

* ROADWAY CLEARANCES *

	If Divided	NB-EB	SB-WB
Rdwy. Wid. Rd 1/Rd 2		30.0 ft	
Vrt. Clr. Ovr. Rd 1/Rd 2			
Max Vert Clr Rd 1/ Rd 2			
Horz U/Clr - Rd 1/Rd 2			
Lat UndClr Left/Right			
RR UndClr Vert/Lat			
Appr. Surface Width		32.0 ft	
Median Width			

* ROADWAY TIS DATA *

	TIS 1st KEY	TIS 2nd KEY
Route System	03	
Route Number	00000076	
High End	158	
Low End	158	
Direction	N	
Reference Pt.	020+00.319	
Interchg. Elem.		

* MISC. BRIDGE DATA *

Struct. Flared
Parallel Struct. NONE
Field Conn. ID RIVETED
Cantilever ID P-PINNED
Permit Code A X
Permit Code B X
Permit Code C X
Permit Code Fut.

* BRIDGE SIGNS *

Posted Load VEH & SEMI
Traffic NO SIGNS
Horizontal DELINEATORS
Vertical NOT APPL

Def. Status ADEQ **Suff. Rating** 64.9

* WATERWAY DATA *

Drng. Area
Wtrwy. Opening 9,345 sq ft
Navigation Control NO PERM REQD
Nav. Vert./Hrz Clr.
Nav. Vert. Lift Clr.
MN Scour Code R-CRIT;MONITOR
Scour Eval. Year 1996

* INSPECTION DATA *

Inspection Date 04-19-2005 (VJRF)
Inspection Frequency 12
Inspector DISTRICT6

Condition Codes		Appraisal Ratings	
Deck	5	Struct. Eval.	5
Superstruct.	6	Deck Geometry	5
Substruct.	6	Underclearances	N
Chan. & Prot.	4	Waterway Adeq'cy	9
Culvert	N	Appr. Alignment	8

Other Inspection Codes

Open, Posted, Clsd.	P	Rail Rating	0
Pier Protection		Appr. Guardrail	1
Scour Critical	3	Appr. Trans.	1
Deck Pct. Unsnd.		Appr. Term.	0

In Depth Inspections

	Y/N	Freq.	Last Insp.
Frac. Critical			
Pinned Asbly.	Y	48	01/1999
Underwater			
Spec. Feat.			

* PAINT DATA *

Year Painted 1980 **Pct.Unsound** 2 %
Total Painted Area 16,253 sq ft
Primer Type ORGANIC ZINC RICH
Finish Type VINYL

* CAPACITY RATINGS *

Design Load H 20
MN
Operating Rating HS 17.4
Inventory Rating HS 11.1
Posting Veh: 24 Semi: 40 Dbl: 40
Rtg Date 07-01-1976

* IMPROVEMENT DATA *

Prop. Work REPLACE COND.
Work By CONTRACT
Prop. Structure BRIDGE
Length 345.0 ft **Width** 40.0 ft
Appr. Rdwy. Work WIDENING
Bridge Cost 924,000
Approach Cost 363,000
Project Cost
Data - Year/Method 1991 COMPUTER

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT6

BRIDGE 6679 TH 76 OVER S FK ROOT RIVER INSP. DATE: 04-19-2005

County: HOUSTON
City:
Township: SHELDON
Section: 09 Township: 103N Range: 06W
Span Type: STL CNT / BM SPAN

Location: 2.8 MI S OF W JCT TH 16
Route: MNTH 76 Ref. Pt.: 020+00.319
Control Section: 2807 Maint. Area: 6A
Local Agency Bridge Nbr:

Length: 300.0 ft
Deck Width: 34.7 ft
Rdwy. Area / Pct. Unsnd: 9,418 sq ft
Paint Area / Pct. Unsnd: 16,253 sq ft 2 %

NBI Deck: 5 Super: 6 Sub: 6 Chan: 4 Culv: N

Open, Posted, Closed: LOAD POSTED

Appraisal Ratings - Approach: 8 Waterway: 9

MN Scour Code: R-CRIT;MONITOR Def. Stat: ADEQ Suff. Rate: 64.9

Load Posting: VEH; SEMI Traffic Signs: NO SIGNS Horiz. Cntl. Signs: DELINEATORS Vert. Cntl. Signs: NOT APPL

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	STR UNIT	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
12	CONCRETE DECK	0	2	04-19-2005	9,065 SF	0	9,065	0	0	0
				10-11-2004	9,065 SF	0	9,065	0	0	0

Notes: There are approximately 70 square feet of small concrete deck patches scattered across the deck surface. There is 350 square feet of concrete scaling and 2 areas of spalling along the assembly joints at both ends.

38	CONCRETE SLAB	0	2	04-19-2005	1,388 SF	0	0	1,388	0	0
				10-11-2004	1,388 SF	0	0	1,388	0	0

Notes: The concrete deck slabs are located at each end of the bridge and are 19 feet in length.
South End Slab - has 2 large patched areas along the centerline for nearly the full length and 7 smaller patched areas for a total of approximately 250 square feet.
North End Slab - has 2 large patched areas along the centerline for nearly the full length and 4 smaller patched areas for a total of approximately 150 square feet. Both of the larger patches have random cracks and small areas of delaminated concrete.

301	POURED DECK JOINT	0	2	04-19-2005	350 LF	308	42	0	N/A	N/A
				10-11-2004	350 LF	348	2	0	N/A	N/A

Notes: The pourable joints along the assembly joints at both ends have completely failed allowing water to pass through onto the the abutments below.

302	COMPRESSION JOINT	0	2	04-19-2005	70 LF	68	2	0	N/A	N/A
				10-11-2004	70 LF	70	0	0	N/A	N/A

Notes: The compression joints are located over the Piers.
Pier # 1 Joint - OK.
Pier # 2 Joint - has 2 small areas where the joint material has lost adhesion approximately 2 linear feet.

303	ASSEMBLY DECK JOINT	0	2	04-19-2005	60 LF	0	60	0	N/A	N/A
				10-11-2004	60 LF	0	60	0	N/A	N/A

Notes: The assembly joints are located over each of the abutments.
South Abutment - the joints has complete paint failure with light corrosion along the top surface, the under side has heavy corrosion with minor loss of section.
North Abutment - the joints has complete paint failure with light corrosion along the top surface, the under side has heavy corrosion with minor loss of section.

320	CONC APPR SLAB-BITOL	0	2	04-19-2005	2 EA	0	2	0	0	N/A
				10-11-2004	2 EA	0	2	0	0	N/A

Notes: South Approach Slab - unsealed transverse and longitudinal cracks with settlement along the entire width of the deck.
North Approach Slab - unsealed transverse and longitudinal cracks with settlement along the entire width of the deck.

331	CONCRETE RAILING	0	2	04-19-2005	732 LF	482	200	50	0	N/A
				10-11-2004	732 LF	482	200	50	0	N/A

Notes: Along both sides of the deck there are scattered concrete rail sections with longitudinal cracks and deteriorated and spalled concrete along the bottom edge. There are scattered concrete posts with vertical and random cracks with some staining, rust spots and small rebar spalls.

107	PAINTED STEEL GIRDER	0	2	04-19-2005	1,560 LF	1,040	300	200	20	0
				10-11-2004	1,560 LF	1,040	300	200	20	0

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT6

BRIDGE 6679 TH 76 OVER S FK ROOT RIVER INSP. DATE: 04-19-2005

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	STR UNIT	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
	Notes: ALL STEEL BEAMS HAVE WELDED COVER PLATES LOCATED AT THE POSITIVE AND NEGATIVE MOMENT AREAS. THE INTERIOR AREAS AT THESE WELDED COVER PLATES HAVE TACK WELD ENDS AND CONTINUOUS WELDS ALONG THE COVER PLATES AT THE CENTER OF THE SPAN. All steel members were painted in 1980. All painted steel beams have scattered areas of failed paint with freckled rust forming or that has formed mainly along the bottom flanges and at the pin connections. Some of the pin connections have failed paint with active corrosion and minor LOS. Both fascia beams have scattered areas of failed paint with active corrosion along the bottom and top flanges. There is some pack rust forming at the faying surface between the bottom flanges and the cover plates and the splice plates on the east fascia beam.									
161	PIN & HANGER-PAINTED	0	2	04-19-2005	12 EA	0	7	5	0	0
				10-11-2004	12 EA	0	7	5	0	0
	Notes: All Pin connection were UT inspected in 2003 and were found to be in good condition. All pin connections have surface rust that has formed or is forming. Pier # 1 - on the north side - beam 2 (CS 3) the nut and pin have advanced corrosion, beam 4 (CS2) the nut and pin have failed paint with active corrosion, the pin does show signs of rotation. Pier # 2 - on the south side - the pin connection at all beams have failed paint and active corrosion with no LOS at this time. All pins show signs of rotation.									
311	EXPANSION BEARING	0	2	04-19-2005	18 EA	4	11	3	N/A	N/A
				10-11-2004	18 EA	4	14	0	N/A	N/A
	Notes: The moveable bearings are located at both abutments and pier 2. South Abutment Bearings - all 6 bearings have failed paint with active corrosion and minor loss of section. The east fascia bearing is frozen in the expanded position which would be consider a condition state 3. Pier # 2 Bearings - both fascia bearings have failed paint with active corrosion and minor loss of section. North Abutment Bearings - all 6 bearings have failed paint with active corrosion and minor loss of section. The east fascia bearing is frozen in the expanded position which would be consider a condition state 3. Bearings 3 & 4 have advanced corrosion and would be consider condition state 3.									
313	FIXED BEARING	0	2	04-19-2005	6 EA	4	2	0	N/A	N/A
				10-11-2004	6 EA	4	2	0	N/A	N/A
	Notes: The fixed bearings located at Pier 1. Pier # 1 Bearings - both fascia bearings have failed paint with active corrosion and minor loss of section.									
205	CONCRETE COLUMN	0	2	04-19-2005	4 EA	4	0	0	0	N/A
				10-11-2004	4 EA	4	0	0	0	N/A
	Notes: Pier # 1 - OK. Pier # 2 - OK.									
210	CONCRETE PIER WALL	0	2	04-19-2005	35 LF	35	0	0	0	N/A
				10-11-2004	35 LF	35	0	0	0	N/A
	Notes: Pier # 1 - OK. Pier # 2 - OK.									
215	CONCRETE ABUTMENT	0	2	04-19-2005	69 LF	43	24	2	0	N/A
				10-11-2004	69 LF	43	24	2	0	N/A
	Notes: South Abutment - has scattered vertical and random cracks in the front face with some leaching and small patched areas scattered across the front face. There is a patched area near the east end that has random cracks with small area of delaminated and spalled concrete. The parapet wall near the top has scattered small spalls and patched areas below the south bound lane and near the west side curb line. The bridge seat is wet at times due to water leaking through the joint above. North Abutment - has scattered vertical and random cracks in the front face with some leaching or rust spots. There are 2 small delaminated areas, one is under beam 3 and the other is between beam 3 & 4 approximately 2 square feet. The parapet wall near the top have scattered small spalls and patched areas. The bridge seat is wet at times due to water leaking through the joint above.									
234	CONCRETE CAP	0	2	04-19-2005	70 LF	60	8	2	0	N/A
				10-11-2004	70 LF	60	8	2	0	N/A
	Notes: Pier # 1 - has 3 short vertical cracks along the top edge at the east end of the cap that can be seen on both sides. Pier # 2 - has 3 short vertical cracks along the top edge at the east end of the cap that can be seen on both sides. There is a small rebar spall at the west end at the bottom of the cantilever overhang and a small concrete delamination at the east end on the south side.									

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT6

BRIDGE 6679 TH 76 OVER S FK ROOT RIVER INSP. DATE: 04-19-2005

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	STR UNIT	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5
387	CONCRETE WINGWALL	0	2	04-19-2005	4 EA	0	3	1	0	N/A
				10-11-2004	4 EA	0	3	1	0	N/A
	Notes: Southwest Wingwall - has a 3 small rebar spalls near the top edge and an area of random cracking extending out from the parapet wall. Southeast Wingwall - has an area of random cracking near the bridge seat with staining. Northwest Wingwall - has scattered random cracks with some staining near the bridge seat. Northeast Wingwall - has 2 areas of random cracking with staining.									
358	CONC DECK CRACKING	0	2	04-19-2005	1 EA	0	0	1	0	N/A
				10-11-2004	1 EA	0	0	1	0	N/A
	Notes: There are approximately 1600 linear feet of unsealed cracks in the surface of the deck. The cracks are of moderate size and density.									
359	CONC DECK UNDERSIDE	0	2	04-19-2005	1 EA	0	1	0	0	0
				10-11-2004	1 EA	0	1	0	0	0
	Notes: There are numerous transverse cracks with efflorescence beneath the deck with diagonal stress cracks at the northeast and southeast corners. In Span 1 above the south abutment is a patched area near the centerline. In Span 2 there is a small spall in the overhang near the pin connections.									
361	SCOUR	0	2	04-19-2005	1 EA	1	0	0	N/A	N/A
				10-11-2004	1 EA	1	0	0	N/A	N/A
	Notes: R - Scour critical. Monitoring required.									
363	SECTION LOSS	0	2	04-19-2005	1 EA	0	1	0	0	N/A
				10-11-2004	1 EA	0	1	0	0	N/A
	Notes: Check notes for elements 107 & 984.									
964	CRITICAL FINDING	0	2	04-19-2005	1 EA	1	0	N/A	N/A	N/A
				10-11-2004	1 EA	1	0	N/A	N/A	N/A
	Notes: No critical findings were observed at the time of inspection.									
981	SIGNING	0	2	04-19-2005	1 EA	1	0	0	N/A	N/A
				10-11-2004	1 EA	1	0	0	N/A	N/A
	Notes: All signs were in place at the time of inspection.									
982	GUARDRAIL	0	2	04-19-2005	1 EA	1	0	0	N/A	N/A
				10-11-2004	1 EA	1	0	0	N/A	N/A
	Notes: All guardrail sections were intact at the time of inspection. There are scattered wooden guardrail posts that are starting to decay at the ground line.									
984	DRAINAGE	0	2	04-19-2005	1 EA	0	1	0	N/A	N/A
				10-11-2004	1 EA	0	1	0	N/A	N/A
	Notes: All deck drains were open at the time of inspection, however all drain extensions have failed paint with active corrosion and minor loss of section.									
985	SLOPES	0	2	04-19-2005	1 EA	0	0	1	N/A	N/A
				10-11-2004	1 EA	0	0	1	N/A	N/A
	Notes: The rip-rap along the north abutment has been washed away, there is significant erosion along the slope in front of the north abutment . The soil on the north side of Pier 1 and in front of the south abutment is being eroded away leaving a hole approximately 3 feet deep.									
986	CURB & SIDEWALK	0	2	04-19-2005	1 EA	0	1	0	N/A	N/A
				10-11-2004	1 EA	0	1	0	N/A	N/A
	Notes: Both of the concrete curbs have been repaired in 2001 & 2004, however there are still a few scattered small rebar spalls and areas of delaminated concrete.									
988	MISCELLANEOUS	0	2	04-19-2005	1 EA	1	0	0	N/A	N/A
				10-11-2004	1 EA	1	0	0	N/A	N/A

Mn/DOT BRIDGE INSPECTION REPORT

Inspector: DISTRICT6

BRIDGE 6679 TH 76 OVER S FK ROOT RIVER INSP. DATE: 04-19-2005

STRUCTURE UNIT: 0

ELEM NBR	ELEMENT NAME	STR UNIT	ENV	INSP. DATE	QUANTITY	QTY CS 1	QTY CS 2	QTY CS 3	QTY CS 4	QTY CS 5

Notes: Yes swallow nests.
There is a utility line at the west side of the east fascia beam.

General Notes: Bridge 6679

NOTE: This structure has a scour code rating of "R" - CRITICAL MONITOR. There is a scour monitoring signs attached on the bridge.

NOTE: All steel beams, pin & hangers and bearings are numbered from the west, all spans and piers are numbered from the south.

NOTE: Bridge was inspected using under deck snooper truck in 2005.

Channel - NBI # 4 The channel has shifted to the north into Span 3 which has left a high silt deposit in Span 2. There is a large amount of timber debris and exposed tree roots down stream. The north bank of the river has significant erosion along both sides of the bridge, rip-rap was added at the north abutment in 1995. There is a scour monitor sign installed at the west end of pier 2 on the north side in 1997.

Inspector's Signature

Reviewer's Signature / Date

Appendix D. Cost Detail

Mn/DOT Historic Bridge Management Plan

BRIDGE No. 6679 MAINTENANCE/STABILIZATION/PRESERVATION (M/S/P) Activity Listing and Costs

Notes:

1 *Costs are presented in 2006 dollars.*
2 *Unit costs are presented to the dollar or cent depending on the precision of the specific value.*

STABILIZATION COST SUMMARY

	ITEM	COSTS
1.00	SUPERSTRUCTURE	$ 14,000
2.00	SUBSTRUCTURE	$ 800
3.00	RAILINGS	$ -
4.00	DECK	$ 23,200
5.00	OTHER	$ -
		$ 38,000

1.00 SUPERSTRUCTURE

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
1.05	Power wash and flush the superstructure	1	16000	SF	$ 0.25	$ 4,000
1.10	Lubricate the bearings & superstructure hinges	5	36	EA	$ 25.00	$ 900
1.15	Reset the expansion bearings	40	18	EA	$ 500.00	$ 9,000
1.20					$ -	$ -
1.25					$ -	$ -
1.30					$ -	$ -
1.35					$ -	$ -
1.40					$ -	$ -
1.45					$ -	$ -
1.50					$ -	$ -
						$ 13,900

2.00 SUBSTRUCTURE

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
2.05	Power wash and flush the piers and abutments	1	1	LS	$ 800.00	$ 800
2.10					$ -	$ -
2.15					$ -	$ -
2.20					$ -	$ -
2.25					$ -	$ -
2.30					$ -	$ -
2.35					$ -	$ -
2.40					$ -	$ -
2.45					$ -	$ -
2.50					$ -	$ -
						$ 800

3.00 RAILINGS

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
3.05					$ -	$ -
3.10					$ -	$ -
3.15					$ -	$ -
3.20					$ -	$ -
3.25					$ -	$ -
3.30					$ -	$ -
3.35					$ -	$ -
3.40					$ -	$ -
3.45					$ -	$ -
3.50					$ -	$ -
						$ -

4.00 DECK

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
4.05	Power wash and flush the deck and railings	1	1	LS	$ 400	$ 400
4.10	Repair expansion joints at the abutments	20	70	LF	$ 200.00	$ 14,000
4.15	Install sealed deck joints at hinge locations	20	70	LF	$ 125.00	$ 8,750
4.20					$ -	$ -
4.25					$ -	$ -
4.30					$ -	$ -
4.35					$ -	$ -
4.40					$ -	$ -
4.45					$ -	$ -
4.50					$ -	$ -
						$ 23,150

5.00 OTHER

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
5.05	Clean the drainage system of debris	1	1	LS	$ 300.00	$ 300
5.10					$ -	$ -
5.15					$ -	$ -
5.20					$ -	$ -
5.25					$ -	$ -
5.30					$ -	$ -
5.35					$ -	$ -
						$ 300

Mn/DOT Historic Bridge Management Plan

BRIDGE No. 6679 MAINTENANCE/STABILIZATION/PRESERVATION (M/S/P) Activity Listing and Costs

Notes:

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PRESERVATION COST SUMMARY

	ITEM	COSTS
1.00	SUPERSTRUCTURE	$ 175,000
2.00	SUBSTRUCTURE	$ 40,000
3.00	RAILINGS	$ 100,000
4.00	DECK	$ 275,000
5.00	OTHER	$ 170,000
		$ 760,000
	Mobilization @ 5% and 20% Contingency:	$ 148,000
		$ 908,000

1.00 SUPERSTRUCTURE

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
1.05	Rehabilitate slab spans to HS20 Inv Rating	75	2	EA	$ 40,000	$ 80,000
1.10	Repair deteriorated steel elements	75	12	EA	$ 2,500	$ 30,000
1.15	Paint the steel superstructure	40	16250	SF	$ 4.0	$ 65,000
1.20					$ -	$ -
1.25					$ -	$ -
1.30					$ -	$ -
1.35					$ -	$ -
1.40					$ -	$ -
1.45					$ -	$ -
1.50					$ -	$ -
1.55					$ -	$ -
1.60					$ -	$ -
1.65					$ -	$ -
						$ 175,000

2.00 SUBSTRUCTURE

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
2.05	Modify abutments for new slab spans	75	2	EA	$ 20,000	$ 40,000
2.10					$ -	$ -
2.15					$ -	$ -
2.20					$ -	$ -
2.25					$ -	$ -
2.30					$ -	$ -
2.35					$ -	$ -
2.40					$ -	$ -
2.45					$ -	$ -
2.50					$ -	$ -
						$ 40,000

3.00 RAILINGS

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
3.05	Replace existing railing	50	628	LF	$ 159	$ 100,000
3.10					$ -	$ -
3.15					$ -	$ -
3.20					$ -	$ -
3.25					$ -	$ -
3.30					$ -	$ -
3.35					$ -	$ -
3.40					$ -	$ -
3.45					$ -	$ -
3.50					$ -	$ -
3.55					$ -	$ -
3.60					$ -	$ -
3.65					$ -	$ -
3.70					$ -	$ -
						$ 100,000

4.00 DECK

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
4.05	Mill and overlay work	40	10453	SF	$ 26	$ 275,000
4.10					$ -	$ -
4.15					$ -	$ -
4.20					$ -	$ -
4.25					$ -	$ -
4.30					$ -	$ -
4.35					$ -	$ -
4.40					$ -	$ -
4.45					$ -	$ -
4.50					$ -	$ -
						$ 275,000

5.00 OTHER

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL
5.05	Fatigue Life Assessment Study	N.A.	1	LS	$ 20,000	$ 20,000
5.10	Preservation Plans and Specifications	N.A.	1	LS	$ 100,000	$ 100,000
5.15	Stream Realignment	30	1	LS	$ 50,000	$ 50,000
5.20					$ -	$ -
5.25					$ -	$ -
5.30					$ -	$ -
5.35					$ -	$ -
						$ 170,000

Mn/DOT Historic Bridge Management Plan

BRIDGE No. 6679 MAINTENANCE/STABILIZATION/PRESERVATION (M/S/P) Activity Listing and Costs

Notes:

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MAINTENANCE COST SUMMARY

	ITEM	ANNUAL COSTS
1.00	SUPERSTRUCTURE	$ 2,800
2.00	SUBSTRUCTURE	$ 800
3.00	RAILINGS	$ -
4.00	DECK	$ 400
5.00	OTHER	$ 1,200
		$ 5,200

1.00 SUPERSTRUCTURE

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL	ANNUAL COST
1.05	Power wash fascia beams	1	600	LF	$ 0.25	$ 150	$ 150
1.10	Spot paint the superstructure	5	1000	SF	$ 4.00	$ 4,000	$ 800
1.15	Lubricate bearings and hinges	5	36	EA	$ 25.00	$ 900	$ 180
1.20	Repaint the steel superstructure	40	16250	SF	$ 4.00	$ 65,000	$ 1,625
1.25					$ -	$ -	$ -
1.30					$ -	$ -	$ -
1.35					$ -	$ -	$ -
1.40					$ -	$ -	$ -
1.45					$ -	$ -	$ -
1.50					$ -	$ -	$ -
						$ 70,050	$ 2,755

2.00 SUBSTRUCTURE

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL	ANNUAL COST
2.05	Power wash piers and abutments	1	1	LS	$ 800.00	$ 800	$ 800
2.10					$ -	$ -	$ -
2.15					$ -	$ -	$ -
2.20					$ -	$ -	$ -
2.25					$ -	$ -	$ -
2.30					$ -	$ -	$ -
2.35					$ -	$ -	$ -
2.40					$ -	$ -	$ -
2.45					$ -	$ -	$ -
2.50					$ -	$ -	$ -
						$ 800	$ 800

3.00 RAILINGS

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL	ANNUAL COST
3.05					$ -	$ -	$ -
3.10					$ -	$ -	$ -
3.15					$ -	$ -	$ -
3.20					$ -	$ -	$ -
3.25					$ -	$ -	$ -
3.30					$ -	$ -	$ -
3.35					$ -	$ -	$ -
3.40					$ -	$ -	$ -
3.45					$ -	$ -	$ -
3.50					$ -	$ -	$ -
						$ -	$ -

4.00 DECK

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL	ANNUAL COST
4.05	Power wash the deck and railing	1	1	LS	$ 400.00	$ 400	$ 400
4.10					$ -	$ -	$ -
4.15					$ -	$ -	$ -
4.20					$ -	$ -	$ -
4.25					$ -	$ -	$ -
4.30					$ -	$ -	$ -
4.35					$ -	$ -	$ -
4.40					$ -	$ -	$ -
4.45					$ -	$ -	$ -
4.50					$ -	$ -	$ -
						$ 400	$ 400

5.00 OTHER

REF. No.	ITEM / DESCRIPTION OF WORK	EXPECTED LIFE CYCLE - YEARS	ITEM QTY	QTY UNIT	UNIT COST	ITEM TOTAL	ANNUAL COST
5.05	Routine inspection	1	1	Ea	$ 600	$ 600	$ 600
5.10	Arm's length inspection	4	1	Ea	$ 1,200	$ 1,200	$ 300
5.15	Clean drainage system of debris	1	1	LS	$ 300	$ 300	$ 300
5.20					$ -	$ -	$ -
5.25					$ -	$ -	$ -
5.30					$ -	$ -	$ -
5.35					$ -	$ -	$ -
						$ 2,100	$ 1,200