Evaluation of Rehabilitation Alternatives for the Cedar Avenue Bridge

Mn/DOT Bridge No. 3145

Prepared for

Minnesota Department of Transportation

and

City of Bloomington, Minnesota

Prepared by

MEAD & HUNT

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1. Introduction

The Old Cedar Avenue Bridge (Bridge No. 3145, also known as Long Meadow Bridge), located at the crossing of Old Cedar Avenue over Long Meadow Lake in the Minnesota River flood plain, is owned by the City of Bloomington (City). Due to structural concerns, the bridge was closed to all service in 2002. Prior to 1993, the bridge was open to vehicular traffic; from 1993 to 2002, the structure was in non-vehicular use for pedestrians and bicycles. In 2008 the City contracted with Kimley-Horn and Associates, Inc. (KHA) to complete a structure condition assessment and prepare cost estimates to determine the feasibility of rehabilitation and/or replacement of the structure. The City has secured a combination of local, state, and federal enhancement funds for use in restoring the Old Cedar Avenue crossing to serve as a connecting component of a regional trail system.

The Minnesota Department of Transportation (Mn/DOT) and the City requested that Mead & Hunt, Inc. (Mead & Hunt) work collaboratively with KHA to develop a rehabilitation option in accordance with the Secretary of the Interior's Standards for Rehabilitation (codified in 36 CFR 67 and referred to herein as Standards). "Rehabilitation" is defined as "the process of returning a property to a state of utility, through repair or alteration, which makes possible an efficient contemporary use while preserving those portions and features of the property which are significant to its historic, architectural, and cultural values." As required for compliance with Section 106 of the National Historic Preservation Act and Section 4(f) of the U.S. Department of Transportation Act, the City considered rehabilitation of the Old Cedar Avenue Bridge as a means to retain the historic bridge, which was previously determined eligible for the National Register of Historic Places (National Register).

To provide background for investigating the rehabilitation option, Mead & Hunt reviewed existing literature on the bridge. This included the Mn/DOT file of plans, correspondence, and other documents on the bridge, along with previous engineering and historical reports. Mead & Hunt also conducted a site visit on August 27, 2008, to review the historical features of the bridge. Based on the site visit and review of available materials, including the original 1919 plan set and shop drawings and the 1957 repair plan, Mead & Hunt evaluated the bridge for character-defining features and historic fabric.

To develop a rehabilitation option that meets the Standards, Mead & Hunt and KHA collaborated at meetings and via multiple conference calls. This collaboration was focused on reviewing the character-defining features and historic fabric of the bridge, and reviewing and discussing the KHA draft report that identifies the bridge's current condition and presents three proposed alternatives. KHA's findings are presented in a report to the City, entitled *Condition and Rehabilitation Recommendations for the Old Cedar Avenue Bridge* and dated November 19, 2008.

Interim findings, cost estimates and the results of the team's collaborative discussions were presented at several meetings of an advisory group, the members of which are described below. At the request of Mn/DOT, a bridge engineer with Mead & Hunt provided review of the cost estimates prepared by KHA. Consultation among agencies continued in February through April 2009 in which the cost of rehabilitation and the requirements upon the bridge owner were debated. At the conclusion of this process, KHA described and estimated the cost of full-scope and reduced scope rehabilitation alternatives. Mead & Hunt reviewed these estimates and in the conclusion of this report, Mead & Hunt describes an alternative rehabilitation approach that reduces the initial cost and minimizes future maintenance costs.

Based on the information developed through consultation between KHA and Mead & Hunt, Mn/DOT CRU and SHPO will provide a recommendation to FHWA as to whether rehabilitation of the bridge is feasible and prudent.

2. Regulatory Requirements

Because federal funds will be used to complete this project, effects to the National Register-eligible Old Cedar Avenue Bridge must be evaluated through the Section 106 of the National Historic Preservation Act process, which accommodates historic preservation concerns in federally-funded undertakings through a consultation process. The Section 106 process involves assessing effects of project activities to identified historic resources and resolving adverse effects, if necessary.

Section 4(f) of the Department of Transportation Act (codified in 23 CFR 774) must also be considered because the proposed project may pose a "use" of the historic bridge. The use of a historic bridge occurs when the proposed action impairs the historic integrity of the bridge either by rehabilitation or demolition, as determined through the Section 106 process (*Programmatic Section 4(f) Evaluation and Approval for Federal Highway Administration (FHWA) Projects that Necessitate the Use of Historic Bridges*, 1983). Conversely, there is no use under Section 4(f) if rehabilitation of the historic bridge does not impair the bridge's historic integrity and does not pose an adverse effect to the historic bridge, as determined through the Section 106 process.

If it is determined that there is no use under Section 4(f), Section 4(f) does not apply to the proposed project. If the proposed project poses a use of the historic bridge, Section 4(f) applies and a Programmatic Section 4(f) Evaluation must be prepared for FHWA review and approval. Such an evaluation must include an alternatives analysis documenting that there is no prudent and feasible alternative to the use of the historic bridge and that the project includes all possible planning to minimize harm resulting from such use.

The FHWA is the lead agency for the Old Cedar Avenue Bridge project responsible for determination of effect under Section 106 and the Section 4(f) evaluation. The City is the project sponsor as owner of the bridge. Other involved parties include Mn/DOT and the State Historic Preservation Office (SHPO). An advisory group composed of the Mn/DOT Cultural Resources Unit (CRU), the City, and the SHPO met with KHA and Mead & Hunt to review structural findings and provide input on a rehabilitation option that meets the project need while complying with the Standards. On January 23, 2009, a day-long consultation meeting was convened that included the advisory group as well as additional City and Mn/DOT staff, representatives of FHWA and the Bloomington Historical Society, and the director of the Historic Bridge Foundation, an advocacy organization. Follow-up meetings and conference calls that included Mn/DOT, FHWA, the City, and KHA were held subsequent to the January meeting (see Section 4 for details). The following summary and recommendation reflect Mead & Hunt's evaluation of project alternatives and their compliance with regulatory requirements. The table in *Section 5 - Conclusion* is intended to provide guidance for the agencies and the City as they make a decision as to which project alternative to pursue.

3. Guidance on Historic Bridge Rehabilitation

Mead & Hunt provided guidance to KHA, the project engineer, concerning compliance with the Standards for the rehabilitation alternatives. This guidance includes the identification of character-defining features for the bridge, an assessment of historic integrity, and additional information specific to bridge elements such as connections and floor system components, and future maintenance requirements.

Character-defining features are prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Such features may include structural or decorative details and materials. While the historic fabric, or historic materials and physical features, of a bridge should be considered for preservation, character-defining features have the highest priority in preservation planning. The rehabilitation of the bridge, including historic fabric and character-defining features, should be in compliance with the Standards.

The Old Cedar Avenue Bridge is a five-span, riveted, Camelback truss built in 1920. The character-defining feature of the Old Cedar Avenue Bridge is the Camelback truss design and construction. This feature includes the design and construction of the Camelback truss spans, the individual members that comprise the truss (including horizontals, verticals, upper and lower chord, and portal and sway bracing), and riveted truss connections.

Additional physical features of the bridge that are considered to be historic fabric include: bridge bearings, pipe railing, floor beams and stringers, and reinforced concrete abutments and piers. The original concrete deck material has been replaced with timber, which is not historic fabric. The remnants of wood utility brackets on the outside of the trusses are not considered to be historic fabric from original construction.

Mead & Hunt's identification of character-defining features and historic fabric was presented to KHA and to the bridge advisory group. KHA used the information on character-defining features and historic fabric in developing the alternatives for rehabilitation of the bridge.

Historic integrity reflects the ability of a property to convey its significance under National Register evaluation criteria. Aspects of historic integrity include location, design, setting, materials, workmanship, feeling, and association. The Old Cedar Avenue Bridge retains substantial historical integrity. With the exception of the 1957 repair to Pier No. 1 and periodic replacement of the deck materials, the design and construction of the bridge is unchanged from the 1919 plans.

To retain historic integrity and comply with the Standards, Mead & Hunt provided information on the appropriate locations for replacement rivets and bolts. This information was contained in a rivet/bolt replacement matrix originally developed for the historic bridge management plan for the Stillwater Lift Bridge (prepared by Mead & Hunt and URS, November 2008), since the use of rivets and bolts in the Stillwater Bridge was considered similar to that of the Old Cedar Avenue Bridge. This approach to replacement of connections provides for compliance with the Standards by using rivets in visible locations combined with more economical high-strength bolts at connection points below the deck. This rivet/bolt

replacement matrix is included as Appendix A. KHA's cost estimate incorporates this approach to connection replacement.

Mead & Hunt also provided recommendations and guidance for the treatment of the bridge floor system, bridge deck, and bridge railing to comply with the Standards. Such guidance was focused on maintaining the bridge's overall historic integrity while meeting the project's need and using economical repair methods and materials. These recommendations included retention of the character-defining Camelback truss while taking advantage of modern construction techniques that would not detract from the historic fabric but would allow for the economical rehabilitation of the deck and floor system. This includes utilizing structural timber deck units that integrated load-carrying capacity with functional use to eliminate the need for rehabilitation of the stringers. An overall cost savings would be realized over complete replacement of the stringers and the deck as separate units. A secondary advantage of the structural deck units is an increased live load capacity of the truss structure by a reduction in the structure dead load. The timber deck panels have the strength to support the pedestrian and maintenance truck design loads as well as meet the AASHTO LRFD Bridge Design Specifications L/500 live load deflection criteria.

4. Summary of Project Alternatives

Employing information from their own investigations, along with information from Mead & Hunt provided in collaboration meetings and conference calls, KHA initially prepared recommendations and cost estimates for three alternatives for the Old Cedar Avenue Bridge: full rehabilitation of five spans, rehabilitation of three spans with new approach spans (termed a "hybrid" by KHA), and replacement with a new bridge. The Mn/DOT Bridge Office also provided comments on a preliminary cost estimate.

KHA provided a detailed description of the alternatives and proposed treatment in a memorandum to the City on November 19, 2008.[1] The November 19 memorandum, including an updated cost estimate summary, was reviewed at a coordination meeting on December 2, 2008, and a brief summary of the information presented at a public open house on the same day. On January 9, 2009, a site visit was conducted by KHA with representatives of FHWA, Mn/DOT, City of Bloomington, and Mead & Hunt, and the alternatives were discussed at that time. Revised cost estimates were discussed at the coordination meeting on January 23, 2009. At a Rehabilitation Engineers Work Session Meeting on February 5, 2009, repair methods and some revisions to cost estimates were reviewed. A meeting on April 21, 2009, reviewed revised maintenance costs.

In response to requests from consulting parties, KHA on behalf of the City prepared an alternative for a reduced scope rehabilitation of the five spans. Subsequent discussion among the City and agencies led to the dropping of the three-span hybrid alternative. An updated set of revised costs for the alternatives was distributed by KHA on May 5, 2009. A description of the remaining three alternatives evaluated by KHA on behalf of the City is summarized below.

Alternative 1. Full-scope rehabilitation of five spans of the historic bridge (KHA May 5, 2009)

- Complete removal of deck, stringers and floor beams
- Encapsulate and remove lead paint from entire bridge
- Install weathering steel stringers and floor beams
- Install full width concrete deck
- Replace bottom lateral bracing
- Reconstruct 100% of lower chord connections
- Replace 100% of lower chords in south trusses
- Repaint entire truss superstructure
- Reconstruct piers from 5' below waterline to top
- Repair abutments
- Straighten bent truss members (5% assumed)
- Install new railing entire length of bridge

[1] KHA also prepared a follow-up email dated November 19, 2008, that presents the total project cost and compares costs of three alternatives, as well as providing supporting documentation for other project costs including maintenance and trail improvements. On November 25, KHA provided a follow-up memorandum that responded to Mead & Hunt's November 19 comments and revisions to the costs for alternatives.

Alternative 2. Reduced-scope rehabilitation of five spans of the historic bridge (KHA May 5, 2009)

- Complete removal of deck, stringers and floor beams
- Encapsulate and remove lead paint from entire bridge
- Install weathering steel floor beams
- Install timber deck, 14 feet wide
- Install bituminous wearing surface on deck
- Replace bottom lateral bracing
- Strengthen 20% of lower chord connections
- Strengthen 25% of lower chords in south trusses
- Repaint bottom four feet of truss superstructure
- Surface repairs of concrete piers from 5' below
- Repair abutments
- Straighten bent truss members (1% assumed)
- Install new railing entire length of bridge

Alternative 3. Removal of the historic bridge and construction of a new bridge (KHA May 5, 2009)

- Complete removal and disposal of existing bridge
- Encapsulate and remove loose lead paint from entire bridge prior to demolition
- Construct new bridge

5. Conclusion

In order to comply with regulatory requirements, the FHWA, in cooperation with Mn/DOT and the City, must consider rehabilitating the Old Cedar Avenue Bridge. In order to comply with the Standards and to have a determination of no adverse effect under Section 106 and no Section 4(f) use, the bridge should retain historic integrity through the preservation of character-defining features and as much historic fabric as possible. As a result of collaboration, rehabilitation alternatives were identified that comply with the Standards. The following table evaluates project alternatives with regard to preservation of character-defining features and historic fabric and regulatory compliance.

An alternative rehabilitation approach (Alternative 4 in table below) is added by Mead & Hunt as part of this report that would reduce the initial costs as well as future maintenance costs. This alternative includes the elimination of painting of the entire superstructure except for the lower chord joints and lower chord for aesthetic purposes. This alternative is proposed based on observations of the present bridge condition, review of the maintenance records and the information presented in Chapter 23 of the National Steel Bridge Alliance (NSBA) Design Handbook.

The Old Cedar Avenue Bridge was originally constructed in 1920 and repainted in 1959. The structure has not been painted since then, other than some minor spot painting. Given that the structure was last painted 50 years ago, conclusions can be drawn from the present condition to estimate how the bridge will react to the elements in the future. The structure currently has an intact top chord, top chord bracing, and web members with only minor surface corrosion. The lower chord is primarily in fair condition except for span 5 that has significant corrosion. There is pack rust present in some, but not all, lower chord joints. A patina protective surface corrosion layer has most likely formed on the surface of the truss members. There is very little section loss of the main truss members except in those areas that have experienced continuous moisture contact and/or exposure to salts such as the floor system and lower chord lateral bracing.

With minimal section loss to the primary truss elements (other than to the span 5 lower chord) even after having been repainted only once in the 89 year existence of the structure, it is prudent to suggest that this structure not be painted except to provide a uniform appearance of the lower chord and lower chord joints and to provide protection to those joints that are cleaned to remove pack rust. With replacement of the floor system, lower chord lateral bracing and the span 5 lower chord, the superstructure would be intact and capable of supporting the expected loads going forward as a pedestrian bridge, with minimal future maintenance.

In review of Chapter 23 of the NSBA Design Handbook, information concerning expected section loss is given that applies to this structure in specific relation to environmental factors that cause corrosion. A mild corrosive environment is one that is defined as having little or no exposure to natural airborne or applied deicing salts; low pollution in the form of sulfur dioxide; low relative humidity; absence of chemical fumes; and an inland location. Observation of the structure condition indicates that the structure could be assumed to be located in a mild corrosive environment. The NSBA Design Handbook further states that corrosion rates in mild environments tend to flatten out after 10 years and continue at slow rates. Reference to the American Society of Testing and Materials (ASTM) study conducted in the 1960s of corrosion rates in certain areas of the country could be utilized for this bridge. An assumption that the

environment in Detroit, Michigan, is similar to Bloomington, Minnesota, would indicate that corrosion rates approaching 30 micrometers over a two-year period could be expected and is consistent with observation of the present bridge condition. This rate of corrosion is equal to 0.001 inch over a two-year period. Further, in considering the use going forward as a pedestrian bridge, it would be realistic to expect that this bridge will not be subject to deicing salts. The NSBA Design Handbook references the 1960's ASTM study that indicates that salted road environments will produce corrosion rates similar to marine environments of approximately 1000 micrometers over a two- year period. Therefore, a conclusion can be drawn that the corrosion rate of this structure will be significantly less than would be expected if this bridge were used as a vehicular bridge. Using a corrosion rate of approximately 30 micrometers per year, it would take approximately 60 years to achieve a section loss of 1/16 of an inch. Given the absence of a painting program for this bridge and the fact that there is not significant section loss to the majority of the main truss members, a conclusion could be drawn that the aforementioned corrosion rate would occur if the bridge remained unpainted.

Future maintenance of the structure would include sweeping the deck, graffiti removal, replacement of the deck wearing surface every 20 years, and normal bridge inspections. This structure would not be exposed to deicing salts so the need to flush the deck and joints would not be needed. In addition, future spot painting or repainting of the entire structure would not be required.

This alternative rehabilitation approach then would consist of performing the following work on this structure to restore it for use as a non-vehicular bridge, and minimize future maintenance:

- Eliminate the stringers to reduce the potential for future degradation of steel elements below the deck.
- Use a laminated timber deck spanning from floor beam to floor beam, with a clear width of 14 feet, capable of supporting the pedestrian live loads and maintenance vehicles without the need for stringers.
- Replace the floor beams.
- Repair the piers and abutments.
- Replace the lower chord bracing to provide adequate lateral support of the truss.
- Replace the bearings.
- Remove any remaining lead based paint.
- Retain the existing gusset plates with the provision for removing the pack rust only from those that require pack rust removal.

Table 1. Effect of Alternatives

		1. Full-scope rehabilitation (five spans)	2. Reduced-scope rehabilitation (five spans)	3. Removal of historic bridge (and new construction)	4. Alternative rehabilitation approach
Character-defining features	**Camelback truss design and construction**	Truss design is retained for original five-span configuration.	Truss design is retained for original five-span configuration.	Truss design is not retained.	Truss is retained for original five-span configuration.
	Truss members	Truss members are rehabilitated or replaced in-kind for five spans. Lower chords and connections replaced.	Truss members are rehabilitated or replaced in-kind for five spans. Elements of Span 5 lower chord may be replaced with minimal alteration to the truss.	No truss members are retained.	Truss members remain intact except for Span 5 lower chord replacement.
	Riveted connections	Rivet replacement follows rivet/bolt matrix for five spans.	Rivet replacement follows bolt/rivet matrix for five spans.	No riveted connections retained.	Riveted connections retained except for Span 5, which follows rivet/bolt matrix.
Historic fabric	**Railing**	Original railing removed and replaced with new railing.	Original railing removed and replaced with new railing.	Original railing removed.	Original railing removed and replaced with new railing.

Table 1. Effect of Alternatives

		1. Full-scope rehabilitation (five spans)	2. Reduced-scope rehabilitation (five spans)	3. Removal of historic bridge (and new construction)	4. Alternative rehabilitation approach
Historic Fabric	**Deck**	Existing deck replaced with new deck.	Existing deck replaced with new deck.	Deck is removed.	Existing deck replaced with new deck.
	Floor system	Existing floor system replaced with new floor system, partially in-kind.	Existing floor system replaced with new floor system, partially in-kind.	Floor system is removed.	Existing floor system replaced with new floor system, partially in-kind.
	Substructure	Original substructure is partially reconstructed.	Original substructure is rehabilitated.	Original substructure is removed.	Original substructure is rehabilitated.
Compliance with Standards		Rehabilitation of character-defining features (five truss spans). May not comply with Standards if members of the truss are replaced when repair is possible.	Rehabilitation of character-defining features (five truss spans) is completed in compliance with Standards.	No compliance with Standards.	Rehabilitation of character-defining features (five truss spans) is completed in compliance with Standards.
Section 106		Possible adverse effect	No adverse effect	Adverse effect	No adverse effect
Section 4(f) effect		Possible Section 4(f) use	No Section 4(f) use	Section 4(f) use—Programmatic 4(f) for historic bridges applies	No Section 4(f) use

Table 1. Effect of Alternatives

	1. Full-scope rehabilitation (five spans)	2. Reduced-scope rehabilitation (five spans)	3. Removal of historic bridge (and new construction)	4. Alternative rehabilitation approach
Bridge construction cost estimate*	$8,119,000	$4,808,000	$3,245,000	$4,565,366
Maintenance cost estimate* (50 years)	$1,967,000	$6,225,000	$531,400	$670,000
Professional fees*	$1,860,000	$1,060,000	$570,000	$1,025,000
Total	$11,946,000	$12,093,000	$4,346,400	$6,260,366

***See KHA report and memo for details on cost estimates for Alternatives 1, 2 and 3. See Appendix B for Mead & Hunt cost estimate for Alternative 4.**

This conclusion reflects Mead & Hunt's evaluation of the four project alternatives related to their compliance with regulatory requirements. It provides guidance for the agencies as they make a decision on which project alternative to pursue. The FHWA, in consultation with SHPO and with input from Mn/DOT and the City, is responsible for making a determination under Section 106. FHWA also determines whether an alternative is prudent and feasible through its Section 4(f) evaluation.

Through the retention of character-defining features, Alternative 4 (alternative rehabilitation approach) and Alternative 2 (reduced-scope rehabilitation) would comply with the Standards and would be expected to garner a no adverse effect determination under Section 106 and a no Section 4(f) use under Section 4(f). Alternative 1 (full rehabilitation) may not comply with the Standards if members of the character-defining trusses, including lower chords and connections, that could be repaired are instead replaced. In this case, an adverse effect finding and determination of Section 4(f) use are possible. Alternative 3 (removal) would clearly result in an adverse effect and Section 4(f) use. The FHWA is responsible for making the final determinations.

Appendix A. Rivet/Bolt Connection Matrix

Rivet/Bolt Connection Matrix*				
Item/Location	**Rivet**	**HHB**	**BHB**	**Comment**
Lower chord repairs and gusset connections		**X**		All are below the deck
Floorbeam and stringer connections		**X**		All are below the deck
Top chord member (Shop-riveted with top plate and bottom lacing)			**X**	Button head facing down
Top chord gusset plate connections		**X**		
Truss vertical and diagonal members, above deck level (Shop-riveted lacing bars and batten plates to flange angles)	**X**			
Truss vertical and diagonal members, above deck level, gusset plate connections		**X**		
Truss verticals and diagonals below deck level		**X**		All are below deck
Portal diagonals (L0-U1) above deck. (Shop-riveted with top plate and bottom lacing)	**X**			
Portal diagonals (L0-U1) above deck, gusset plate connections		**X**		
Sway frames: lower horizontal strut	**X**			
Sway frames: diagonal members and top struts		**X**		
Portal frames at ends of truss spans: lower horizontal strut	**X**			
Portal frames at ends of truss spans: diagonal members and top struts		**X**		
Top lateral bracing		**X**		

HHB = Hex Head High Strength Bolt

BHB = Button Head Bolt (Tension Control)

** This matrix was developed for the Stillwater Lift Bridge and may not apply to all aspects of the Old Cedar Avenue Bridge. Specifically, BHB would be used for exposed bolt heads on the exterior of the structure as costs were estimated to be similar to HHB.*

Appendix B. Cost Estimate for Alternative Rehabilitation Approach

Alternative Rehabilitation Approach

Rehabilitation Bridge Cost Summary

Item Description		Cost
Substructure (Abutments)	$	55,200
Substructure (Piers)	$	662,160
Superstructure	$	1,066,500
Deck	$	739,250
Painting	$	343,070
Temporary Bridge	$	250,000
Subtotal	**$**	**3,116,180**
Mobilization @ 5%	$	155,809
Contingency @ 20%	$	623,236
Subtotal	**$**	**3,895,225**
Inflation @ 7.5% (1.5 yr @ 5%)	$	292,141
SUBTOTAL:	**$**	**4,187,366**
Approach Work		$353,000
Permitting		$25,000
Bridge Construction Cost Estimate		**$ 4,565,366**

Superstructure - Abutments

Item Description	Qty Unit	Item Qty	Unit Price	Amount
Concrete Surface Repair	SF	100	$ 100.00	$ 10,000
Clean & Seal Structural Cracks	LF	120	$ 80.00	$ 9,600
Concrete Removal	LF	52	$ 50.00	$ 2,600
Concrete Placement	CY	20	$ 1,500.00	$ 30,000
Excavation	CY	60	$ 50.00	$ 3,000
			Subtotal:	**$ 55,200**

Superstructure - Piers

Item Description	Qty Unit	Item Qty	Unit Price	Amount
Concrete Repair	SF	930	$ 200.00	$ 186,000
Sheet Piling	SF	11,904	$ 40.00	$ 476,160
			Subtotal:	**$ 662,160**

Alternative rehabilitation approach

Superstructure - Spans 1 to 5

Item Description	Qty Unit	Item Qty	Unit Price	Amount
Demolition (Floor system and railings)	EA	5	$31,300.00	$ 56,500
Temporary Truss Support and Jacking	EA	5	$65,000.00	$ 325,000
Bearing Replacement	EA	20	$ 3,750.00	$ 75,000
Lower chord Repair	LB	6,800	$ 8.00	$ 54,400
Temporary Lower chord Support	EA	4	$ 2,000.00	$ 8,000
Steel Floor Beams	LB	84,000	4.00	$ 336,000
Temporary Lateral Stabilization	EA	5	$10,000.00	$ 50,000
Bottom Lateral Bracing	LB	7,150	$ 4.00	$ 28,600
Lateral Bracing Gusset Plates	EA	90	$ 700.00	$ 63,000
Truss Member Straightening	EA	7	$10,000.00	$ 70,000
			Subtotal:	**$ 1,066,500**

Deck

Item Description	Qty Unit	Item Qty	Unit Price	Amount
Timber Deck Panel	Panel	40	$13,500.00	$ 540,000
Rail	LF	1,700	$ 100.00	$ 170,000
Bituminous Surface	Ton	225	$ 130.00	$ 29,250
			Subtotal:	**$ 739,250**

Painting

Item Description	Qty Unit	Item Qty	Unit Price	Amount
Lead Paint (Encapsulation)	SF	47,060	$ 2.00	$ 94,120
Paint New Steel	SF	0	$ 2.50	$ -
Clean & Paint (existing steel below the deck)	SF	19,150	$ 13.00	$ 248,950
			Subtotal:	**$ 343,070**

Minimal Rehabilitation Alternative						
Rountine Maintenance						
Item Description	**Action**	**Cost Per Event (2008 US$)**	**Years 2011 to 2026**	**Years 2026 to 2043**	**Years 2043 to 2060**	**50 Yr. Cost (2008 US$)**
Graffiti Removal & Vandalism Repair	Clean & Repair	$ 1,000.00	16	17	17	$ 50,000.00
Structural Inspection	Base Inspection	$ 5,000.00	12	13	12	$ 185,000.00
In-Depth Structural Inspection	4-Yr. Inspection	$ 10,000.00	4	4	5	$ 130,000.00
Sweep Clean Deck	Sweep	$ 700.00	16	17	17	$ 35,000.00
Bituminous Rehab	Crack Seal	$ 20,000.00	2	2	2	$ 120,000.00
Bituminous Reconstruct	Remove & Replace	$ 50,000.00	1	1	1	$ 150,000.00
		Projected Costs:	$ 1,115,200.00	$ 3,529,900.00	$ 1,379,900.00	$ 670,000.00
		Annualized Costs:	$ 124,500.00	$ -	$ -	$ 13,400.00