CITY OF ANN ARBOR, MICHIGAN

LOCAL BRIDGE PROGRAM FUNDING APPLICATION FOR PREVENTATIVE MAINTENANCE FOR THE E. MEDICAL CENTER DRIVE BRIDGE OVER THE WOLVERINE LINE

February 2017

Prepared by:

CITY OF ANN ARBOR
PROJECT MANAGEMENT SERVICES UNIT
PUBLIC SERVICES AREA
P.O. BOX 8647
301 E. HURON STREET
ANN ARBOR, MICHIGAN 48107-8647

CITY OF ANN ARBOR, MICHIGAN

LOCAL BRIDGE PROGRAM FUNDING APPLICATION
E. MEDICAL CENTER DRIVE BRIDGE OVER THE WOLVERINE LINE

FEDERAL STRUCTURE ID. NO. 814021200000R01 MDOT STRUCTURE NO. 11065

Introduction and Background

The E. Medical Center Drive Bridge over the Wolverine Line (formally known as the Norfolk Southern Railroad tracks) is a two-way, four-lane bridge that was built in 1982.

The three-span bridge was constructed with twelve, rolled-steel, wide flange, beams and a reinforced concrete deck with a latex-modified concrete overlay. The bridge length is approximately 160'-0" from reference line to reference line with an out-to-out width of 70'-11¼" and approximate skew of 36° left. The alignment of E. Medical Center Drive is in a horizontal curve over the bridge. The cross-section includes two sidewalks, four lanes of traffic (three northbound and one southbound lane), and 3-tube, concrete parapet mounted, railings. The clear roadway width is 47'-0". Expansion joints are located over both piers.

The existing substructure consists of two stub abutments and two round column bent piers. In accordance with the existing bridge plans, the abutment substructure units are supported on piles and the two piers are supported on spread footings. **The Federal Sufficiency Rating of the bridge is 75.2.**

Structure Condition

This structure is generally in fair condition. There are approximately 1,107 ft^2 (≈ 9.8% of the deck area) of delaminated and spalled areas. The north span has the largest concentration of spalled areas with approximately 29.4% of the north span being spalled and delaminated. The bottom side of the bridge deck has approximately 5% of the total area consisting of spalls (some with exposed reinforcement), delaminations, cracks with moisture and efflorescence, and rust stains. In order to better determine the amount of delaminated areas, we utilized infra-red thermal scanning technology in 2013 and again hand-sounded the deck in 2015 to locate and define the extent of delaminated areas.

The paint system has failed. The expansion joints located over the piers are in poor condition. The glands in the expansion joints are torn and debris-filled. The joints leak causing corrosion at the beam ends and ponding water on the pier caps. The beam ends at the expansion joints are corroding, but there is no measurable section loss. The end diaphragms under the expansion joints also have corrosion without measurable section loss.

The bridge abutments are in good condition. The abutments have hairline cracks, but no delaminations were found. The abutments are covered in graffiti.

The piers are in fair condition. The south pier has a total of 18 areas of delaminations totaling 262 ft^2; the north pier has 12 areas of delaminations totaling 283 ft^2. The lower half of the piers are covered in graffiti. It appears that the northerly pier's cap must be replaced.

The bridge railings are in fair condition with vertical cracking at approximately 5' increments. The northeast, northwest, and southeast rail end walls have spalled concrete and exposed anchor bolts. The exposed bolts have rusted.

Economic Importance of Structure

The E. Medical Center Drive Bridge over the Wolverine Line carries vehicular and pedestrian traffic in a north-south direction. E. Medical Center Drive serves as the main entrance into the University of Michigan's Medical Center. E. Medical Center Drive also connects to Fuller Road and is aligned directly opposite Maiden Lane.

The University of Michigan's Medical Center is located immediately south of the E. Medical Center Drive bridge. The Fuller Road/Maiden Lane/E. Medical Center Drive intersection and the bridges that link to it essentially serves as the main entrance in the medical center. The medical center receives about **35,000 visitors, patients, and employees each day** and has revenues of **$3 billion dollars** each year. Access to the hospital must be preserved. E. Medical Center Drive directly links to one of two access points to the University Hospital System's Wall Street District which is home to the W. K. Kellogg Eye Center, the University's Department of Opthamology, one 500-600 car parking lot and a second proposed 500-600 car parking lot, and a proposed Transit Center that will shuttle patients and visitors between the Wall Street District facilities and the Medical Center. Attached, please find a graphic representation of the University's Medical Campus and its relation to the E. Medical Center Drive Bridge (please see Figure 18.)

Average Daily Traffic

The average daily traffic for E. Medical Center Drive at this bridge is 17,220 vehicles per day (2014 counts). Over 325 pedestrians cross Fuller Road at the E. Medical Center/Maiden Lane intersection during each peak hour.

Maintenance Work Performed and Design Deficiencies

To date, no significant maintenance work has been performed on this structure.

Anticipated Repair Methodology

The bridge is planned to have all steel beams, diaphragms, and cross braces cleaned and re-coated. The northerly pier cap is proposed to be removed and replaced. The expansion joints will be removed and replaced. At this time it is not believed that any of the beams ends will require significant steel repairs, however, some diaphragms under the expansion joints may need to be replaced depending upon their condition upon further inspection. The latex modified concrete wearing surface is planned to be removed and replaced (shallow overlay.) The guardrails will be

upgraded to meet current standards and overgrown brush will be removed from around the perimeter of the bridge. The current barrier and railing configuration on the outside edges of the bridge does not meet current NCHRP 350 crash requirements, however we do not have any crash history on this bridge that suggests their removal and replacement is warranted. Consequently, we will remove the railing elements and have them re-galvanized and painted as were the recently rehabilitated railings on the nearby Fuller Road and Maiden Lane bridges.

Bridge Posting

The bridge is not posted and can carry all legal live loads.

Effects of Bridge Closure

Since the bridge is not posted and can carry all legal live loads and the scope of work that is currently being planned is preventative maintenance, closure of this structure for the foreseeable future is not likely. However, if this bridge were to close, significant disruption to the operation of the medical center would occur. This would include the majority of the 35,000 daily visitors, patients, and employees and significant disruption to the transit operations of the Ann Arbor Transportation Authority that service the Medical Center. The shortest detour route length would be approximately 0.90 miles. Additionally, travel time to, and ingress and egress from, the Medical Center would be greatly increased as the other access points into the medical center are not designed to accommodate the large number of vehicles, busses, and pedestrians that would be forced upon them. Further, emergency access and emergency and scheduled ambulance trips into and out of the medical center would be significantly impacted as well. Without doubt, the operation of the Medical Center and the Wall Street District would be impacted to a large degree.

Local Agency Contact

Michael G. Nearing, P.E.
Senior Project Manager, Project Management Services Unit
City of Ann Arbor, Public Services Area

(734) 794-6410 ext. 43635

Estimated Preventative Maintenance Costs

The estimated cost for the planned preventative maintenance for the E. Medical Center Drive Bridge over the Wolverine Line tracks is **$1,918,000**. A breakdown of the estimated cost is listed below (which includes inflation at 3% per year and railroad flagging costs):

1. Design Engineering		$ 100,000
2. Construction Engineering		$ 300,000
	Sub-total	$ 400,000
A. Approach Construction		$ 518,000
B. Structure Construction		$ 1,000,000
	Sub-total	$ 1,518,000
	Grand Total:	**$1,918,000**

List of Figures

E. Medical Center Drive over the Wolverine Line

Figure 1 East Elevation Looking West

Figure 2 Deck Delaminations in North Span (looking north)

Figure 3 Deck Delaminations in Center Span (looking north)

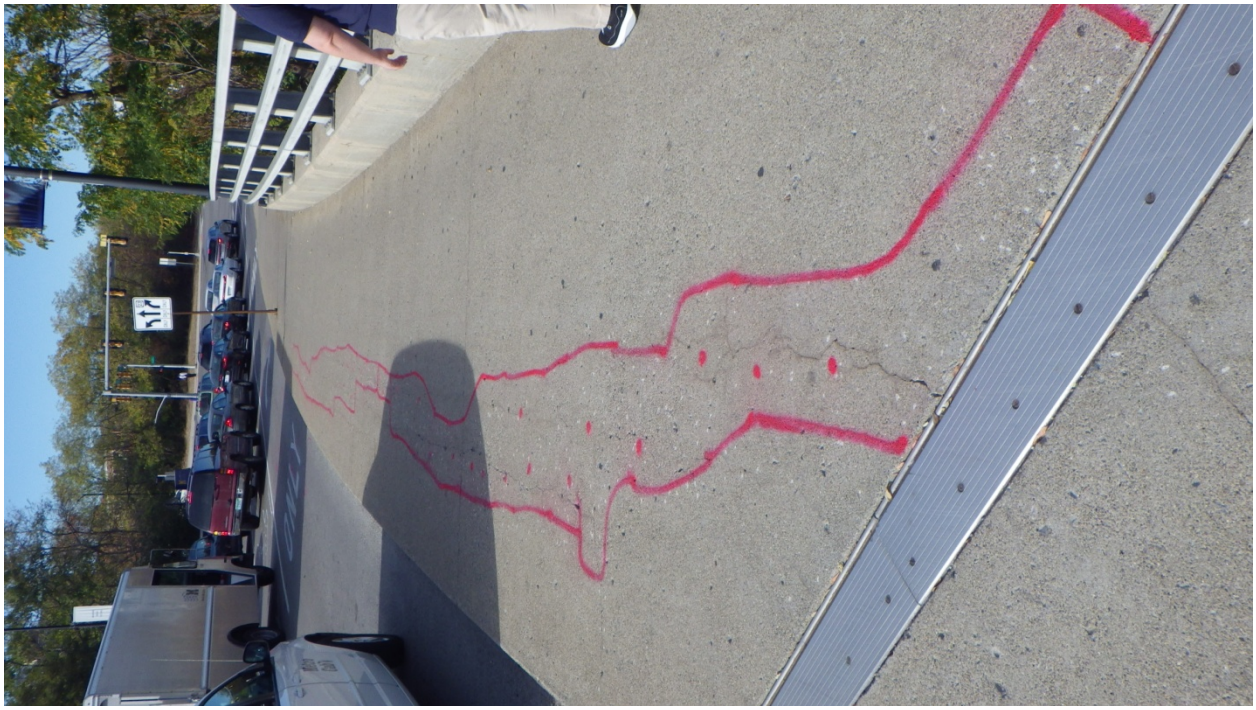

Figure 4 Sidewalk Delaminations on east sidewalk

Figure 5 Moisture and Cracking in Bottom of Deck, Span 3

Figure 6 Full Depth Cracks with Moisture, Leaching, and Rust Stains

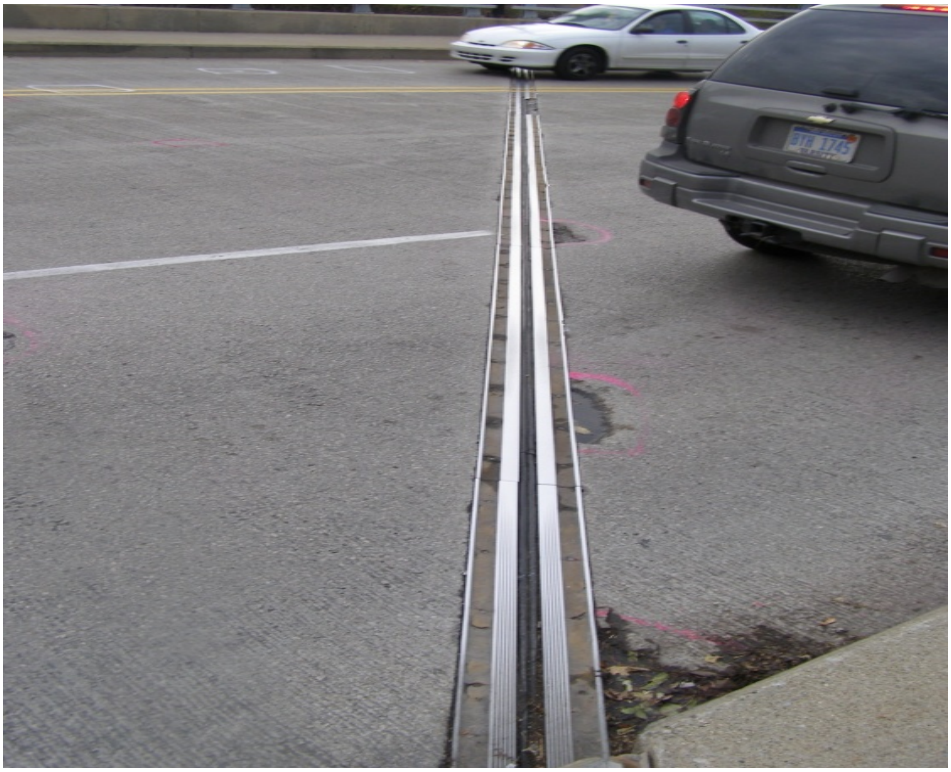

Figure 7 Spalling along South Expansion Joint (looking west)

Figure 8 North Approach (looking north)

Figure 9 End Diaphragm and Beam End Surface Rusting and Paint Failure, Pier 2

Figure 10 Typical Paint Failure

Figure 11 Paint Failures at bottom flange of beams

Figure 12 Cracked Pier Cap (North Pier (Pier 2))

Figure 13 Delamination on South Side of South Pier (Pier 1)

Figure 14 Delaminations on South Side of North Pier (Pier 2)

Figure 15 Typical heavy vegetation surrounding bridge

Figure 16 Typical railing end block failures

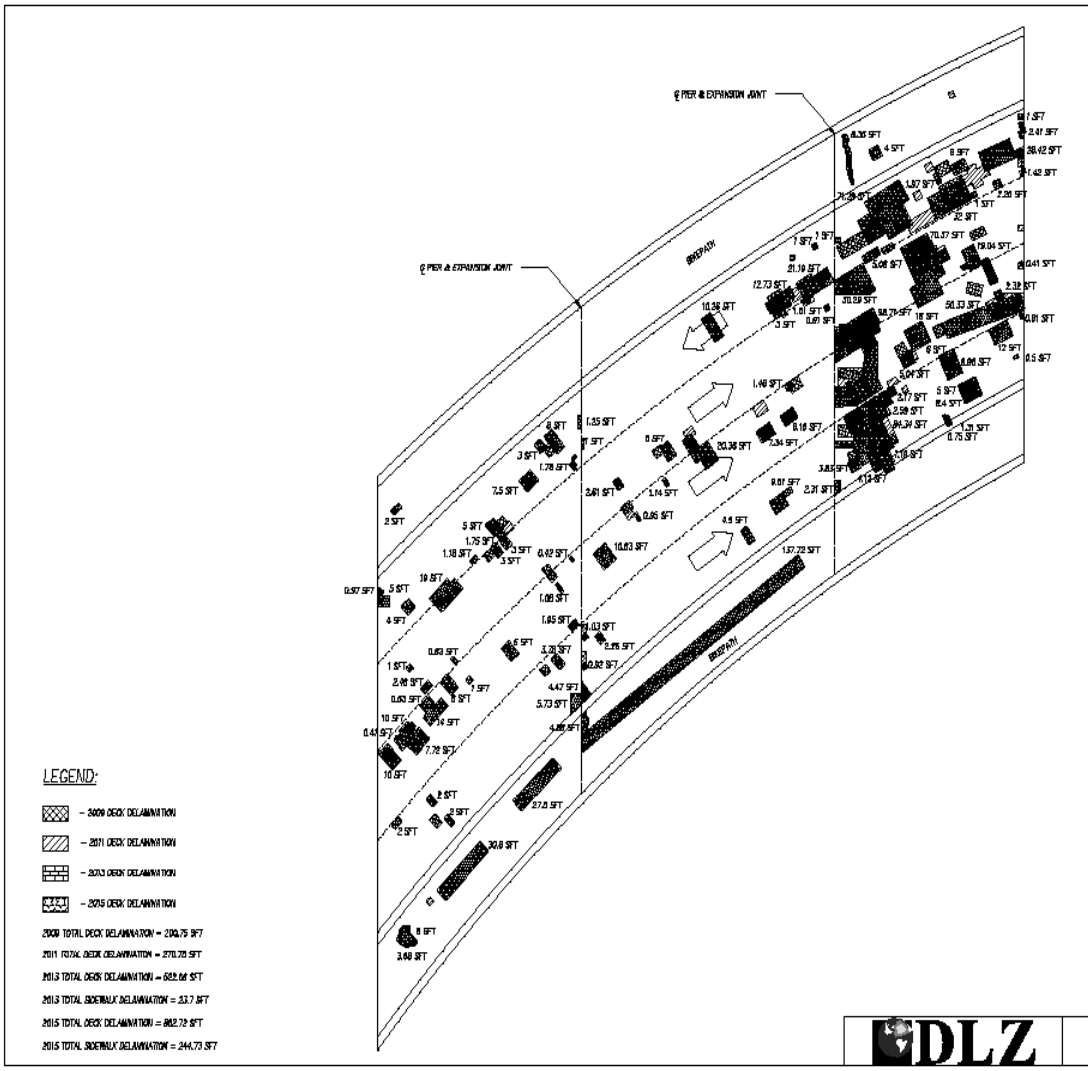

Figure 17 2015 Bridge Deck and Sidewalk Delamination Survey

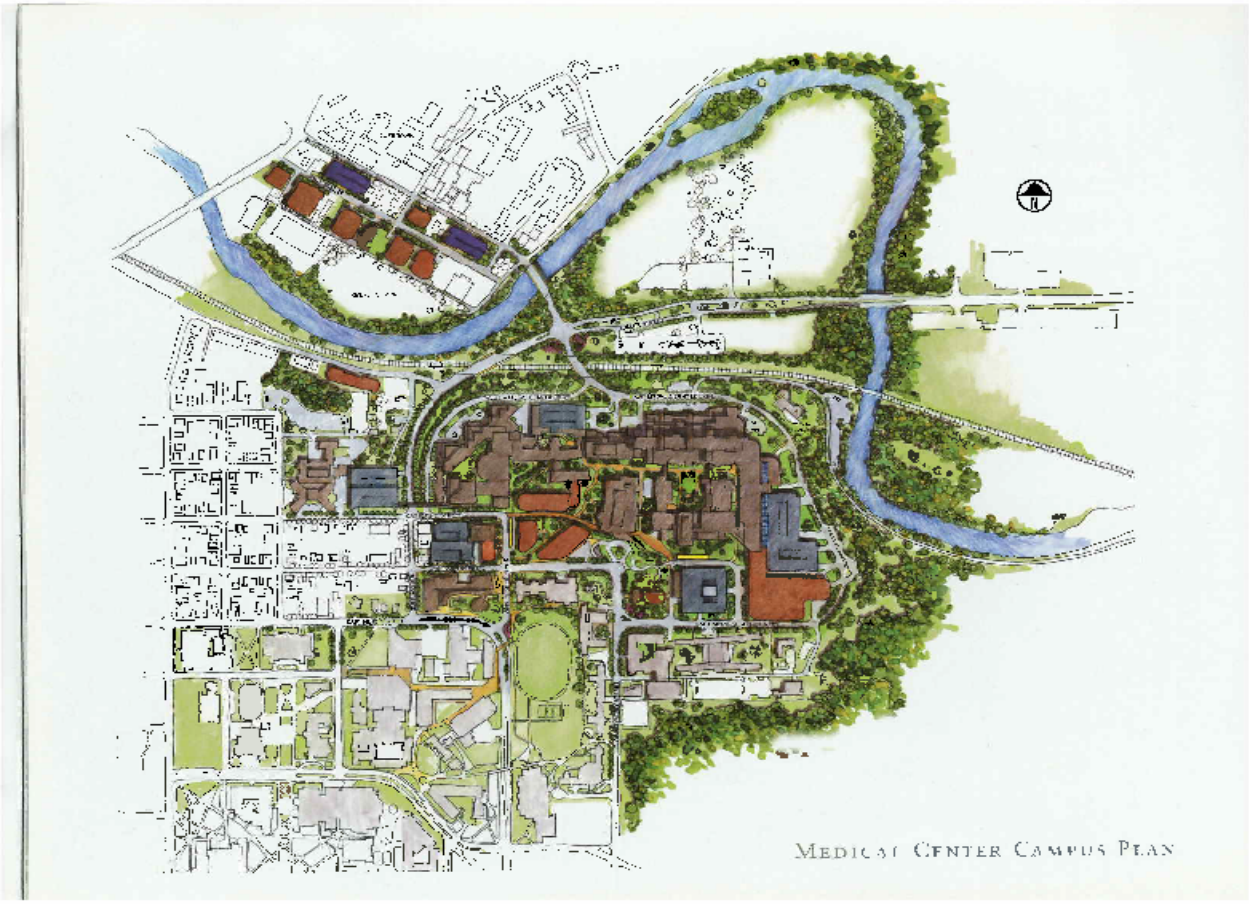

Figure 18 Medical Center Campus Plan