2012
BRIDGE INSPECTION PROGRAM

TREATMENT PLANT DRIVE OVER HURON RIVER

CITY OF ANN ARBOR

Prepared by
DLZ Michigan, Inc.
1425 Keystone Avenue
Lansing, MI 48911

January 24, 2013

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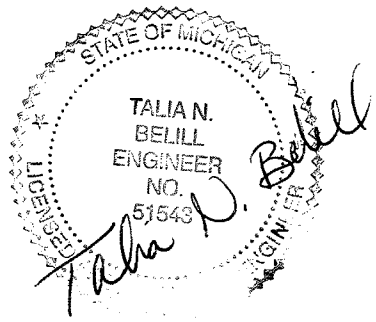

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State of Michigan No. 51543

DLZ

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Structure Description

The existing bridge carrying Treatment Plant Drive over the Huron River is located in the City of Ann Arbor, Michigan. Treatment Plant Drive is the only access road to the wastewater treatment plant. This two lane road dead ends into the treatment plant and is located east of South Dixboro Road.

The two span bridge was constructed in 1934 with three rolled steel wide flange beams and reinforced concrete deck. The bridge spans 117'-1" from reference line to reference line with an out-to-out width of 18'-6". The cross section includes one lane of traffic and an open concrete parapet railing with a single aluminum rail mounted on top. The clear roadway width is 16'-0". There is an expansion joint located over the pier.

The existing substructure is supported by full height reinforced concrete abutments with straight wingwalls, and one wall pier. All of the substructure elements are supported on piles based on the existing bridge plans.

The bridge was rehabilitated in 2000. The bridge deck was overlaid, the bridge railings and guardrail were replaced, the expansion joints were replaced, and the substructure was patched.

Inspection Findings

The bridge was inspected on October 14, 2012. The overall condition of the structure is fair.

Deck

The concrete deck is in fair condition. There are multiple cracks, delaminations, spalls, and concrete patches present, totaling approximately 8.5% of the deck area (Photos 7-12). The bottom side of the deck has over 5% of the total area containing transverse and longitudinal cracks with efflorescence, some delaminations, and rust stains (Photos 17-19).

Stringers

The existing structural steel is in good condition (Photo 20). There is surface rust on the fascia beams and at the beam ends. Minor coating failure, but primary members retain section properties (Photo 21). The beams are simple spans that are fixed at the pier. The beam ends are in contact with one another at the pier (Photos 23-25). There are no signs of overstress caused by the beam ends in contact during expansion times (warm weather).

The utility diaphragms located at the pier have heavy rusting and holes in the web (Photo 22).

There is evidence of leaking at all joints. The bearings at the abutments are corroded from water penetration (Photos 26-28). The beam ends and bearings at the piers also exhibit surface corrosion caused from moisture. (Photos 23-25).

Abutments

The existing superstructure is supported on full-height concrete abutments with wingwalls that are pile supported. The abutments are in fair condition. The west abutment has vertical cracking and a 1 sft delamination under the center beam (Photos 29 and 32). There are minor spalls and delaminations totaling 5 sft along the north wingwall vertical joint (Photos 30 and 31). There is a 2sft delamination on the abutment at the northwest wingwall. The west backwall has minor cracking at the utility conduits.

The east abutment has vertical cracking and a 1 sft delamination under the center beam (Photo 33). There are minor cracks under the bearings. The southeast cheekwall has a horizontal crack at the abutment (Photo 34). There is a large gap between the abutment and south wingwall with vegetation. There is 1 sft of spalled concrete along the abutment at the south joint. There are spalls in the northeast abutment corner. The east backwall has minor cracking, spalls and delaminations totaling 2sft (Photo 36). Minor delaminations were found on the west and east abutments totaling 8sft and 4sft, respectively.

Piers
The wall pier, which is supported on piles, is in fair condition. When the structure was rehabilitated in 2000 concrete patches were placed at the water line where concrete had spalled. The patches located at the waterline have spalled (Photos 41 and 42).

There are five delaminated areas on the east side of the pier totaling 34 sft (Photo 43). There is spalled concrete under the south fascia beam (Beam B3) (Photo 44). There are two spalled areas at the waterline, one of which has exposed reinforcement (Photos 45 and 46).

On the west side of the pier, there are four areas of delaminated and spalled concrete totaling 76 sft (Photo 37). Two areas are located in previous patched areas at the waterline (Photos 41 and 42). The southwest portion of the pier cap is spalled with exposed, rusted reinforcing steel (Photos 38 and 39). The concrete remaining on the pier cap under the south fascia bearing is delaminated.

The upstream (north) pier end is delaminated (Photo 40). The pier delaminations and spalls total 110sft which is approximately 20% of the total exposed pier surface.

Miscellaneous Findings
There is heavy vegetation present adjacent to the structure.

See Appendix A for the updated Bridge Safety Inspection Report which details the condition of numerous bridge elements.

Bridge Compliance with Current Standards

The bridge has the following features that do not meet current standards:

- Clear Roadway Width (less than 18'):
  - If operating as a two-lane bridge, the proper signs should be placed to inform drivers of a narrow bridge crossing.
  - If operating as a one-lane bridge, the proper signs should be placed to inform drivers of the one-lane bridge crossing.

Load Rating Analysis

DLZ reviewed the load rating calculations performed in 2008. The condition of the structure has not changed since the last load rating; therefore, DLZ concurs with the previous load rating analysis. We concur with the previous findings that Treatment Plant Drive Bridge has capacity to carry any legal live load and the bridge does not require live load restrictions.

Streambed Cross-Sections

Streambed cross-sections were obtained during this inspection cycle. See Appendix E for the streambed data and graphs. These streambed cross-sections will serve as a datum for comparing streambed movement during future inspections cycles.

Recommendations

The inspection of the Treatment Plant Drive Bridge found the structure to be in fair condition. There are some repairs that should be completed in order to extend the lifespan of the structure. DLZ completed two cost estimates with recommendations listed below. Recommendations listed below are prioritized with low, medium, high priority:

Option 1: Deck patching, joint repairs, and substructure repairs

- Obtain underwater inspection of Abutments and Piers every 5 years (High).
- Obtain river cross-sections to chart streambed movement in two inspection cycles. MDOT recommends cross-sections are graphed every other cycle or 4 years (High).
- Patch the spalled and delaminated exposed areas of the substructure during low water. Repairing the pier cap spalls under the south fascia beam at the bearing is a critical repair item (High).
- Perform deck patching and joint repair at the expansion joint which shows evidence of leaking. Deck patching will extend the life of the deck 3 to 10 years (Medium).
- Remove vegetation overgrowth (Low).

According to MDOT's Bridge Deck Preservation Matrix, for a structure with a deck surface rating of 5 with less than 10% deficiencies and a bottom surface rating of 5, the recommended repair option is deck patching. Deck patching and joint repair can be performed while maintaining access to the Wastewater Treatment Plant (WWTP). Treatment Plant Drive is the only access road into and out of the plant. Maintaining access to the plant is required. The repairs can be coordinated with the WWTP to be performed on the weekends between shift changes and trucks. High early strength concrete will be required. Deck patching will extend the service life 3 to 10 years. The shallow overlay performed in 2000 met its life expectancy of 10 to 15 years. This repair should be performed within the next 5 years.

The spalled and delaminated pier cap requires hand chipping, possibly placement of new reinforcing steel, the placement of embedded galvanic anodes, and concrete placement. The spalled and delaminated area extends from under the south fascia beam (Beam B3) to the end of the cap. To perform this repair, temporary support of the south fascia beams will be required. Embedded galvanic anodes are typical on repairs where new and old concrete as well as reinforcement are joined. Anodes are recommended in the areas of substructure and joint repairs because the bridge repair service life is greater than 10 years.

Concrete spalls at the waterline are areas of previous repairs that should be patched again to protect the structural integrity of the pier. It is difficult to assess if the spalls extend to the streambed or are concentrated at the waterline elevation. However, if the deck and superstructure are in place, a cofferdam cannot be driven using conventional methods. It is impractical to repair the pier when water levels are low since the Huron River water levels are controlled by a dam at this location. Therefore, it will be difficult to patch the spalls along the waterline and impossible to repair the concrete below the water line without installing a cofferdam to allow for dewatering.

When wading depths are exceeded, an underwater inspection of the substructure units is required by the National Bridge Inspection Standards at a maximum frequency of 5 years. Streambed cross-sections indicate that the water depth varies from 3 feet to 10 feet. This warrants an underwater inspection.

Streambed cross-sections were obtained during this inspection cycle. To comply with MDOT recommendations, these should be surveyed in 4 years.

There is tree and vegetation growth surrounding the abutments. They should be removed to prevent the trees and vegetation from trapping moisture against the concrete substructures and steel beams.

Option 2: Structure widening and existing deck replacement, painting, and substructure repairs

- Obtain underwater inspection of Abutments and Piers every 5 years (High).
- Obtain river cross-sections to chart streambed movement in two inspection cycles. MDOT recommends cross-sections are graphed every other cycle or 4 years (High).
- Patch the spalled and delaminated areas of the substructure. Repairing the pier cap spalls under the south fascia beam at the bearing is a critical repair item (High).
- Replace bearings (High).
- Perform a deck and substructure widening in order to maintain traffic and replace the existing deck and railings (Low).
- Paint structural steel (Low).
- Remove vegetation overgrowth (Low).

DLZ is recommending structure widening and existing deck replacement occur in the next 10 years which is considered a low priority at this time. According to MDOT's Bridge Deck Preservation Matrix, for a structure with a deck surface rating of 5 with less than 10% deficiencies and a bottom surface rating of 5, the recommended repair option is deck patching. However, there are other factors to consider when recommending a deck repair. DLZ would typically recommend a deep concrete overlay but maintenance of traffic would not be possible for that type of rehabilitation. The challenge of maintaining access into the WWTP at all times requires a larger scope of work. In order to maintain access, the superstructure and substructure units must be widened approximately 17'. Based on the Washtenaw County Parcel information, the existing right-of-way (ROW) on Treatment Plant Drive is 55' (27.5' from the ROW/road centerline). The structure widening can occur within the existing ROW, but a temporary grading permit will likely be required. The widened bridge will be approximately 26.25' from the centerline since the existing bridge width is approximately 9.25' from centerline, plus the minimum widening of 17' which is required to maintain traffic.

After the bridge has been widened, the existing utilities could be relocated and supported by the new portion of the bridge. This could be accomplished with minimal disruption. After the utilities have been relocated, a conventional cofferdam could be installed to allow for dewatering at the pier for the concrete repairs.

Beyond the deck condition and geometric constraints, the existing structural steel has surface rust which is the beginning sign of paint system failure. Each bay and fascia conveys utilities across the structure. The beams are difficult to access due to utilities for painting. Removal of the deck will assist with painting. If the deck is removed and the utilities relocated to the new portion of the bridge, the beams could be temporarily moved off the substructure to be cleaned

and coated while the bearings and sole plates are replaced. The bearings are rated a 5 due to pack rust, exposed shims, and deterioration. There is no method for repairing the bearings. Bearing replacement can only be accomplished by raising the beams. If this were to be done with the deck patching option, the raising of the beams through the use of jacks would damage concrete in the deck and backwalls. With the structure widening, the deck and beams would be removed. The backwalls would be cut down and the bearing assemblies could be easily replaced.

The structure widening and existing deck replacement, structural steel painting, bearing replacement, and utility relocation do not have to be performed immediately, but when performed it will increase the life of the structure by over 40 years. This repair should be performed within the next 10 years. For planning purposes, the cost estimate for repair option 2 assumes the repair will be performed in the year 2020.

Repairing the pier cap spalls under the south fascia beam at the bearing is an immediate repair item. The spalled and delaminated pier cap requires hand chipping, possibly placement of new reinforcing steel, the placement of embedded galvanic anodes, and concrete placement. The spalled and delaminated area extends from under the south fascia beam (Beam B3) to the end of the cap. To perform this repair, temporary support of the south fascia beams will be required. Embedded galvanic anodes are typical on repairs where new and old concrete as well as reinforcement are joined. Anodes are recommended in the areas of substructure and joint repairs because the bridge repair service life is greater than 10 years. This repair should be made now, while the concrete spall repairs at the waterline areas can be repaired at the time of the structure widening and existing deck replacement.

When wading depths are exceeded, an underwater inspection of the substructure units is required by the National Bridge Inspection Standards at a maximum frequency of 5 years. Streambed cross-sections indicate that the water depth varies from 3 feet to 10 feet. This warrants an underwater inspection.

Streambed cross-sections were obtained during this inspection cycle. To comply with MDOT recommendations, these should be surveyed in 4 years.

There is tree and vegetation growth surrounding the abutments. They should be removed to prevent the trees and vegetation from trapping moisture against the concrete substructures and steel beams.

Summary of Repair Costs

A breakdown of the cost of the recommended repairs is shown in Appendix C. The estimated cost for repair option 1 is $77,000, which includes deck patching, substructure repairs, joint replacement, and removal of vegetation to be performed in year 2013. The estimated cost for repair option 2 is $1,649,000, which includes structure widening and existing deck replacement, bearing replacement, structural steel painting, utility relocation, substructure repairs, and removal of vegetation to be performed in year 2020.

Appendix A

SI&A and BSIR Forms

Form 1717A-01/2002

Michigan Department of Transportation
Structure Inventory and Appraisal

MDOT Bridge ID	Control Section
8102125 0000000B01	8102125 0..

NBI Bridge ID	Struct Num	Region	TSC	County	City Resp	City Location	7- Facility Carried
815021200000B01	11078	06	6B	81	212	212	TREATMENT PLANT ..

6- Feature Intersected	9- Location	Latitude	Longitude	Owner	Maint Resp
HURON RIVER	0.5 MI E US-23	42 16' 13.22"	83 40' 4.25"	4	4

Bridge History, Type, Materials

27 - Year Built	1934	
106 - Year Reconstructed	1985	
202 - Year Painted	1986	
203 - Year Overlay	2000	
43 - Main Span Bridge Type	3	02
44 - Appr Span Bridge Type		
77 - Steel Type	1	
78 - Paint Type	9	
79 - Rail Type	6	
80 - Post Type	2	
107 - Deck Type	1	
108A - Wearing Surface	3	
108B - Membrane	0	
108C - Deck Protection	1	

Structure Dimensions

34 - Skew	37	
35 - Struct Flared	0	
45 - Num Main Spans	2	
46 - Num Apprs Spans	0	
48 - Max Span Length	59.1	
49 - Structure Length	117.1	
50A - Width Left Curb/SW	0	
50B - Width Right Curb/SW	0	
33 - Median	0	
51 - Width Curb to Curb	16.0	
52 - Width Out to Out	18.37	
112 - NBIS Length	Y	

Inspection Data

90 - Inspection Date	10/14/2012	
91 - Inspection Freq	24	
92A - Frac Crit Req/Freq	N	
93A - Frac Crit Insp Date		
92B - Und Water Req/Freq	N	
93B - Und Water Insp Date		
92C - Oth Spec Insp Req/F..	N	
93C - Oth Spec Insp Date		
176A - Und Water Insp Met..		
58 - Deck Rating	5	
58A - Deck Surface Rtg	5	
59 - Superstructure Rating	7	
59A - Paint Rating	5	
60 - Substructure Rating	5	
61 - Channel Rating	6	
62 - Culvert Rating	N	

Navigation Data

38 - Navigation Control	0
39 - Vertical Clearance	0
40 - Horizontal Clearance	0
111 - Pier Protection	
116 - Lift Brdg Vert Clear	

Route Carried By Structure(ON Record)

5A - Record Type	1	
5B - Route Signing	5	
5C - Level of Service	0	
5D - Route Number	00000	
5E - Direction Suffix	0	
10L - Best 3m Unclr-Lt	0	0
10R- Best 3m Unclr- Rt	99	99
PR Number		
Control Section	0	
11- Mile Point	0.0	
12- Base Highway Network	0	
13- LRS Route-Subroute	000..	-
19- Detour Length	125	
20- Toll Facility	3	
26- Functional Class	19	
28A - Lanes On	2	
29 - ADT	75	
30 - Year of ADT	2002	
32- Appr Roadway Width	20.0	
32A/B - Ap Pvt Type/Width	4	20.0
42A- Service Type On	1	
47L - Left Horizontal Clear	0.0	
47R- Right Horizontal Clear	16.4	
53- Min Vert Clr Ov Deck	99	99
100- STRAHNET	0	
102 - Traffic Direct	3	
109 - Truck %	10	
110 - Truck Network	0	
114 - Future ADT	75	
115 - Year Future ADT	2022	
Freeway	0	

Structure Appraisal

36A- Bridge Railing	0
36B-Rail Transition	1
36C- Approach Rail	1
36D- Rail Termination	1
67- Structure Evaluation	5
68- Deck Geometry	3
69- Underclearance	N
71- Waterway Adequacy	9
72- Approach Alignment	8
103- Temporary Structure	
113- Scour Criticality	8

Miscellaneous

37- Historical Significance	5
98A- Border Bridge State	
98B- Border Bridge %	
101- Parallel Structure	N
EPA ID	
Stay in Place Forms	

Route Under Structure(UNDER Record)

5A - Record Type		
5B - Route Signing		
5C - Level of Service		
5D - Route Number		
5E - Direction Suffix		
10L - Best 3m Unclr-Lt		
10R- Best 3m Unclr- Rt		
PR Number		
Control Section		
11- Mile Point		
12- Base Highway Network		
13- LRS Route-Subroute		
19- Detour Length		
20- Toll Facility		
26- Functional Class		
28B - Lanes Under		
29 - ADT		
30 - Year of ADT		
42B- Service Type Under	5	
47L - Left Horizontal Clear		
47R- Right Horizontal Clear		
54A - Left Feature	N	
54B- Left Underclearance	99	99
54C- RIght Feature	N	
54D- Right Underclearance	99	99
Under Clearance Year		
55A - Reference Feature	N	
55B- Right Horiz Clearance	0	
56- Left Horiz Clearance	0	
100- STRAHNET		
102 - Traffic Direct		
109 - Truck %		
110 - Truck Network		
114 - Future ADT		
115 - Year Future ADT		
Freeway		

Proposed Improvments

75 - Type of Work	35	1
76- Length of Improvement	117	
94- Bridge Cost	77	
95- Roadway Cost		
96- Total Cost	77	
97- Year of Cost Estimate	2013	

Load Rating and Posting

31- Design Load	0	
41- Open, Posted, Closed	A	
63- Oper Rtg Method	1	
64F- Fed Rtg Method	86.7	
64M- Mich Oper Rtg	9	126
65- Inv Rtg Method	1	
66- Inventory Load	51.3	
70- Posting	5	
141- Posted Loading		
195- Analysis ID		
193- Overload Class		

Facility	Federal Structure ID	Inspector Name	Agency/Consultant	Inspection Date
TREATMENT PLANT DR	815021200000B01	Talia Belill	DLZ Michigan	10/14/2012

Feature	Latitude	Longitude	Struc Num	Insp Freq	Insp Key
HURON RIVER	42 16' 13.22"	83 40' 4.25"	11078	24	NYAH

Location	Length	Width	Year Built	Year Recon	Br Type	Scour Eval	No.Pins
0.5 MI E US-23	117.1	18.37	1934	1985	3	02 8	

Legend	
9	New
7-8	Good
5-6	Fair
3-4	Poor
2 or Less	Critical

NBI INSPECTION

	08	10	12	
1. Surface SIA-58A	5	5	5	Multiple cracks, delaminations, spalls, and concrete patches are present. (12) Multiple cracks, delaminations, spalls, and concrete patches are present. (10) Cracks, delaminated areas, and old concrete patches were present. Delaminated areas totaled approximately 3% of the deck area. (08)
2. Expansion Jts	8	7	7	Debris present. Rust on beam ends indicate joint leakage. (12) Debris present. Evidence of leaking at pier. (10) Some accumulated debris in expansion joints. (08)
3. Other Joints	6	6	6	Broken and delaminated concrete at joints at abutments. (12) Evidence of leaking at abutments. (10) Some broken concrete along deck joints over abutments. (08)
4. Railings	8	8	8	Railing is in good condition, but does not meet current standards. (12) Railing is in good condition, but does not meet current standards. (10) No deficiencies noted. (08)
5. Sidewalks or curbs	N	N	N	(12) (10) (08)
6. Deck Bottom Surface SIA-58B	6	5	5	Several transverse and longitudinal cracks with efflorescence. Some areas of minor delaminations. (12) Evidence of leaking at all joints, especially over the pier. Several transverse and longitudinal cracks with efflorescence. (10) Bad area over the pier plus a couple other areas throughout the rest of the deck. Several cracks w/ efflorescence. (08)
7. Deck SIA-58	6	5	5	Multiple cracks, delaminations, spalls, and concrete patches are present. Delaminations total 8.5% of deck area. Several transverse and longitudinal cracks with efflorescence present at underside of deck. (12) Multiple cracks, delaminations, spalls, and concrete patches are present. Delaminations total 8.5% of deck area. Several transverse and longitudinal cracks with efflorescence present at underside of deck. (10) (08)
8. Drainage				Ponding along south railing, west span. (12) (10) (08)
9. Stringer SIA-59	7	7	7	Surface rust at beam ends and along fascia beams. Minor rusting along all beams top flanges. The north and center fixed beam ends are in contact with each other at the pier. There is a minor gap between the fixed beam ends of the south beams. Utility supporting diaphragms at pier have holes in web. (12) Surface rust at beam ends and along fascia beams. Beam ends are in contact with each other at the pier. (10) Surface rust at beam ends. No section loss. (08)
10. Paint SIA-59A	5	5	5	Approximately 5% of steel is exposed. Surface rust noted along fascia and at beam ends. (12) Approximately 5% of steel is exposed. Surface rust noted along fascia and at beam ends. (10) About 5% of the steel is exposed. (08)
11. Section Loss	2	2	2	Surface rust at beam ends and along fascia beams. No section loss in primary members. (12) Surface rust at beam ends and along fascia. No section loss. (10) Rusty beam ends w/ little or no section loss. (08)
12. Bearings	5	5	5	Bearings have pack rust showing signs of leaking joints. SE bearing is covered in debris and has deterioration from leaking along abutment. (12) Bearings have pack rust and showing signs of leaking joints. SE bearing has significant deterioration from leaking along abutment. (10) SE bearing showed significant deterioration from leaking backwall. Other bearings have minimal section loss. (08)

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0.5 MI E US-23	117.1	18.37	1934	1985	3	8	

Legend	
9	New
7-8	Good
5-6	Fair
3-4	Poor
2 or Less	Critical

NBI INSPECTION

	08	10	12	
13. Abutments SIA-60	6	6	6	Minor cracks under bearings at east abutment. Spalls and delamination at NE and SE corners. Horizontal crack at SE cheekwall. There is a large separation between the SE wingwall and abutment with a tree growing between them. Vertical crack and 4 spalls/delaminations on the west abutment. Backwall has cracking at utilities. (12) Minor cracks under bearings at east abutment. Spalls and delamination at NE and SE corners. Horizontal crack at SE cheekwall. Spalls along vertical joint of west abutment. (10) Small spall on east backwall. Spall along vertical joint of west abutment. (08)
14. Piers SIA-60	5	5	5	Significant areas of delaminated and spalled concrete totaling 110sft. Concentration of spalled concrete and delaminations are at the waterline where previous concrete patches are present and under the south fascia beam on the pier. Vertical cracks are present. Rebar is exposed at 2 locations. (12) Significant area of delaminated and spalled concrete at SW pier cap totaling 40sft. Additional spalled concrete and delamination at the waterline where previous concrete patches are present. Multiple delaminated and spalled areas of concrete totaling 40sft. (10) Concrete eroded at waterline. Other spalls and delamination found above water. Several old patches present. (08)
15. Slope Protection	5	5	5	Defined slopes with heavy vegetation. (12) Defined slopes with heavy vegetation. (10) Slopes heavily vegitated. (08)
16. Approach Pavt	8	7	7	HMA is in good condition. Cracking at centerline of roadway and wheel lines on east approach. Pothole off east end of bridge. (12) HMA in good condition. Cracking at centerline of roadway and wheel lines on east approach. (10) Approach pavement still in good condition. (08)
17. Approach Shldrs Swalks	8	7	7	HMA is in good condition. Cracking at centerline of roadway and wheel lines on east approach. No sidewalks present. (12) HMA in good condition. Cracking at centerline of roadway and wheel lines on east approach. (10) Approach pavement still in good condition. (08)
18. Approach Slopes				(12) (10) (08)
19. Utilities				6" conduit along south fascia. 3' pipe in each beam bay. 3.5' pipe along north fascia. Overhead line along north and south sides, parallel to road. Storm sewer outfall located NE of bridge. Concrete flow control chamber located NE of bridge. (12) 6" conduit along south fascia. 3' pipe in each beam bay. 3.5' pipe along north fascia. Overhead line along north and south sides, parallel to road. Storm sewer outfall located NE of bridge. Concrete flow control chamber located NE of bridge. (10) (08)
20. Channel SIA-61	6	6	6	Due to the bend in the river, water has eroded soil at pier and east abutment. Water is approximately 3'-8' deep under the west span and approximately 5.5'-10' deep at the east span. (12) Due to the bend in the river, water has eroded soil at pier and east abutment. (10) Water is approximately 8' to 10' deep along pier and east abutment, but only 2' to 3' deep across entilre channel about 50' downstream. (08)
21. Drainage Culverts				(12) (10) (08)

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0.5 MI E US-23	117.1	18.37	1934	1985	3 3	8	

Legend	
9	New
7-8	Good
5-6	Fair
3-4	Poor
2 or Less	Critical

[ ] 08 10 12

NBI INSPECTION

Guard Rail

36A	0
36B	1
36C	1
36D	1

Crit Feat Insp(SIA-92)

	Freq	Date
92A Frac Crit		
92B Und. Watr		
92C Spl.Insp		
Fatg Sntv.Insp	-	-

71 Watr Adeq	9
72 Appr Align	8
Temp Supp	
Hi Ld Hit (M)	
Special Insp Equip.	

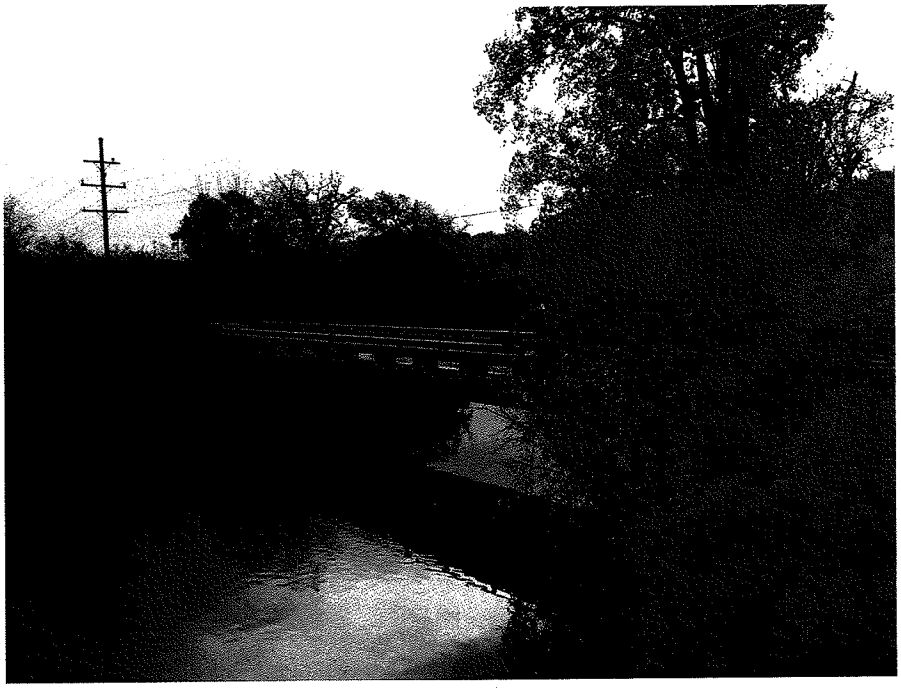
General Notes

Appendix B

Photographs

Photograph Log

Treatment Plant Drive over Huron River



Photograph No. 1
North Elevation Looking South

Photograph No. 2
South Elevation Looking North

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 3
East Approach Looking West

Photograph No. 4
East Approach Looking East

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 5
West Approach Looking West

Photograph No. 6
West Approach Looking East

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 7
West End of the Deck Looking West

Photograph No. 8
East End of the Deck Looking West

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 9
Ponding Water on West Half of West Span Looking West

Photograph No. 10
East Half of West Span Looking East

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 11
West Half of East Span Looking West

Photograph No. 12
East Half of East Span Looking East

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 13
Dirt and Debris in Deck Joint

Photograph No. 14
Bridge Railing in Good Condition (North Shown)

Photograph Log

Treatment Plant Drive over Huron River

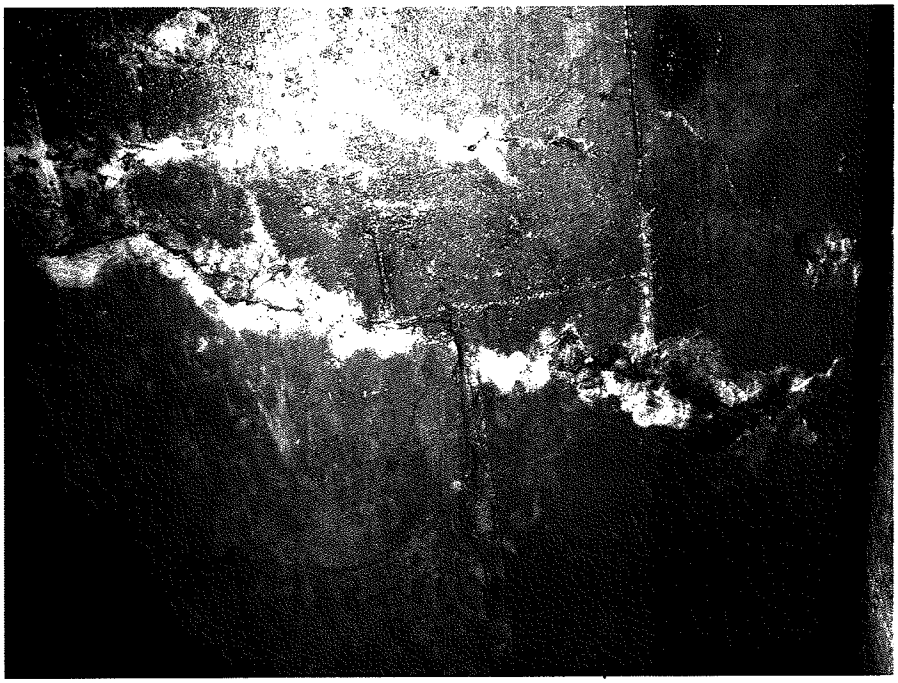
Photograph No. 15
Concrete Delaminations along West Reference Line

Photograph No. 16
Cracking and Pothole in Approach Pavement near East Reference Line

Photograph Log

Treatment Plant Drive over Huron River

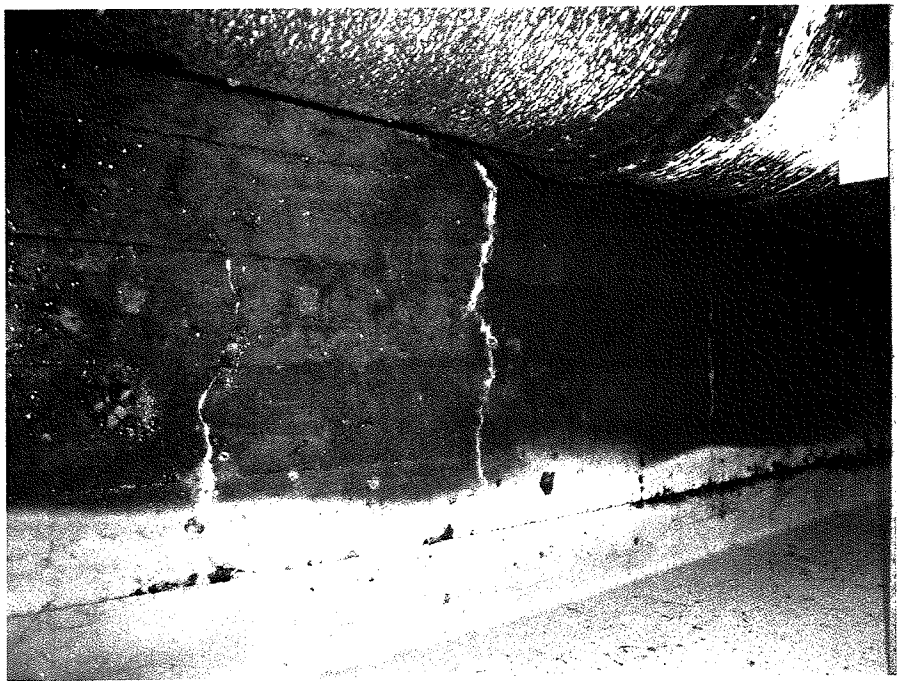
Photograph No. 17
Moisture and Cracking with Efflorescence near Previously Patched Area on the Underside of Deck



Photograph No. 18
Rusting, Moisture, Cracking with Efflorescence near Previously Patched Area, Underside of Deck

Photograph Log

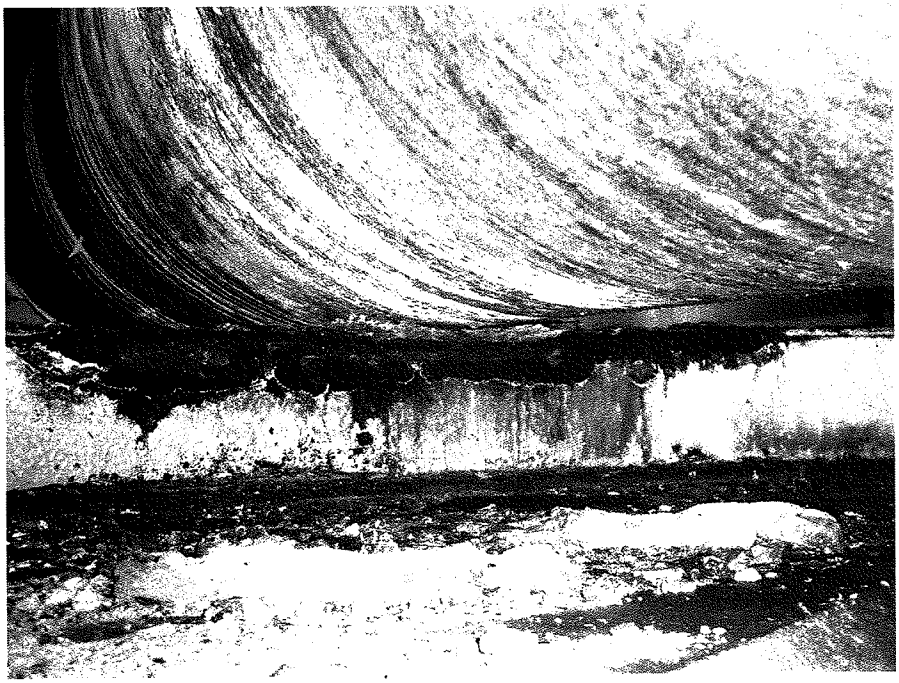
Treatment Plant Drive over Huron River



Photograph No. 19
Transverse Cracking with Efflorescence on the Underside of Deck

Photograph No. 20
Structural Steel in Good Condition with Minor Surface Rusting (North Bay)

Photograph No. 21
Signs of Paint Failing along South Fascia Beam (West)



Photograph No. 22
Deterioration and Holes in Utility Diaphragm at Pier

Photograph No. 23
Surface Rusting at North Beam Ends at Pier

Photograph No. 24
Surface Rusting at Center Beam Ends at Pier

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 25
Surface Rusting at South Beam Ends, Minor Gap Between Beams at Pier

Photograph No. 26
Surface Rusting and Minor Deterioration at West Abutment, North Beam Bearing

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 27
Surface Rusting and Minor Deterioration at West Abutment, Center Beam Bearing

Photograph No. 28
Debris, Surface Rusting, Minor Deterioration at East Abutment, South Beam Bearing

Photograph Log

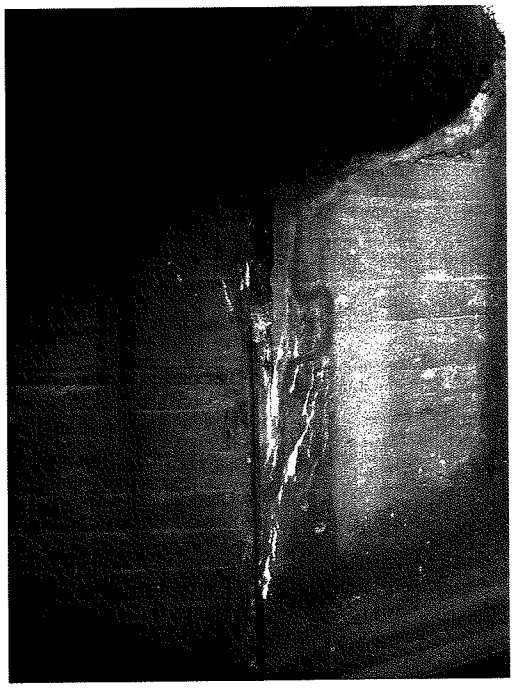
Treatment Plant Drive over Huron River

Photograph No. 29
Vertical Crack and Delaminations on West Abutment

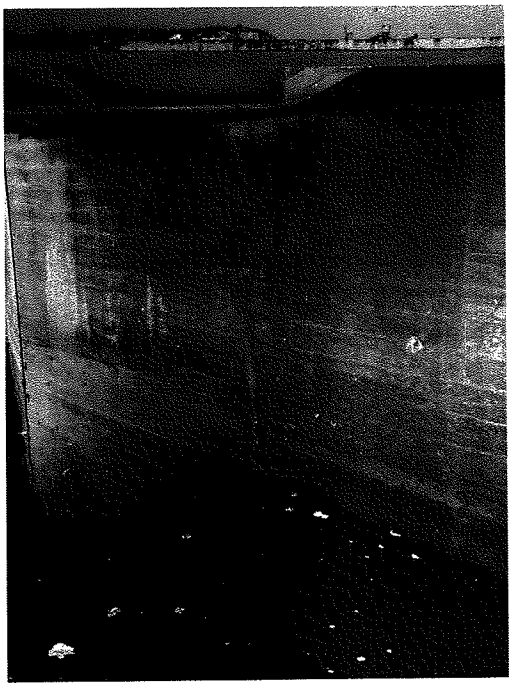
Photograph No. 30
Delamination along Northwest Wingwall Extending to Water Line

Photograph Log

Treatment Plant Drive over Huron River



Photograph No. 31
West Abutment Delaminations and Spalls at Northwest Wingwall



Photograph No. 32
Delamination and Vertical Cracking at West Abutment

Photograph No. 33
Vertical Crack and Delaminations on East Abutment

Photograph No. 34
Cracking at Cheekwall and Gap at East Abutment and South Wingwall

Photograph No. 35
Spalling at East Abutment and South Wingwall

Photograph No. 36
Spalling and Cracking at Southeast Corner of East Backwall

Treatment Plant Drive over Huron River

Photograph No. 37
Delaminations on the West Side of the Pier

Photograph No. 38
Delamination, Spalling and Exposed Reinforcement on Southwest Corner of Pier, West Side

Photograph No. 39
Spalling at South Fascia Bearing at West Side of Pier

Photograph No. 40
Delaminations and Cracking on North End of Pier

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 41
Spalling and Delaminations Water line on Northwest Side of Pier

Photograph No. 42
Spalling and Delaminations Water line on Southwest Side of Pier

Photograph No. 43
Spalls and Delaminations on East Side of Pier

Photograph No. 44
Spalling Underneath the South Fascia on East Side of Pier

Photograph Log

Treatment Plant Drive over Huron River

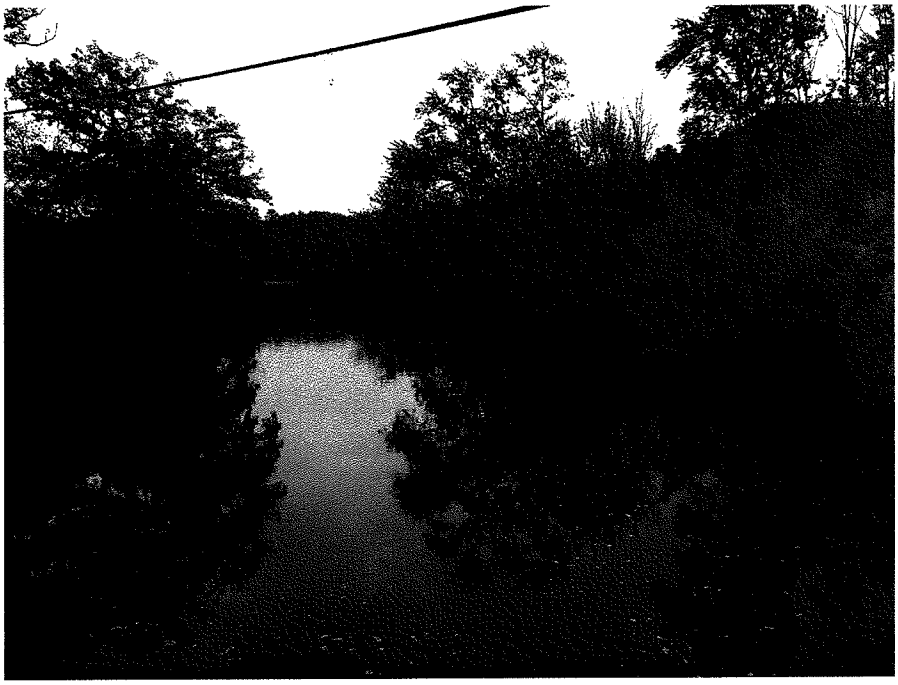
Photograph No. 45
Spalling, Delaminations and Scaling at Water line on Northeast Side of Pier

Photograph No. 46
Spalling and Exposed Reinforcement at Water line on Southeast Side of Pier

Photograph Log

Treatment Plant Drive over Huron River

Photograph No. 47
Upstream of Bridge Looking North



Photograph No. 48
Downstream of Bridge Looking South

Appendix C

Repair Cost Estimate

2013 CALL FOR PROJECTS REV. 12/07/11

BRIDGE REPAIR COST ESTIMATE 1

ENGINEER: TNB DATE: 11/8/2012 DECK AREA: 2,166.0 SFT STRUCTURE ID: 11078

LOCATION: Treatment Plant Dr over Huron River, Ann Arbor, MI DECK DIM: 18.5' Wide x 117.083' Long

PRIMARY REPAIR STRATEGY: **Deep Patching, Joint Replacement, Substructure Repairs, Vegetation Removal** STR. TYPE: **Steel 2 Span Non-Composite**

	WORK ITEM	QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE					
	Multiple Spans, Concrete (add demo. & road approach & traffic control)		SFT	$150.00 /SFT	
	Multiple Spans, Steel (as above)		SFT	$180.00 /SFT	
	Single Span or Over Water, Concrete (as above)		SFT	$190.00 /SFT	
	Single Span or Over Water, Steel (as above)		SFT	$210.00 /SFT	
	Pedestrian Bridge (includes removal, add traffic control)		SFT	$285.00 /SFT	
	Other				
NEW SUPERSTRUCTURE					
	Concrete (includes rem of old super, new railing, add t.c. & approach)		SFT	$110.00 /SFT	
	Steel (as above)		SFT	$160.00 /SFT	
	Over Water (add to new superstructure cost)		SFT	$28.00 /SFT	
	Other				
WIDENING					
	Added portion only. _____ ft of width (add road approach widening)		SFT	$190.00 /SFT	
	Other				
NEW DECK					
	Includes removal of old deck & new railing (add t.c. & approach)		SFT	$65.00 /SFT	
	Other				
DEMOLITION					
	Entire bridge, grade separation		SFT	$27.00 /SFT	
	Entire bridge, over water		SFT	$36.00 /SFT	
	Other				
SUPERSTRUCTURE REPAIR					
	Concrete Deck Patch (includes hand chipping)	155.0	SFT	$33.00 /SFT	$5,115.00
	Full Depth Patch (Assumed 10% of Deck Patching Area)	20.0	SFT	$70.00 /SFT	$1,400.00
	HMA Cap (no membrane - add bridge rail if req'd)		SFT	$1.20 /SFT	
	HMA Overlay with WP membrane (add bridge rail if req'd)		SFT	$4.50 /SFT	
	Removal of Concrete Wearing Course (latex)		SFT	$2.00 /SFT	
	Removal of HMA Overlay or Epoxy Overlay		SFT	$1.00 /SFT	
	Epoxy Overlay		SYD	$34.00 /SYD	
	Shallow Overlay (includes joint replmt & hydro, add bridge rail if req'd)		SFT	$23.00 /SFT	
	Deep Overlay (includes joint replmt & hydro, add bridge rail if req'd)		SFT	$24.00 /SFT	
	PCI Beam End Repair ($2000-$4000 per beam end)		EA	$3,000.00 EA	
	Repair Structural Steel ($2000 bolted, $6000 welded)		EA	$5,000.00 EA	
	High Load Hit Repair (PCI Beam)		SFT	$200.00 /SFT	
	Paint Structural Steel		SFT	$9.00 /SFT	
	Partial Painting		SFT	$18.00 /SFT	
	Pin & Hanger replacement (includes temporary supports)		EA	$6,000.00 EA	
	Other				
SUBSTRUCTURE REPAIR					
	Pier repair (measured x 2) Replace unit if spalled area > 30%		CFT	$180.00 /CFT	
	Pier repair over water (measured x 2)	110.0	CFT	$200.00 /CFT	$22,000.00
	Pier replacement		CFT	$70.00 /CFT	
	Abutment repair (measured x 2)	12.0	CFT	$200.00 /CFT	$2,400.00
	Temporary Supports for Substructure Repair (South Fascia Beams)	2.0	EA	$1,500.00 EA	$3,000.00
	Slope Protection repairs		SYD	$80.00 /SYD	
	Other: Repair Accessibility	1.0	LSUM	$5,000.00 LSUM	$5,000.00
MISCELLANEOUS					
	Expansion or Construction Joints (includes removal)	18.0	FT	$450.00 /FT	$8,100.00
	Bridge Railing, remove and replace (type 4 $210, aesthetic parapet $260)		FT	$235.00 /FT	
	Thrie Beam Railing retrofit		FT	$34.00 /FT	
	Deck Drain Extensions		EA	$500.00 EA	
	Scour Countermeasures		LSUM	LSUM	
	Other Tree Removal	1.0	LSUM	$1,000.00 LSUM	$1,000.00
ROAD WORK					
	Approach Pavement, 12" RC (add C & G, GR, Slope, Shldr.) 40' ea. end		SFT	$11.50 /SFT	
	Approach Curb & Gutter (18' ea. quad.)		FT	$37.50 /FT	
	Guardrail Anchorage to Bridge (<40')		quads	$1,500.00 /quad	
	Guardrail, Type B or T (beyond GR anchorage to bridge, <200')		FT	$21.50 /FT	
	Guardrail Ending (end section)		EA	$1,850.00 /EA	
	Roadway Approach work (beyond approach pavement)		LSUM	LSUM	
	Utilities		LSUM	LSUM	
	Other				
TRAFFIC CONTROL - Unit Cost to be determined by Region or TSC T&S					
	Part Width Construction		LSUM	$80,000.00 LSUM	
	Crossovers		EA	$250,000.00 EA	
	Temporary Traffic Signals		set	$18,000.00 /set	
	RR Flagging		LSUM	LSUM	
	Detour		LSUM	LSUM	
	Other				
CONTINGENCY (10% - 20%) (use higher contingency for small projects)		20.0	%	$48,000.00	$10,000.00
MOBILIZATION (estimate at 5% but put "10% max" in pay item description)		5.0	%	$58,000.00	$3,000.00
INFLATION (assume 5% per year, beginning in **2013**)		5.0	%	$61,000.00	$3,000.00

(DOES NOT INCLUDE PE & CE)

CONSTRUCTION TOTAL		**$64,000.00**
PRELIMINARY ENGINEERING	**8%**	**$5,120.00**
CONSTRUCTION ENGINEERING	**12%**	**$7,680.00**
TOTAL PROJECT COST		**$77,000.00**

[redacted]

2020 CALL FOR PROJECTS
BRIDGE REPAIR COST ESTIMATE 2

REV. 12/07/11

ENGINEER: TNB DATE: 11/8/2012 DECK AREA: 2,166.0 SFT STRUCTURE ID: 11078

LOCATION: Treatment Plant Dr over Huron River, Ann Arbor, MI DECK DIM: 18.5' Wide x 117.083' Long

PRIMARY REPAIR STRATEGY: **Structure Widening, Deck Replacement, Painting, Substructure Repairs, Bearing Replacement, Utility Relocations, Vegetation Removal** STR. TYPE: **Steel 2 Span Non-Composite**

WORK ITEM	QUANTITY	UNIT	UNIT COST	TOTAL
NEW BRIDGE				
Multiple Spans, Concrete (add demo. & road approach & traffic control)		SFT	$150.00 /SFT	
Multiple Spans, Steel (as above)		SFT	$180.00 /SFT	
Single Span or Over Water, Concrete (as above)		SFT	$190.00 /SFT	
Single Span or Over Water, Steel (as above)		SFT	$210.00 /SFT	
Pedestrian Bridge (includes removal, add traffic control)		SFT	$285.00 /SFT	
Other				
NEW SUPERSTRUCTURE				
Concrete (includes rem of old super, new railing, add t.c. & approach)		SFT	$110.00 /SFT	
Steel (as above)		SFT	$160.00 /SFT	
Over Water (add to new superstructure cost)		SFT	$28.00 /SFT	
Other				
WIDENING				
Added portion only. 17 ft of width (add road approach widening)	1,989.0	SFT	$190.00 /SFT	$377,910.00
Other				
NEW DECK				
Includes removal of old deck & new railing (add t.c. & approach)	2,167.0	SFT	$65.00 /SFT	$140,855.00
Other				
DEMOLITION				
Entire bridge, grade separation		SFT	$27.00 /SFT	
Entire bridge, over water		SFT	$36.00 /SFT	
Other				
SUPERSTRUCTURE REPAIR				
Concrete Deck Patch (includes hand chipping)		SFT	$33.00 /SFT	
Full Depth Patch (Assumed 10% of Deck Patching Area)		SFT	$70.00 /SFT	
HMA Cap (no membrane - add bridge rail if req'd)		SFT	$1.20 /SFT	
HMA Overlay with WP membrane (add bridge rail if req'd)		SFT	$4.50 /SFT	
Removal of Concrete Wearing Course (latex)		SFT	$2.00 /SFT	
Removal of HMA Overlay or Epoxy Overlay		SFT	$1.00 /SFT	
Epoxy Overlay		SYD	$34.00 /SYD	
Shallow Overlay (includes joint replmt & hydro, add bridge rail if req'd)		SFT	$23.00 /SFT	
Deep Overlay (includes joint replmt & hydro, add bridge rail if req'd)		SFT	$24.00 /SFT	
PCI Beam End Repair ($2000-$4000 per beam end)		EA	$3,000.00 EA	
Repair Structural Steel ($2000 bolted, $6000 welded)		EA	$5,000.00 EA	
High Load Hit Repair (PCI Beam)		SFT	$200.00 /SFT	
Paint Structural Steel	4,640.0	SFT	$9.00 /SFT	$41,760.00
Partial Painting		SFT	$18.00 /SFT	
Pin & Hanger replacement (includes temporary supports)		EA	$6,000.00 EA	
Other Remove Beams and Bearing Replacements	9.0	EA	$3,500.00 EA	$31,500.00
SUBSTRUCTURE REPAIR				
Pier repair (measured x 2) Replace unit if spalled area > 30%		CFT	$180.00 /CFT	
Pier repair over water (measured x 2)	110.0	CFT	$200.00 /CFT	$22,000.00
Pier replacement		CFT	$70.00 /CFT	
Abutment repair (measured x 2)	12.0	CFT	$200.00 /CFT	$2,400.00
Temporary Supports for Substructure Repair		EA	$1,500.00 EA	
Slope Protection repairs		SYD	$80.00 /SYD	
Other: Cofferdam for Pier Repairs	1.0	LSUM	$7,000.00 LSUM	$7,000.00
MISCELLANEOUS				
Expansion or Construction Joints (includes removal)		FT	$450.00 /FT	
Bridge Railing, remove and replace (type 4 $210, aesthetic parapet $260)		FT	$235.00 /FT	
Thrie Beam Railing retrofit		FT	$34.00 /FT	
Deck Drain Extensions		EA	$500.00 EA	
Scour Countermeasures		LSUM	LSUM	
Other				
ROAD WORK				
Approach Pavement, 12" RC (add C & G, GR, Slope, Shldr.) 40' ea. end	2,800.0	SFT	$11.50 /SFT	$32,200.00
Approach Curb & Gutter (18' ea. quad.)		FT	$37.50 /FT	
Guardrail Anchorage to Bridge (<40')	4.0	quads	$1,500.00 /quad	$6,000.00
Guardrail, Type B or T (beyond GR anchorage to bridge, <200')	200.0	FT	$21.50 /FT	$4,300.00
Guardrail Ending (end section)	4.0	EA	$1,850.00 /EA	$7,400.00
Roadway Approach work (beyond approach pavement)	4,200.0	SFT	$8.00 SFT	$33,600.00
Utilities	1.0	LSUM	$50,000.00 LSUM	$50,000.00
Other				
TRAFFIC CONTROL - Unit Cost to be determined by Region or TSC T&S				
Part Width Construction (Additional cost for Widening work in Stages)	1.0	LSUM	$10,000.00 LSUM	$10,000.00
Crossovers		EA	$250,000.00 EA	
Temporary Traffic Signals		set	$18,000.00 /set	
RR Flagging		LSUM	LSUM	
Detour		LSUM	LSUM	
Other				
CONTINGENCY (10% - 20%) (use higher contingency for small projects)	20.0	%	$767,000.00	$153,000.00
MOBILIZATION (estimate at 5% but put "10% max" in pay item description)	5.0	%	$920,000.00	$46,000.00
INFLATION (assume 5% per year, beginning in **2013**)	40.0	%	$966,000.00	$386,000.00

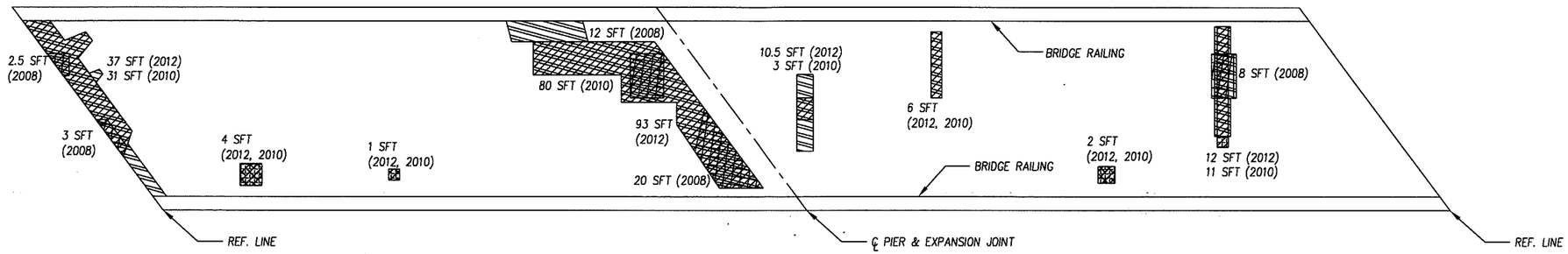
(DOES NOT INCLUDE PE & CE)

CONSTRUCTION TOTAL		**$1,352,000.00**
PRELIMINARY ENGINEERING	**10%**	**$135,200.00**
CONSTRUCTION ENGINEERING	**12%**	**$162,240.00**
TOTAL PROJECT COST		**$1,649,000.00**

Appendix D

Deck Delamination Survey

N



LEGEND:

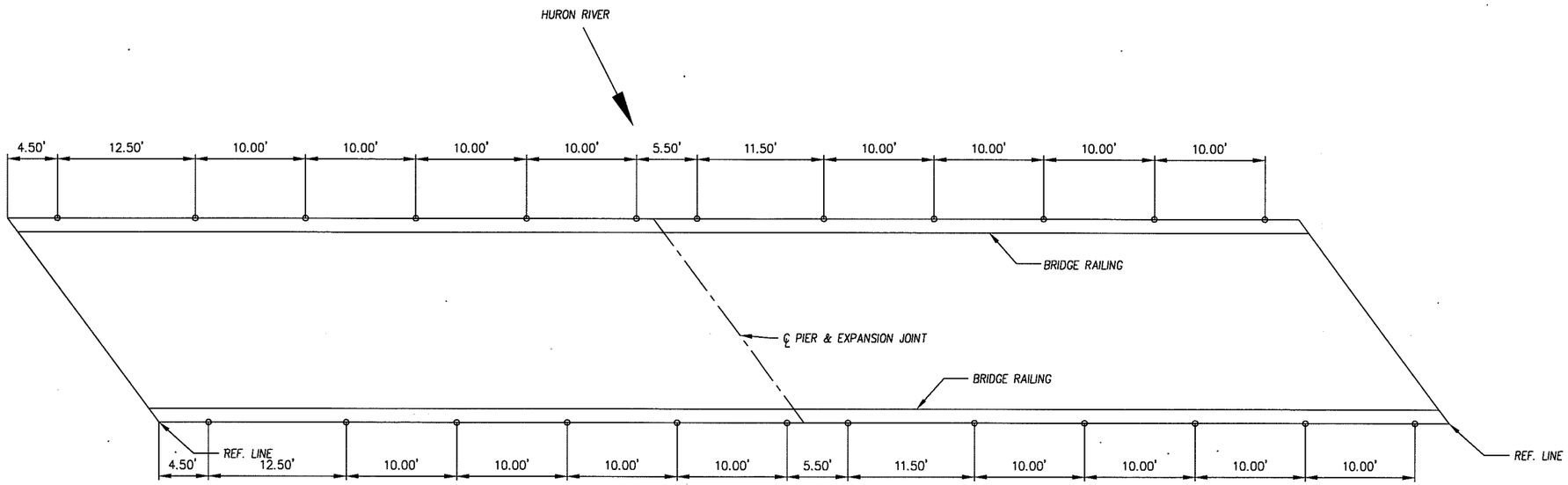
- 2008 DECK DELAMINATION
- 2010 DECK DELAMINATION
- 2010 SPALLING
- 2012 DECK DELAMINATION
- 2012 SPALLING

DLZ

TREATMENT PLANT DRIVE DECK
DELAMINATION SURVEY

Appendix E

Streambed Cross-Sections



LEGEND:

o – 2013 STREAMBED CROSS SECTION SURVEY POINTS

DLZ

TREATMENT PLANT DRIVE
STREAMBED CROSS SECTIONS

BRIDGE CROSS-SECTIONS

ATE: 1/15/2013
STRUCTURE NO.: 11078
CONTROL SECTION:
ROUTE: Treatment Plant Drive
WATERCOURSE: Huron River

PREVIOUS CROSS SECTION

UPSTREAM FACE

BENCHMARK ELEVATION:

DESCRIPTION OF BENCHMARK:

UNDERCLEARANCE ELEVATION:
TOP OF ROAD ELEVATION:

WATER SURFACE ELEVATION:

DATE: **N/A**
REFERENCE ELEV:

STATION	READING	ELEVATION	DESCRIPTION
04.50			
04.50			
17.00			
27.00			
37.00			
47.00			
57.00			
62.50			
74.00			
84.00			
94.00			
104.00			
113.50			
113.50			

CURRENT CROSS SECTION

UPSTREAM FACE

BENCHMARK ELEVATION: 745.10
GPS RTK NORTHING (FT): 281504.01
GPS RTK EASTING (FT): 13312354.51
DESCRIPTION OF BENCHMARK:
TOP OF THE SW CORNER OF THE NW BRIDGE RAILING CORNER OF BRIDGE
UPSTREAM BEAM ELEV: 738.8

UNDERCLEARANCE ELEVATION: 8.4
TOP OF ROAD ELEVATION: 742.76
GPS RTK NORTHING (FT): 281506.87
GPS RTK EASTING (FT): 13312419.87
WATER SURFACE ELEVATION: 730.4

DATE: 1/15/2013
REFERENCE ELEV: 0

READING	ELEVATION	DESCRIPTION
	730.40	WEST ABUTMENT
	727.15	RIVER BOTTOM AT WEST ABUTMENT
	725.70	RIVER BOTTOM
	724.63	RIVER BOTTOM
	723.65	RIVER BOTTOM
	722.64	RIVER BOTTOM
	722.44	WEST FACE AT PIER, RIVER BOTTOM
	721.84	EAST FACE AT PIER, RIVER BOTTOM
	720.64	RIVER BOTTOM
	720.24	RIVER BOTTOM
	721.78	RIVER BOTTOM
	723.84	RIVER BOTTOM
	724.94	RIVER BOTTOM AT EAST ABUTMENT
	730.40	EAST ABUTMENT

DOWNSTREAM FACE

BENCHMARK ELEVATION:

UNDERCLEARANCE ELEVATION:
TOP OF ROAD ELEVATION:
WATER SURFACE ELEVATION:

DATE:
REFERENCE ELEV:

STATION	READING	ELEVATION	DESCRIPTION
04.50			
04.50			
17.00			
27.00			
37.00			
47.00			
57.00			
62.50			
74.00			
84.00			
94.00			
104.00			
113.50			
113.50			

DOWNSTREAM FACE

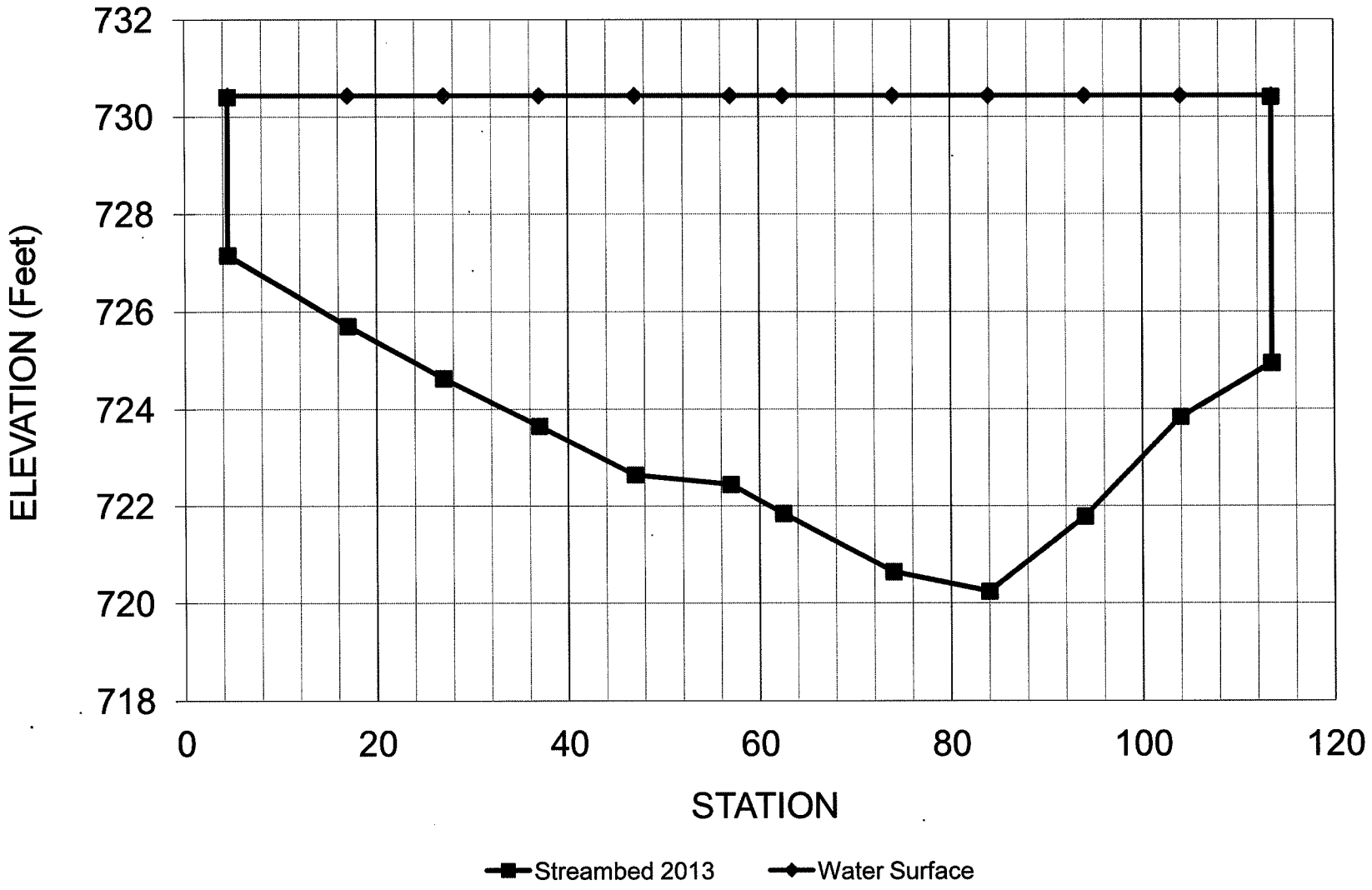
BENCHMARK ELEVATION: 745.10
GPS RTK NORTHING (FT): 281504.01
GPS RTK EASTING (FT): 13312354.51
DESCRIPTION OF BENCHMARK:
TOP OF THE SW CORNER OF THE NW BRIDGE RAILING CORNER OF BRIDGE
DOWNSTREAM BEAM ELEV: 738.8

UNDERCLEARANCE ELEVATION: 8.4
TOP OF ROAD ELEVATION: 742.76
GPS RTK NORTHING (FT): 281506.87
GPS RTK EASTING (FT): 13312419.87
WATER SURFACE ELEVATION: 730.4

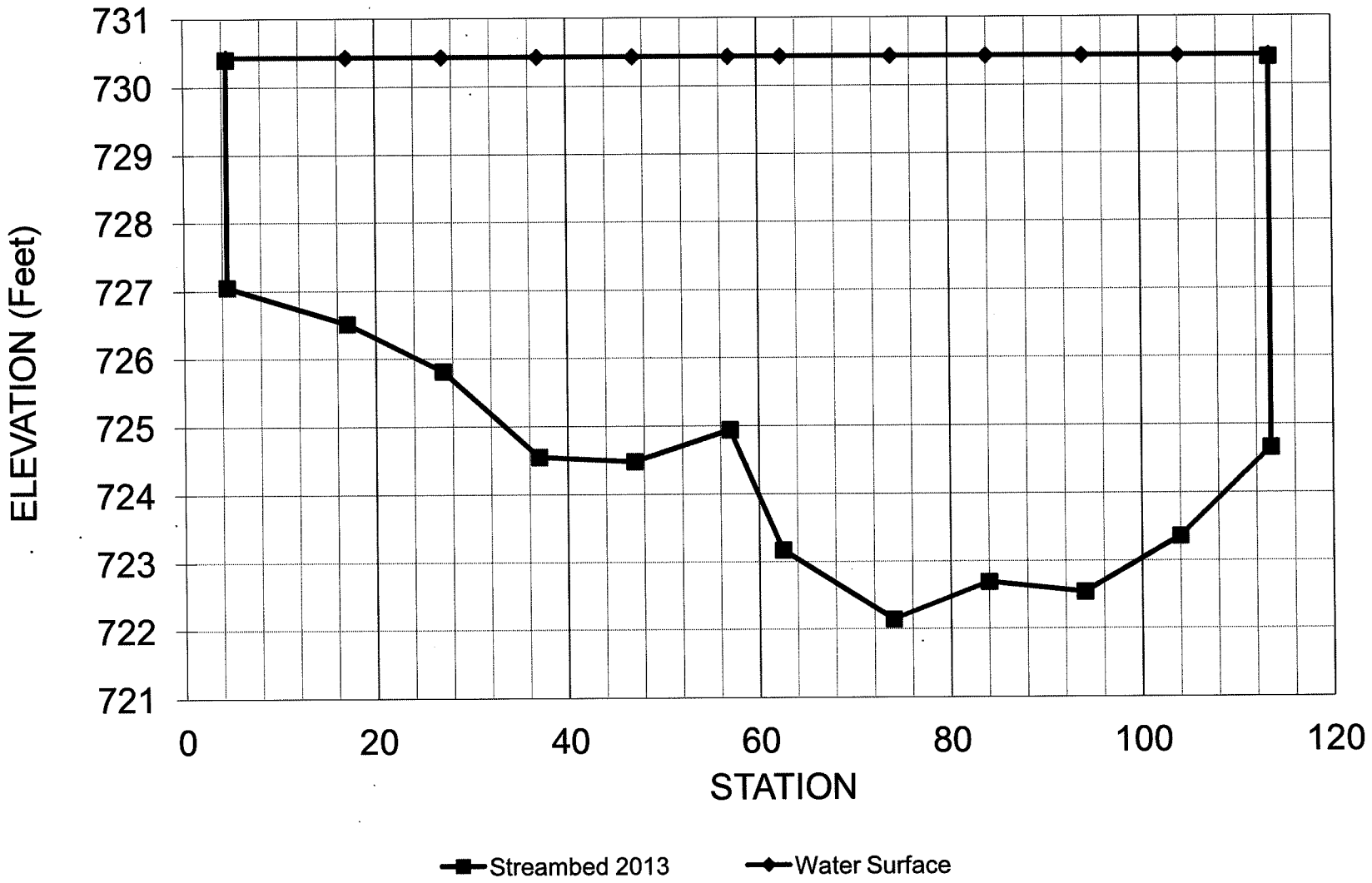
DATE: 1/15/2013
REFERENCE ELEV: 0

READING	ELEVATION	DESCRIPTION
	730.40	WEST ABUTMENT
	727.05	RIVER BOTTOM AT WEST ABUTMENT
	726.51	RIVER BOTTOM
	725.81	RIVER BOTTOM
	724.55	RIVER BOTTOM
	724.48	RIVER BOTTOM
	724.94	WEST FACE AT PIER, RIVER BOTTOM
	723.17	EAST FACE AT PIER, RIVER BOTTOM
	722.14	RIVER BOTTOM
	722.69	RIVER BOTTOM
	722.54	RIVER BOTTOM
	723.36	RIVER BOTTOM
	724.66	RIVER BOTTOM AT EAST ABUTMENT
	730.40	EAST ABUTMENT

UPSTREAM FACE
(Looking Upstream)
Treatment Plant Drive over Huron River (B01), 1/15/13



DOWNSTREAM FACE
(Looking Upstream)
Treatment Plant Drive over Huron River (B01), 1/15/13



Appendix F

Quality Control Inspection

Company: DLZ Michigan, Inc. - Lansing Quality Control Officer: Corey Van Luchene, P.E.
Team Leader: Talia Belill, P.E. Team Member(s): Paul Izzo
City/County: Ann Arbor, Michigan
Structure: 11078 - Treatment Plant Drive over Huron River

Field Review Form

	QC #	Items to Review
✓	1	Main structure type correct (43A)
✓	2	"One Lane Bridge" or "Narrow Bridge" (51, 28A, 102, & 41) postings in place; if not, is it recommended (41)?
✓	3	Load limit (66B) bridge postings in place (66C & 70); if not, is it recommended (41)? Not Reqd
✓	4	Bridge rail and approach coding (36A) acceptable
NA	5	Foundation type acceptable (113B)
	6	Maintenance and repair items properly addressed
NA	7	Photos taken of load posting
NA	8	Photos taken of condition ratings of 4 or less for items 58, 59, 60, or 62
	9	Channel profiles or cross-sections taken for all bridges
	10	If scour noted, was it adequately documented?
	11	If deterioration noted, was it adequately documented?
✓	12	Stream channel alignment problems are noted using sketches

Comments:

2- Less Than 18' Wide w/ 2 Lanes - Rec. Posting Narrow Bridge

4- Recommend Posting Bridge End Markers

Company: DLZ Michigan, Inc. - Lansing Quality Control Officer: Corey Van Luchene, P.E.
Team Leader: Talia Belill, P.E. Team Member(s): Paul Izzo
City/County: Ann Arbor, Michigan
Structure: 11078 - Treatment Plant Drive over Huron River

Field Review Form

QC #		Ratings		QCO Concur*	
		Prev. Inv.	Curr. Inv.	Yes	No
15	Item 58: Deck	5	5	☑	☐
16	Item 59: Superstructure	7	7	☑	☐
17	Item 60: Substructure	5	5	☑	☐
18	Item 62: Culvert	NA	NA	☑	☐
19	Item 113A: Scour Critical Bridge	8	8	☑	☐

***The Quality Control Officer shall provide concurrence for all items coded a 4 or less, or a change of two or more from the previous inspection. If no ratings are 4 or less, a minimum of one item is to be concurred with.**

Comments:

Provide items reviewed, printed name, and signature in space below.

QC Nos.	Inspection Team Leader	Quality Control Officer
1-4, 6, 9, 12-17, 19	Talia N. Belill	Corey Van Luchene

QUALITY CONTROL REVIEW FORM
Company: DLZ Michigan, Inc. - Lansing
Quality Control Officer: Corey Van Luchene, P.E.
Team Leader: Talia Belill, P.E. Team Member(s): Paul Izzo
City/County: Ann Arbor, Michigan
Structure: 11078 - Treatment Plant Drive over Huron River

Office Review Form – (One copy of this sheet shall be filled out for each bridge.)

	Item #	Items to Review
✓	1	All inspectors qualified
✓	2	Inspection completed within the required frequency 10/17/12, 10/4/12
✓	3	Ratings of 4 or less for Items 58, 59, 60, or 62 have been documented properly (photos, notes, and sketches) NA
✓	4	Critical Deficiencies properly handled (Part 1 – Section 7)
✓	5	Load ratings performed and reflect current site conditions (Part 3)
✓	6	Posting policies have been complied with (Part 3) – Noted in Report
✓	7	Maintenance and repair items reflective of noted deficiencies
NA	8	"Estimated Year Remaining Life" values consistent with the condition ratings – NA
✓	9	Bridge files contain all available data (Part 1 – Section 5)
✓	10	Priority schedule consistent with the bridge usage and deterioration
NA	11	If required, scour Plan of Action developed, on file, and current (Part 4 – Section 7) NA
✓	12	Printed inspection report uses standard format

Provide items reviewed, printed name, and signature in space below.

Item(s)	Inspection Team Leader	Quality Control Officer
1-7, 9, 10, 12		Corey Van Luchene

Comments:

Draft Report Reviewed. Additional Comment provided to Team Leader.

2012
BRIDGE INSPECTION PROGRAM

TREATMENT PLANT DRIVE OVER HURON RIVER

CITY OF ANN ARBOR

DLZ Logo?

Prepared by
DLZ Michigan, Inc.
1425 Keystone Avenue
Lansing, MI 48911

December 2012

2012
BRIDGE INSPECTION PROGRAM

TREATMENT PLANT DRIVE OVER HURON RIVER

CITY OF ANN ARBOR

December 2012

Talia N. Belill, P.E.
Registered Professional Engineer
State of Michigan No. 51543

Table of Contents

Structure Description

The existing bridge carrying Treatment Plant Drive over the Huron River is located in the City of Ann Arbor, Michigan. Treatment Plant Drive is the only access road to the wastewater treatment plant. This two lane road dead ends into the treatment plant and is located east of South Dixboro Road.

The two span bridge was constructed in 1934 with three rolled steel wide flange beams and reinforced concrete deck. The bridge spans 117'-1" from reference line to reference line with an out-to-out width of 18'-6". The cross section includes one lane of traffic and 1 tube railings mounted on concrete parapets. The clear roadway width is 16'-0". There is an expansion joint located over the pier.

The existing substructure is supported by full height reinforced concrete abutments, straight wingwalls, and one wall pier. All of the substructure elements appear to be supported on piles based on the existing bridge plans.

The bridge was rehabilitated in 2000. The bridge deck was overlaid, the bridge railings and guardrail were replaced, the expansion joints were replaced, and the substructure was patched.

Inspection Findings

The bridge was inspected on October 14, 2012. The overall condition of the structure is fair.

Deck

The concrete deck is in fair condition. There are multiple cracks, delaminations, spalls, and concrete patches present, totaling approximately 8.5% of the deck area (Photos 7-12). The bottom side of the deck has over 5% of the total area ~~consisting of~~ transverse and longitudinal cracks with efflorescence, some delaminations, and rust stains (Photos ~~15-17~~ 17-19).

There is evidence of leaking at all joints. The bearings at the abutments are rusted from water penetration (Photos 26-28). The beam ends and bearings at the piers also exhibit surface rusting caused from moisture. (Photos 23-25).

Stringers

The existing structural steel is in good condition (Photo ~~18~~ 20?). There is surface rust on the fascia beams and at the beam ends. Minor coating failure, but primary members retain section properties (Photos 21 & 22). The utility diaphragms located at the pier have heavy rusting and holes in the web.

Abutments

The existing superstructure is supported on full-height concrete abutments with wingwalls that are pile supported. The abutments are in fair condition. The west abutment has vertical cracking and a delamination under the center beam (Photos 29 & 32). There are minor spalls and delaminations along the north wingwall vertical joint (Photos 30 & 31). The west backwall has minor cracking at the utility conduits.

The east abutment has vertical cracking and a delamination under the center beam (Photo 33). There are minor cracks under the bearings. The southeast cheekwall has a horizontal crack at the abutment (Photo 34). There is a large gap between the abutment and south wingwall with vegetation. There are spalls along the abutment at the south joint. There are spalls in the

northeast abutment corner. The east backwall has minor cracking, spalls and delaminated concrete (Photo 36). Minor delaminations were found on the west and east abutments totaling 8sft and 4sft, respectively.

Piers
The wall pier which is supported on piles is in fair condition. When the structure was rehabilitated in 2000, concrete patches were placed at the water line where concrete had spalled. These ~~previous~~ patches located at the waterline have spalled.

There are five delaminated areas on the east side of the pier (Photo 43). There is spalled concrete under the south fascia beam (Beam B3) (Photo 44). There are two spalled areas at the waterline, one of which has exposed reinforcement (Photos 45 & 46).

On the west side of the pier, there are four areas of delaminated/spalled concrete (Photo 37). Two areas are located in previous patched areas at the waterline (Photos 41 & 42). The southwest portion of the pier cap is spalled with exposed, rusted reinforcing steel (Photos 38 & 39). The concrete remaining on the pier cap under the south fascia bearing is delaminated.

Should say North?

The upstream pier end is delaminated. The pier delaminations and spalls total 110sft.

Miscellaneous Findings
There is heavy vegetation present adjacent to the structure.

See Appendix A for the updated Bridge Safety Inspection Report which details the condition of numerous bridge elements.

Bridge Compliance with Current Standards

or

The bridge has the following features that do not meet current standards:

- 1 Tube parapet mounted railing – is not an approved crash tested railing that satisfies AASHTO ~~and~~ MDOT standards.
- Clear Roadway Width:
  - Per AASHTO "Geometric Design of Very Low-Volume Local Roads (ADT<400)", the bridge width should be equal to the width of the traveled way plus 2 ft.
  - If operating as a one-lane bridge, the proper signs should be placed to inform drivers of the one-lane bridge crossing.

Load Rating Analysis

DLZ reviewed the load rating calculations performed in 2008. The condition of the structure has not changed since the last load rating; therefore, DLZ concurs with the previous load rating analysis. We concur with the previous findings that Treatment Plant Drive Bridge has capacity to carry any legal live load and the bridge does not require live load restrictions.

Streambed Cross-Sections

Streambed cross-sections were obtained during this inspection cycle. See Appendix E for the streambed data and graphs. These streambed cross-sections will serve as a datum for comparing streambed movement during future inspections cycles.

Recommendations

The inspection of the Treatment Plant Drive Bridge found the structure to be in fair condition. There are some repairs that should be completed in order to extend the lifespan of the structure. DLZ completed three cost estimates with recommendations listed below. Recommendations listed below are prioritized with low, medium, high priority:

Option 1: Deck patching, joint repairs, and substructure repairs

- Obtain underwater inspection of Abutments and Piers every 5 years (High).
- Obtain river cross-sections to chart streambed movement in two inspection cycles. MDOT recommends cross-sections are graphed every other cycle or 4 years (High).
- Patch the spalled and delaminated exposed areas of the substructure during low water. Repairing the pier cap spalls under the south fascia beam at the bearing is a critical repair item (High).
- Perform deck patching and joint repair at the expansion joint which shows evidence of leaking. Deck patching will extend the life of the deck 10 to 15 years (Medium).
- Remove vegetation overgrowth (Low).

According to MDOT's Bridge Deck Preservation Matrix, for a structure with a deck surface rating of 5 with less than 10% deficiencies and a bottom surface rating of 5, the recommended repair option is deck patching. Deck patching and joint repair can be performed while maintaining access to the Wastewater Treatment Plant (WWTP). Treatment Plant Drive is the only access road into and out of the plant. Maintaining access to the plant is required. The repairs can be coordinated with the WWTP to be performed on the weekends between shift changes and trucks. High early strength concrete will be required. Deck patching which will extend the service life 3 to 10 years. The shallow overlay performed in 2000 met its life expectancy of 10 to 15 years. This repair should be performed within the next 5 years.

The spalled and delaminated pier cap requires hand chipping, possibly placement of new reinforcing steel, the placement of embedded galvanic anodes, and concrete placement. The spalled and delaminated area extends from under the south fascia beam (Beam B3) to the end of the cap. To perform this repair, temporary support of the south fascia beams will be required. Embedded galvanic anodes are typical on repairs where new and old concrete as well as reinforcement are joined. Anodes are recommended in the areas of substructure and joint repairs because the bridge repair service life is greater than 10 years.

Concrete spalls at the waterline are areas of previous repairs that should be patched again to protect the structural integrity of the pier. However, if the deck and superstructure are in place, a cofferdam cannot be driven using conventional methods. Therefore, the repairs should be made at low water time to repair the exposed deficiencies.

When wading depths are exceeded, an underwater inspection of the substructure units is required by the National Bridge Inspection Standards at a maximum frequency of 5 years. Streambed cross-sections indicate that the water depth varies from 3 feet to 10 feet. This warrants an underwater inspection.

Streambed cross-sections were obtained during this inspection cycle. To comply with MDOT recommendations, these should be surveyed in 4 years.

There is tree and vegetation growth surrounding the abutments. They should be removed to prevent the trees and vegetation from trapping moisture against the concrete substructures and steel beams.

Option 2: Structure widening and existing deck replacement, painting, and substructure repairs

- Obtain underwater inspection of Abutments and Piers every 5 years (High).
- Obtain river cross-sections to chart streambed movement in two inspection cycles. MDOT recommends cross-sections are graphed every other cycle or 4 years (High).
- Patch the spalled and delaminated areas of the substructure. Repairing the pier cap spalls under the south fascia beam at the bearing is a critical repair item (High).
- Perform a deck and substructure widening in order to maintain traffic and replace the existing deck and railings (Low).
- Paint structural steel (Low).
- Replace bearings (Low). If rusted & Not operable, shouldn't this be higher?
- Remove vegetation overgrowth (Low).

DLZ is recommending structure widening and existing deck replacement occur in the next 10 years which is considered a low priority at this time. According to MDOT's Bridge Deck Preservation Matrix, for a structure with a deck surface rating of 5 with less than 10% deficiencies and a bottom surface rating of 5, the recommended repair option is deck patching. However, there are other factors to consider when recommending a deck repair. DLZ would typically recommend a deep concrete overlay but maintenance of traffic would not be possible for that type of rehabilitation. The challenge of maintaining access into the WWTP at all times requires a larger scope of work. In order to maintain access, the superstructure and substructure units must be widened approximately 17'. Based on the Washtenaw County Parcel information, the existing right-of-way (ROW) on Treatment Plant Drive is 55' (27.5' from the ROW/road centerline). The structure widening can occur within the existing ROW, but a temporary grading permit will likely be required. The widened bridge will be approximately 26.25' from the centerline since the existing bridge width is approximately 9.25' from the plus the minimum widening of 17' which is required to maintain traffic.

After the bridge has been widened, the existing utilities could be relocated and supported by the new portion of the bridge. This could be accomplished with minimal disruption. After the utilities have been relocated, a conventional cofferdam could be installed to allow for dewatering at the pier for the concrete repairs.

Beyond the deck condition and geometric constraints, the existing structural steel has surface rust which is the beginning sign of paint system failure. Each bay and fascia conveys utilities across the structure. The beams are difficult to access due to utilities for painting. Removal of the deck will assist with painting. If the deck is removed and the utilities relocated to the new portion of the bridge, the beams could be temporarily moved off the substructure to be cleaned and coated while the bearings and sole plates are replaced. The bearings are rated a 5 due to pack rust, exposed shims, and deterioration. There is no method for repairing the bearings. Bearing replacement can only be accomplished by raising the beams. If this were to be done with the deck patching option, the raising of the beams through the use of jacks would damage concrete in the deck and backwalls. With the structure widening, the deck and beams would be removed. The backwalls would be cut down and the bearing assemblies could be easily replaced.

The structure widening and existing deck replacement, structural steel painting, bearing replacement, and utility relocation do not have to be performed immediately, but when performed it will increase the life of the structure by over 40 years. This repair should be performed within the next 10 years. For planning purposes, the cost estimate for repair option 2 assumes the repair will be performed in the year 2020.

Repairing the pier cap spalls under the south fascia beam at the bearing is an immediate repair item. The spalled and delaminated pier cap requires hand chipping, possibly placement of new reinforcing steel, the placement of embedded galvanic anodes, and concrete placement. The spalled and delaminated area extends from under the south fascia beam (Beam B3) to the end of the cap. To perform this repair, temporary support of the south fascia beams will be required. Embedded galvanic anodes are typical on repairs where new and old concrete as well as reinforcement are joined. Anodes are recommended in the areas of substructure and joint repairs because the bridge repair service life is greater than 10 years. This repair should be made now, while the concrete spall repairs at the waterline areas can be repaired at the time of the structure widening and existing deck replacement.

When wading depths are exceeded, an underwater inspection of the substructure units is required by the National Bridge Inspection Standards at a maximum frequency of 5 years. Streambed cross-sections indicate that the water depth varies from 3 feet to 10 feet. This warrants an underwater inspection.

Streambed cross-sections were obtained during this inspection cycle. To comply with MDOT recommendations, these should be surveyed in 4 years.

There is tree and vegetation growth surrounding the abutments. They should be removed to prevent the trees and vegetation from trapping moisture against the concrete substructures and steel beams.

Summary of Repair Costs

A breakdown of the cost of the recommended repairs is shown in Appendix C. The estimated cost for repair option 1 is $77,000, which includes deck patching, substructure repairs, joint replacement, and removal of vegetation to be performed in year 2013. The estimated cost for repair option 2 is $1,575,000, which includes structure widening and existing deck replacement, bearing replacement, structural steel painting, utility relocation, substructure repairs, and removal of vegetation to be performed in year 2020.

option 3?

Photograph Log

Treatment Plant Drive over Huron River

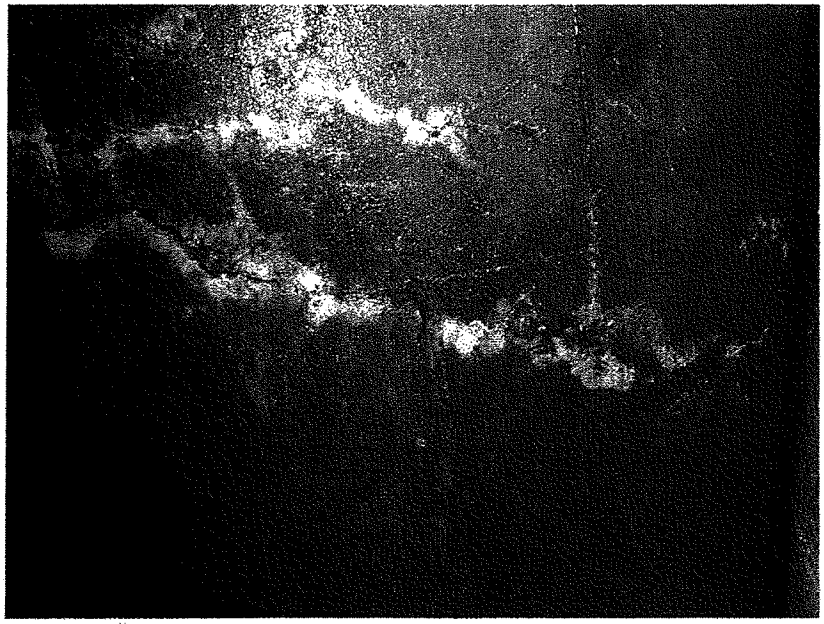
Photograph No. 15
Concrete Delaminations along West Reference Line

Photograph No. 16
Cracking and Pothole near East Reference Line

Photograph Log

Treatment Plant Drive over Huron River

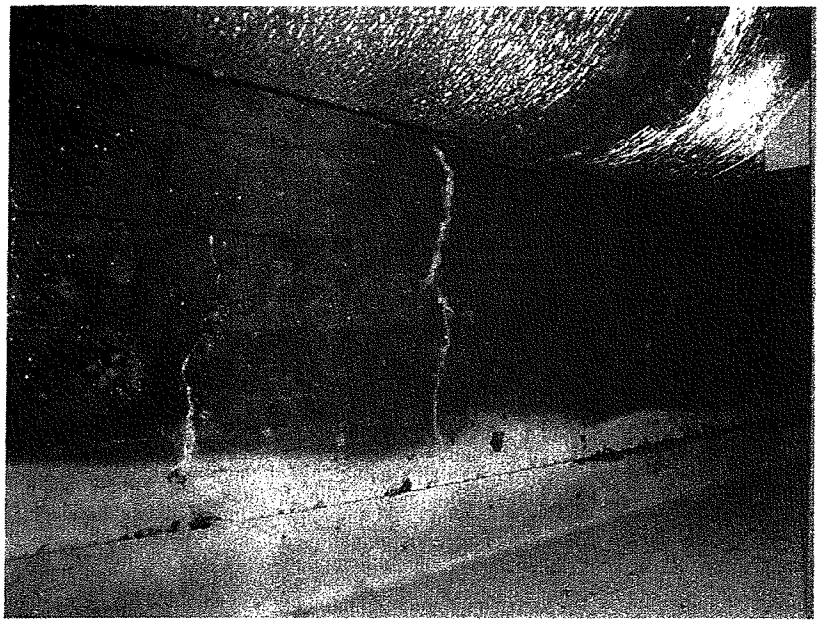
Photograph No. ~~15~~ 17
Moisture and Cracking with Efflorescence near Previously Patched Area on the Underside of Deck



Photograph No. ~~16~~ 18
Rusting, Moisture, Cracking with Efflorescence near Previously Patched Area, Underside of Deck

Photograph Log

Treatment Plant Drive over Huron River



Photograph No. ~~17~~ 19
Transverse Cracking with Efflorescence on the Underside of Deck

Photograph No. ~~18~~ 20
Structural Steel in Good Condition with Minor Surface Rusting (North Bay)