UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 2110

CSAH NO. 8

OVER THE

MINNESOTA RIVER

DISTRICT 8 - BROWN COUNTY

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 5221 (CEI 167)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 2110, Bents 2, 3, and 4, and Pier 1, were found to be in fair condition. Pier 1 exhibited substantial section loss of the footing and heavy section loss at the nose of the upstream column. All the piles of Bents 2, 3, and 4 exhibited scaling with maximum penetration of 1 inch. Several of the bent piles also exhibited spalling with exposed reinforcing steel. The channel bottom has degraded exhibiting and overall lowering and widening of the river channel at the bridge.

INSPECTION FINDINGS:

(A) All of the piles of Bents 2, 3, and 4 exhibited widespread scaling with penetrations of up to 1 inch.

(B) Pier 1 exhibited heavy scaling on each face of the upstream nose with 1 inch maximum penetration, and at the downstream end with penetrations that were 4 inches maximum depth.

(C) The tops of both column footings of Pier 1 were exposed at 12.8 feet below water. Heavy to moderate deterioration was present from 12.8 feet to bedrock at 14.8 feet all around the footings. At the downstream column of Pier 1, the horizontal penetrations due to section loss were approximately 12 inches at the upstream corner and sides and 8 inches towards the downstream nose, and at the upstream column of Pier 1, the horizontal penetrations were approximately 2 feet at the upstream corner and sides.

(D) A heavy accumulation of timber debris consisting of logs and branches was observed at the upstream noses of Bents 3 and 4 extending from the channel bottom to 1 foot above the waterline.

RECOMMENDATIONS:

(A) Repair the footing of Pier 1 by forming a new enlarged encasement around existing footings keyed into river bed.

(B) Patch heavy scaling on Pier 1 with formed, reinforced, anchored concrete designed for underwater applications.

(C) Patch the spalls on the piles of Bents 2, 3, and 4 with epoxy grout.

(D) Remove the timber debris upstream of Bents 3 and 4 during routine maintenance.

(E) Perform a scour analysis to determine horizontal and lateral stability of the channel, as well as ultimate scour depths.

(F) In light of apparent age and extent of deterioration for structure, investigate cost benefit of total bridge replacement.

(G) Reinspect the submerged substructure at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Daniel G. Stromberg

Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.

Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 2110

Feature Crossed: Minnesota River

Feature Carried: CSAH No. 8

Location: District 8 - Brown County

Bridge Description: Starting at the south end of the bridge, the superstructure consists of a multiple beam approach span, two pony truss spans, and three multiple beam spans. The substructure units, starting from the south, consist of: Bent 1 (South Abutment), a concrete cap supported by three octagonal concrete piles; Bent 2, a "dumbbell" shaped concrete cap supported by three octagonal concrete piles at each end; Pier 1, two square concrete columns with a concrete diaphragm wall; Bent 3, same as Bent 2; Bent 4, same as Bent 1; Bent 5, a concrete cap supported by two rectangular concrete columns; and the North Abutment. No design plan details were available.

2. INSPECTION DATA

Professional Engineer/Team Leader: Daniel G. Stromberg, P.E., S.E.

Dive Team: Clayton G. Brookins, Valerie Roustan

Date: October 21, 2007

Weather Conditions: Cloudy, 55^{o}F

Underwater Visibility: 1.0 foot

Waterway Velocity: 1.0 f.p.s

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Bent 2, Pier 1, Bent 3 and Bent 4.

General Shape: Bent 2 consists of a "dumbbell" shaped concrete cap supported by three octagonal concrete piles at each end. Pier 1 consists of a diaphragm wall with a square column and footing at each end. Bent 3, same configuration as Bent 2. Bent 4 consists of a concrete cap supported by three octagonal concrete piles

Maximum Water Depth at Substructure Inspected: Approximately 14.8 feet.

4. WATERLINE DATUM

Water Level Reference: The top of Bent 3, Elevation 102.33.

Water Surface: The waterline was approximately 10.5 feet below reference. Waterline Elevation = 91.8.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 5

Item 61: Channel and Channel Protection: Code 6

Item 92B: Underwater Inspection: Code B/10/07

Item 113: Scour Critical Bridges: Code I/07

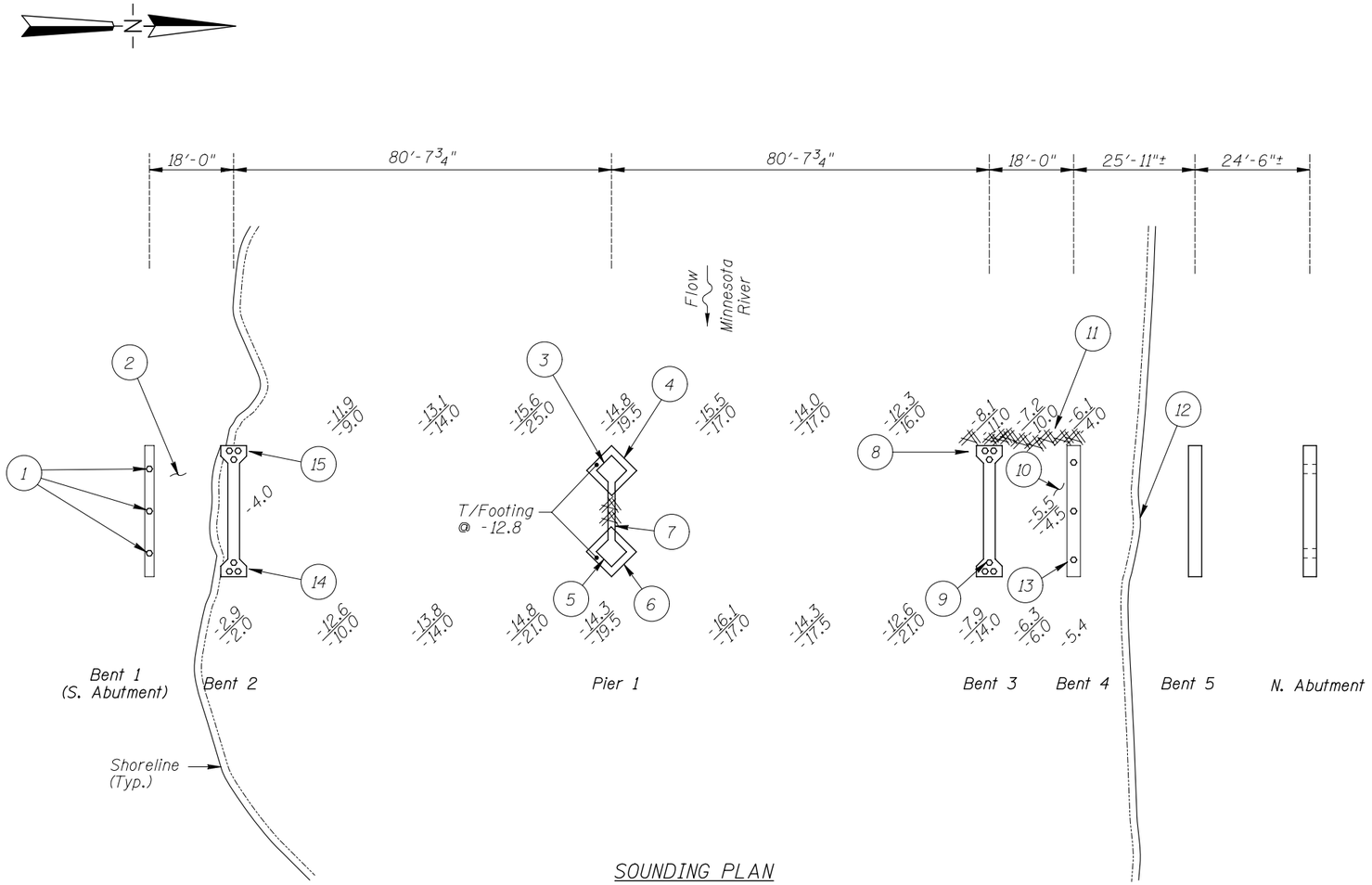
Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

_____ Yes X No

Photograph 1. View of Bent 2, Looking Northwest.

Photograph 2. View of Pier 1, Looking Northwest.

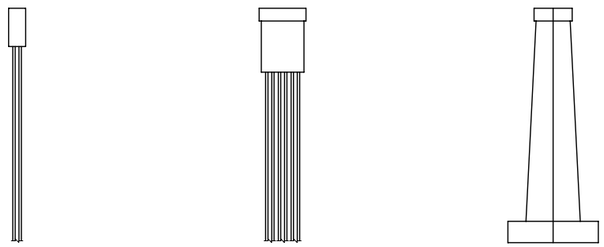
Photograph 3. View of Bents 3 and 4, Looking Southeast.



SOUNDING PLAN

INSPECTION NOTES:

1. Three octagonal concrete piles exposed a maximum of 4 feet below the pile cap of the abutment. A timber and concrete wall was exposed behind the piles.
2. Riprap, typically 1 foot to 2 foot in diameter, and soil bank sloped steeply to river channel.
3. Heavy scaling from -5 feet to -10 feet, 2.5 feet on each face of the upstream nose with 1 foot maximum penetration. Moderate scaling on all faces from -3 feet to -10 feet, 1/2 inch maximum penetration. Light scaling above -5 feet typically 1/8 inch penetration.
4. Top of footing located at -12.8 feet. Heavy deterioration was present from -12.8 feet to bedrock at -14.8 feet all the way around the footing with approximately 2 feet of horizontal penetration typical at the upstream corner and sides.
5. Moderate scaling on all faces from -7 feet to -10 feet with 3 inches to 4 inches maximum penetration. Light scaling above -7 feet typically 1/8 inch penetration.
6. Top of footing exposed at -12.8 feet. Heavy to moderate deterioration was present from -12.8 feet to bedrock at -14.8 feet all the way around the footing. Horizontal penetration was approximately 12 inches at upstream nose and sides and 8 inches towards the downstream nose.
7. The diaphragm wall extended 10 feet below water with light scaling of 1/8 inch typical penetration. Timber debris consisting of 6 inch to 8 inch diameter branches was present between the columns below the wall.
8. Scaling at all piles of Bent 3 starting 1 foot below the waterline to -3 feet, with 1 inch maximum penetration.
9. Spall with impending spall on pile from pile cap down 5 feet, up to 1.5 foot wide with 1.5 inches maximum penetration and exposed reinforcing steel (corroded).
10. Channel bottom consisted of 4 inches of soft silt over firmer silt.
11. A heavy accumulation of timber debris consisting of logs and branches up to 2 feet in diameter was observed at the upstream noses of Bents 3 and 4, extending from the channel bottom to 1 foot above the waterline.
12. Highly eroded riverbank.
13. Scaling at all piles of Bent 4 starting 1 foot below the waterline to -3 feet, with 1/4 inch maximum penetration.
14. Scaling at all piles of Bent 2 starting 1 foot below to the channel bottom, with 1/2 inch maximum penetration.
15. On the downstream face of the northern most pile of Bent 1 at the upstream end, pile exhibited section loss (1.5 inches) from under the pile cap to 1.5 feet above waterline with exposed and corroded reinforcement.



TYPICAL END VIEW BENTS 1 AND 4

TYPICAL END VIEW BENTS 2 AND 3

TYPICAL END VIEW PIER 1

GENERAL NOTES:

1. Bents 2, 3, 4, and Pier1 1 were inspected underwater.
2. At the time of inspection on October 21, 2007, the waterline was located approximately 10.5 feet below top of pile cap at Bent 3. This corresponds with a waterline elevation of 91.8 feet based on design drawings.
3. Soundings indicate the water depth at the time of the inspection and are measured in feet.
4. Soundings were taken parallel to the bridge at 1/4 point intervals between the substructure units.

Legend

-0.4	Sounding Depth (10/21/07)
-0.4	Sounding Depth (11/3/93)
	Timber Debris
	Octagonal Concrete Pile

Note:

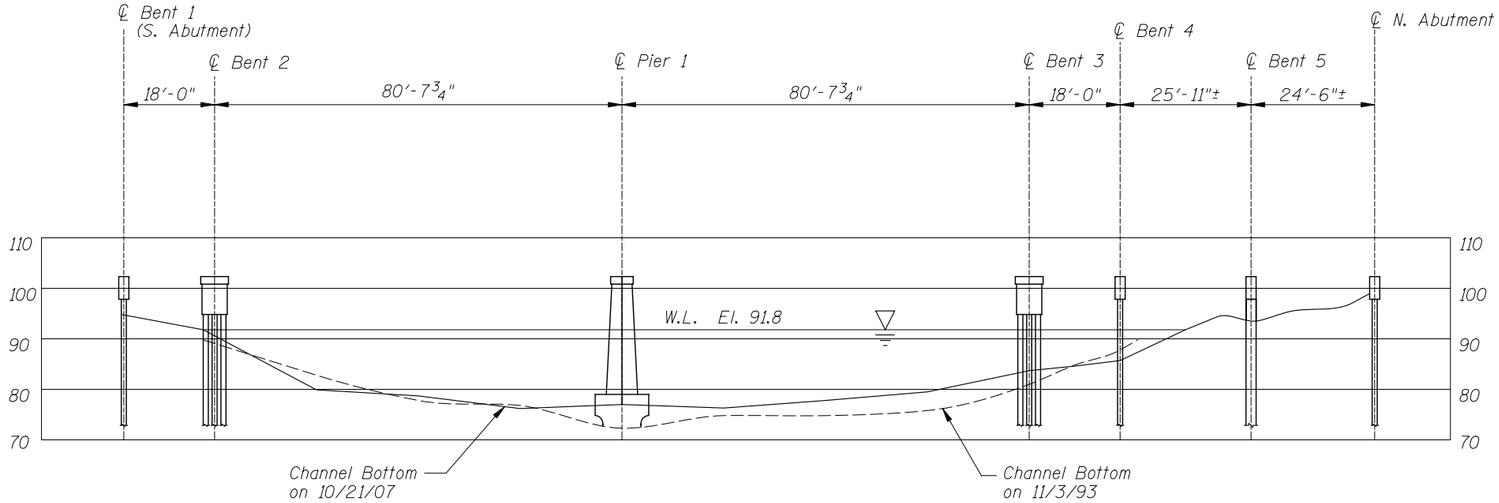
All soundings based on 2007 waterline location.

MINNESOTA DEPARTMENT OF TRANSPORTATION UNDERWATER BRIDGE INSPECTION

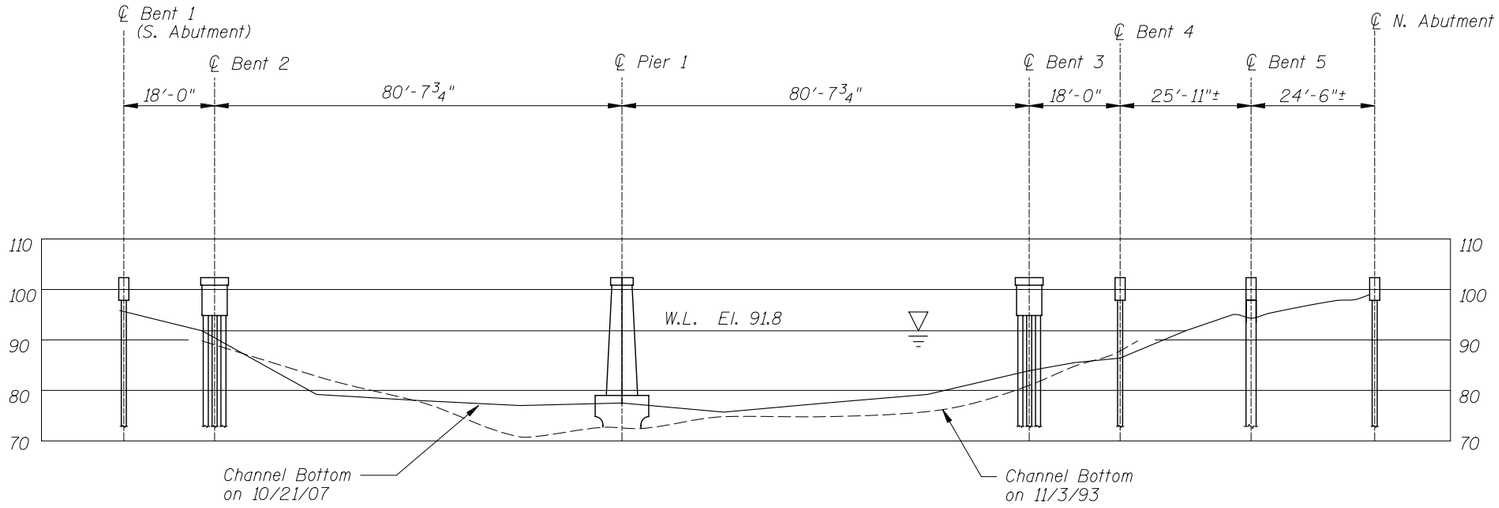
STRUCTURE NO. 2110
OVER THE MINNESOTA RIVER
DISTRICT 8, BROWN COUNTY

INSPECTION AND SOUNDING PLAN

Drawn By: PRH	COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	Date: OCT., 2007
Checked By: MDK		Scale: NTS
Code: 52212110		Figure No.: 1



UPSTREAM FASCIA PROFILE



DOWNSTREAM FASCIA PROFILE

Note:

Refer to Figure 1 for General Notes.

MINNESOTA
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INSPECTION AND SOUNDING PLAN

Drawn By: PRH	COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com	Date: OCT., 2007
Checked By: MDK		Scale: NTS
Code: 52212110		Figure No.: 2

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: October 21, 2007
ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E., S.E.
BRIDGE NO: 2110 WEATHER: Cloudy, 55°F
WATERWAY CROSSED: Minnesota River
DIVING OPERATION: X SCUBA _____ SURFACE SUPPLIED AIR
_____ OTHER_____
PERSONNEL: Clayton G. Brookins, Valerie Roustan
EQUIPMENT: Scuba, U/W Light, Lead Line, Probe Rod, Scraper, Sounding Pole, Camera
TIME IN WATER: 3:30 p.m.
TIME OUT OF WATER: 4:00 p.m.
WATERWAY DATA: VELOCITY 1.0 f.p.s
VISIBILITY 1.0 foot
DEPTH 14.8 feet maximum at Pier 1
ELEMENTS INSPECTED: Bents 2, 3, and 4 and Pier 1
REMARKS: Overall, the concrete below water was in fair condition. All of the piles of Bents 2, 3, and 4 exhibited widespread scaling with penetrations of up to 1 inch. Several of the bent piles also exhibited spalling with exposed reinforcing steel. In addition, Pier 1, exhibited heavy scaling on each face of the upstream nose with 1 inch maximum penetration, and at the downstream end with penetrations that were 4 inches maximum depth. The tops of both column footings of Pier 1 were exposed at 12.8 feet below water. Heavy to moderate deterioration was present from 12.8 feet to bedrock at 14.8 feet all around the footing. At the downstream column of Pier 1, the horizontal penetrations due to section loss were approximately 12 inches at the upstream corner and sides and 8 inches towards the downstream nose, and at the upstream column of Pier 1, the horizontal penetrations were approximately 2 feet at the upstream corner and sides.

FURTHER ACTION NEEDED: ___X___ YES _____ NO

Repair the footing of Pier 1 by forming a new enlarged encasement around existing footings keyed into river bed.

Patch heavy scaling on Pier 1 with formed, reinforced, anchored concrete designed for underwater applications.

Patch the spalls on the piles of Bents 2, 3, and 4 with epoxy grout.

Remove the timber debris upstream of Bents 3 and 4 during routine maintenance.

Perform a scour analysis to determine horizontal and lateral stability of the channel, as well as ultimate scour depths.

In light of apparent age and extent of deterioration for structure, investigate cost benefit of total bridge replacement.

Reinspect the submerged substructure at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 2110
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER. Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED Minnesota River

INSPECTION DATE October 21, 2007

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

CONDITION RATING

			SUBSTRUCTURE						CHANNEL					GENERAL					
UNIT REFERENCE NO.		MAXIMUM DEPTH OF WATER	PILING	COLUMNS, SHAFTS, OR FACES*	FOOTINGS	DISPLACEMENT	OTHER	OVERALL SUBSTRUCTURE CONDITION CODE*	SCOUR	EMBANKMENT EROSION	EMBANKMENT PROTECTION	OTHER (DRIFT/DEBRIS)	OVERALL CHANNEL & PROTECTION CONDITION	CONCRETE	STEEL	TIMBER	LOSS OF SECTION	PREVIOUS REPAIR OR MAINTENANCE	OTHER
	UNIT DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	Bent 2	4.0’	6	5	N	8	N	5	8	6	N	N	6	5	N	N	N	N	N
	Pier 1	14.8’	N	5	5	8	N	5	6	N	N	7	6	5	N	N	N	N	N
	Bent 3	8.1’	6	5	N	8	N	5	8	N	N	6	6	5	N	N	N	N	N
	Bent 4	6.1’	6	5	N	8	N	5	8	6	N	6	6	5	N	N	N	N	N

*UNDERWATER PORTION ONLY

REMARKS: Overall, the concrete below water was in fair condition. All of the piles of Bents 2, 3, and 4 exhibited widespread scaling with penetrations of up to 1 inch. Several of the bent piles also exhibited spalling with exposed reinforcing steel. In addition, Pier 1, exhibited heavy scaling on each face of the upstream nose with 1 inch maximum penetration, and at the downstream end with penetrations that were 4 inches maximum depth. The tops of both column footings of Pier 1 were exposed at 12.8 feet below water. Heavy to moderate deterioration was present from 12.8 feet to bedrock at 14.8 feet all around the footing. At the downstream column of Pier 1, the horizontal penetrations due to section loss were approximately 12 inches at the upstream corner and sides and 8 inches towards the downstream nose, and at the upstream column of Pier 1, the horizontal penetrations were approximately 2 feet at the upstream corner and sides.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.
USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.