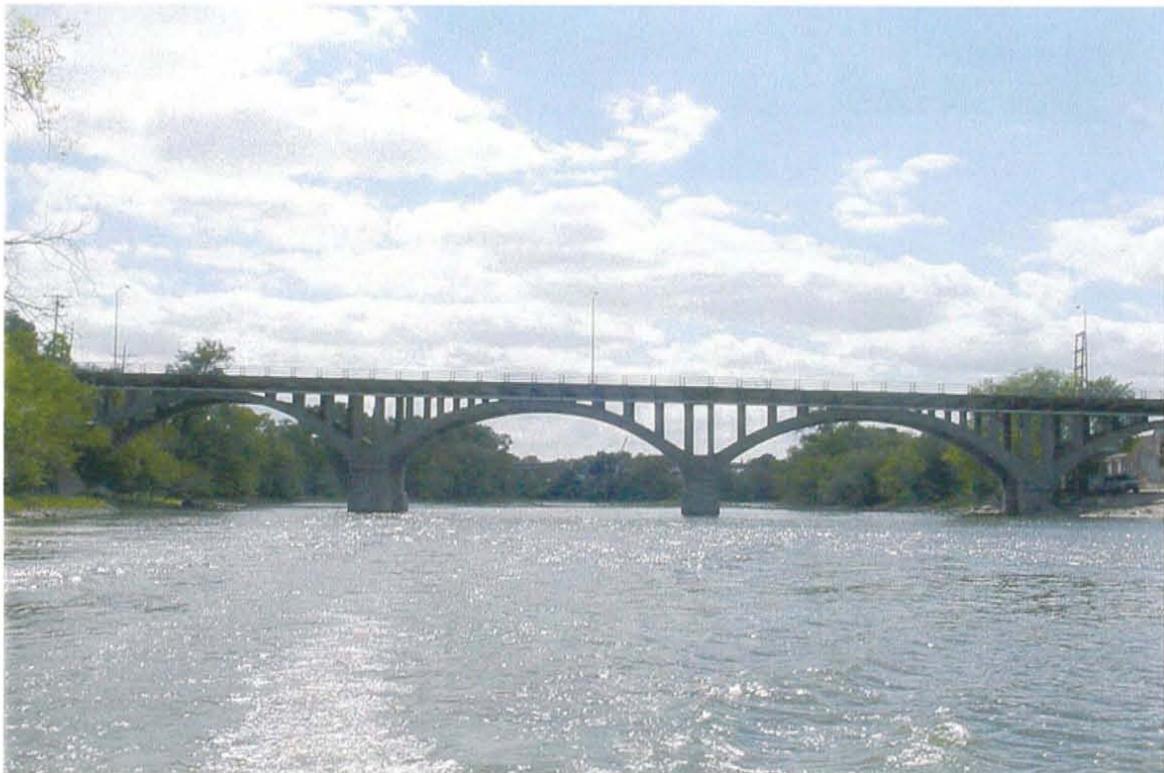


**UNDERWATER INVESTIGATION
OF
STRUCTURE NO. 101-6132
MORGAN STREET
OVER THE
ROCK RIVER
IN
ROCKFORD, ILLINOIS**



**AUGUST 31, 2005
PREPARED FOR THE
CRAWFORD MURPHY & TILLY, INC.**

UNDERWATER INVESTIGATION
OF
STRUCTURE NO. 101-6132
MORGAN STREET
OVER THE
ROCK RIVER
IN
ROCKFORD, ILLINOIS

AUGUST 2005

Prepared For:
CRAWFORD MURPHY & TILLY, INC.

Prepared by:
COLLINS ENGINEERS, INC.
123 North Wacker Drive, Suite 300
Chicago, IL 60606

CEI JOB NO. 4538

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UNDERWATER INVESTIGATION

OF

STRUCTURE NO. 101-6132

MORGAN STREET

OVER THE

ROCK RIVER

IN

ROCKFORD, ILLINOIS

1.0 INTRODUCTION

1.1 Purpose and Scope

This report consists of the results of a detailed underwater investigation of Structure No. 101-6132, Morgan Street over the Rock River in Rockford, Illinois.

Collins Engineers, Inc. conducted the underwater investigation for Crawford Murphy & Tilly, Inc. (CMT) on August 31, 2005. The work performed included a detailed inspection of the substructure components located in the water at the time of the investigation from the waterline to the channel bottom. In addition, a brief inspection was also made of those areas above the waterline that could be submerged during periods of higher water. Soundings of the channel bottom were taken along the upstream and downstream fascias, along lines 50, 100, and 200 feet upstream and downstream of the bridge, and around the substructure units in the water.

The following report includes a description of the structure, the method of investigation, a description of existing conditions, and an evaluation and recommendations based on the findings.

1.2 General Description of the Structure

The Morgan Street Bridge spans the Rock River in Rockford, Illinois. Refer to Figure 1 in Appendix A for a Location Map. The main structure over the waterway consists of an eight span open spandrel continuous concrete arch bridge, supported by seven reinforced concrete piers and two reinforced concrete abutments. The orientation of the longitudinal axis of the bridge is west to east. The substructure units along the waterway are labeled from west to east as Piers 5 through 7, and the East Abutment. Piers 6 and 7, which were the submerged substructure units at the time of inspection, are constructed of reinforced concrete founded on spread footings supported by timber piles. Refer to Photographs 1 and 2 in Appendix B for overall views of the Morgan Street Bridge.

1.3 Method of Investigation

A detailed field inspection was conducted to determine the physical condition of the substructure units from the waterline to the channel bottom. A brief visual examination of the substructure units above the waterline was also made.

A three-person team, consisting of a licensed structural engineer-diver, a technician-diver, and a technician, conducted the underwater inspection. During the inspection, the diver was able to work from a boat. Scuba equipment was used to perform the underwater inspection, consisting of a visual and tactile examination of the entire surface of the substructure units from waterline to channel bottom, with particular attention given to any noted areas of excessive deterioration or apparent distress. Photographs were taken to document typical conditions and any deterioration. Several areas on the underwater surfaces of the substructure units were cleaned so that the condition could be more closely examined. Observations of the channel bottom adjacent to the substructure units were also made. The type of channel bottom material, presence and location of scour holes, presence or absence of riprap, presence and location of any foundation undermining, and the presence of debris were noted. The condition of the shorelines in the vicinity of the bridge was also noted.

The location of the waterline with respect to the bridge was noted and water depth soundings were taken with a Fathometer along the upstream and downstream fascias, along lines 50, 100, and 200 feet upstream and downstream of the bridge, and around the substructure units in the water. A sounding plan was developed using the soundings and mapping of the shoreline. Refer to

Figure 2 in Appendix A for the sounding plan showing the channel limits around the structure. Refer to Figure 3 in Appendix A for the channel cross section along the downstream fascia.

2.0 EXISTING CONDITIONS

At the time of the inspection, the waterline of the Rock River was located approximately 6.5 feet below the top of the first ledge above the waterline at the downstream end of the western Pier 7 fascia. This corresponds to a waterline elevation of 87.0 feet. Piers 6 and 7 were located in the waterway at the time of inspection. The shores upstream and downstream of the bridge typically consisted of silty sand with stones and rocks measuring up to 1 foot in diameter. The river was flowing from north to south at approximately 2.0 feet per second, with a water temperature of approximately 67 degrees Fahrenheit. The visibility below water was less than 1 foot. During the inspection, the skies were partly cloudy with an air temperature around 74 degrees Fahrenheit.

Pier 6

Pier 6 was generally in fair condition below water. A scour countermeasure, which was placed around the pier in 1959, consisted of a grouted aggregate concrete encasement with the vertical sides formed by a sheet piling cofferdam driven into the existing channel bottom. The top of the grouted aggregate concrete was located 1 to 2 feet below the waterline around the pier perimeter. This encasement was in poor condition with heavy section loss along the west side of the pier. Large voids were visible in the vertical encasement face, extending from the center of the upstream column on the west fascia to the downstream nose. The areas of encasement section loss typically extended from the channel bottom to 2 feet below the top of the encasement along the upstream fascia and from 1 foot above the channel bottom to 7.5 feet below the top of the encasement along the downstream fascia and downstream nose. At the southwest corner of the pier where the section loss was heaviest, the void exhibited up to 6 feet of penetration. However, the diver did not observe any timber piles around the perimeter of the pier in accessible areas. Above water, the pier exhibited vertical cracks and map cracking with exudation, measuring up to 1/16-inch wide. In addition, random areas of delaminated concrete and associated section loss were also observed around the perimeter of the pier wall. Refer to Figure 4 in Appendix A for the Pier 6 Plan, Elevations and Inspection Notes.

The channel bottom material around Pier 6 typically consisted of concrete rubble with interspersed construction debris, having no probe rod penetration possible. Refer to Photographs 3 through 5 in Appendix B for views of Pier 6.

Pier 7

Pier 7 was generally in fair condition below water. A scour countermeasure, which was placed around the pier in 1959, consisted of a grouted aggregate concrete encasement with the vertical sides formed by a sheet piling cofferdam driven into the existing channel bottom. The top of the grouted aggregate concrete was located approximately 2 feet below the waterline around the pier perimeter. This encasement was in poor condition with heavy section loss along the west side of the pier. Large voids were visible in the southwest corner of the vertical encasement face, extending from the channel bottom to 7 feet below the top of the encasement. At the southwest corner of the pier where the section loss was heaviest, the void exhibited up to 5 feet of penetration. However, the diver did not observe any timber piles around the perimeter of the pier in accessible areas. Above water, the pier exhibited vertical cracks and map cracking with exudation, measuring up to 1/16-inch wide. In addition, random areas of delaminated concrete and associated section loss were also observed around the perimeter of the pier wall. Refer to Figure 5 in Appendix A for the Pier 7 Plan, Elevations and Inspection Notes.

The channel bottom material around Pier 7 typically consisted of concrete rubble with interspersed construction debris, having no probe rod penetration possible. Along the east side of the pier between the columns, the channel bottom material typically consisted of sandy gravel with up to 2 inches of probe rod penetration. A heavy accumulation of timber debris was located along the downstream nose, extending from the channel bottom up 6 feet. This debris consisted of trees measuring up to 8 inches in diameter with associated branches. Refer to Photographs 6 through 9 in Appendix B for views of Pier 7.

3.0 EVALUATION AND RECOMMENDATIONS

Overall, the submerged portions of the inspected substructure units of the Morgan Street Bridge were generally in fair condition. No significant deterioration of the substructure units was observed on Pier 6 or Pier 7. However, a significant amount of deterioration was observed on the grouted aggregate concrete encasement.

The grouted aggregate concrete encasements were in poor condition below the waterline. Due to the high flow conditions in 1999, the exact configuration of these encasements could not be determined. What was previously described as undermining of the concrete countermeasures is actually heavy section loss along the west side and downstream nose of the plain concrete encasements. This is evident at the southwest corner of Pier 7, where the encasement was intact from the channel bottom up 1 foot.

At both piers, the encasement section loss was heaviest at the southwest corner, where Pier 6 had up to 6 feet of penetration and Pier 7 had up to 5 feet of penetration. At both locations, the diver was unable to detect any exposed timber piles in accessible areas. Areas that were not accessible included smaller voids that did not allow for tactile examination of the substructure concrete.

Comparing the soundings taken to those taken in 1999 indicates that the channel bottom along the downstream fascia of the structure has remained fairly consistent, while the channel bottom upstream and 50 feet downstream of the structure has remained consistent or filled in slightly. However, the soundings indicate that degradation of the channel bottom material has occurred 100 feet and 200 feet downstream of the structure. It should also be noted that the channel bottom elevations around the substructure units have also remained fairly consistent over the last 6 years. Refer to Figure 3 in Appendix A for a comparison of the channel bottom contour along the downstream fascia.

Based on conversations with CMT personnel, the Morgan Street Bridge will be replaced within the next 5 years. If complete replacement of the bridge occurs within the next 5 years, then no structural repairs to the scour countermeasures will be necessary. However, based on the encasement condition and noted high water velocity on the Rock River, it is recommended that the Morgan Street Bridge be inspected underwater at intervals not to exceed 12 months until the bridge is replaced. Underwater inspections will help document further deterioration of the encasements that may allow for undermining of the concrete footings. Should the life of the structure be prolonged over 5 years, it is recommended that the encasements be repaired, or new scour countermeasures be installed. It is also recommended that the noted cracks and areas of section loss above water also be repaired.

In accordance with the National Bridge Inspection Standards (NBIS), it is recommended that the substructure of Structure No. 101-6132 be inspected underwater at intervals not to exceed 12 months until the bridge is replaced. Collins Engineers, Inc. also recommends that soundings at the bridge be taken as part of the biennial inspections and during or soon after flood occurrences. If the soundings indicate a significant change in the channel bottom elevation, an underwater inspection should be performed.



09.29.05
exp 11.30.06

Respectfully submitted,

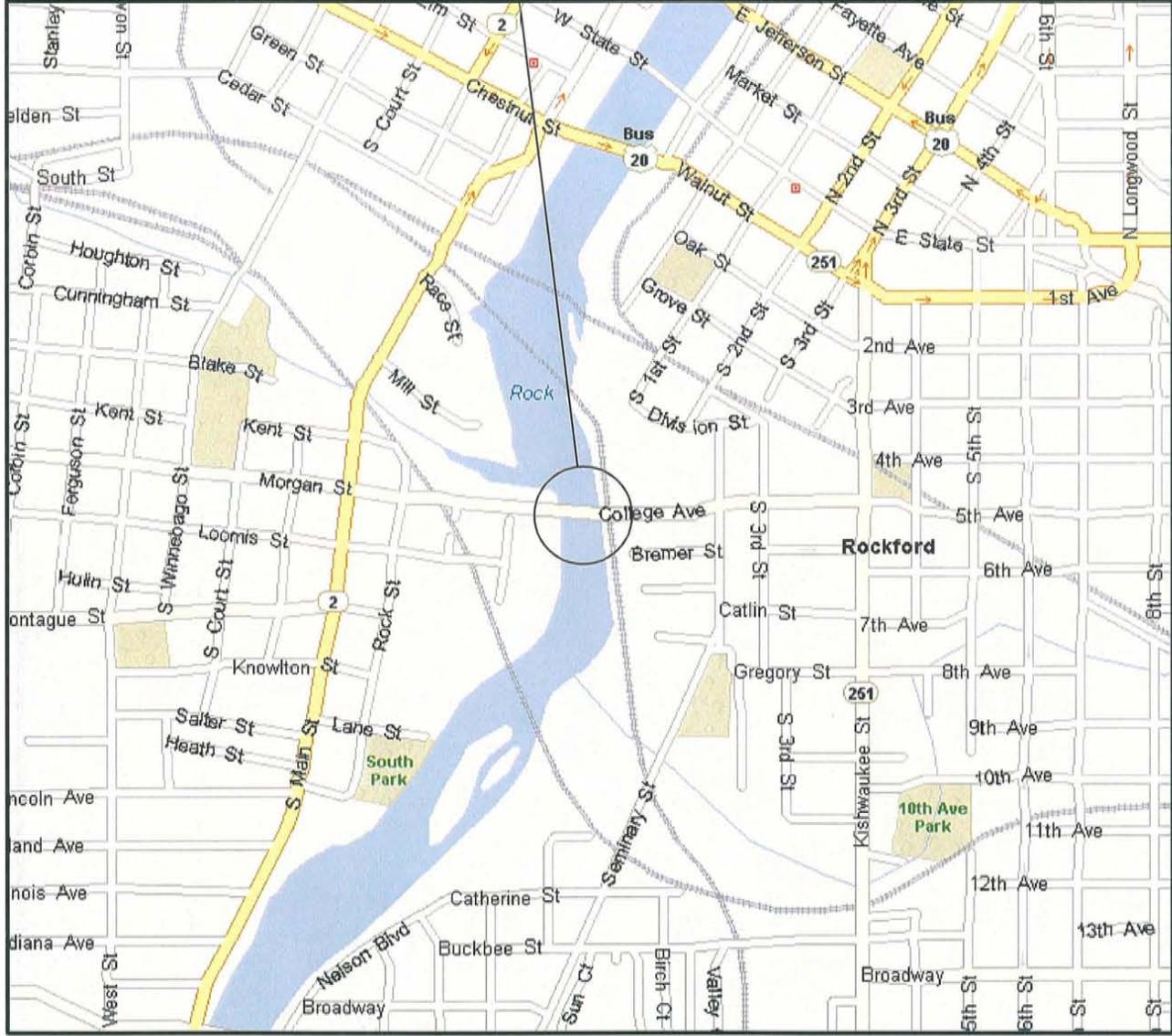
COLLINS ENGINEERS, INC.

A handwritten signature in black ink, appearing to read "JOE O'Leary".

John E. O'Leary, S.E., P.E.



Structure No. 101-6132



CRAWFORD MURPHY & TILLY, INC.

MORGAN STREET BRIDGE
OVER THE ROCK RIVER
IN ROCKFORD, ILLINOIS
STRUCTURE NO. 101-6132
LOCATION MAP

Drawn By: DR
Checked By: JEO
Code: 45380001

COLLINS ENGINEERS
123 North Wacker Drive
Suite 300
Chicago, IL 60606
(312) 704-9300
www.collinsengr.com
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Date: SEPT., 2005
Scale: NTS
Figure No.: 1

200' Upstream



100' Upstream

50' Upstream

Upstream Fascia

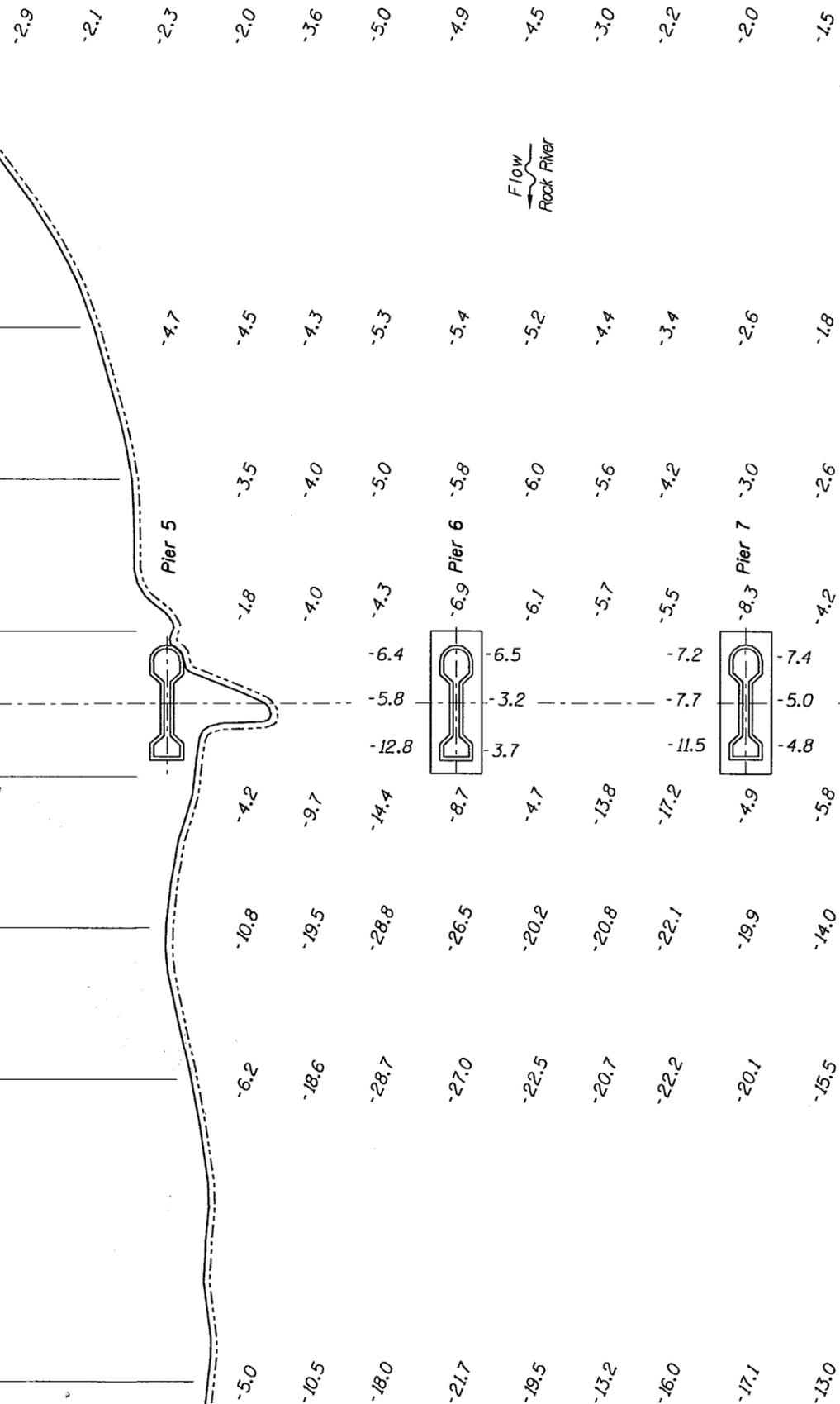
☉ Morgan Street Bridge

Downstream Fascia

50' Downstream

100' Downstream

200' Downstream



Flow
Rock River

General Notes:

1. Pier 6 and Pier 7 were inspected underwater.
2. At the time of the inspection, the waterline of the Rock River was located approximately 6.5 feet below the top of the first ledge above the waterline at the downstream end of the western Pier 7 fascia. This corresponds to a waterline elevation of 87.0 feet.
3. Soundings indicate the channel bottom depth at the time of inspection and are measured in feet.
4. Soundings were taken parallel to the bridge fascias, around each substructure unit, as well as 50 feet, 100 feet, and 200 feet upstream and downstream of the bridge.
5. The water velocity of the Rock River at the time of inspection was approximately 2 feet per second.

Legend

-5.0 Channel Cross Section Depth from Waterline

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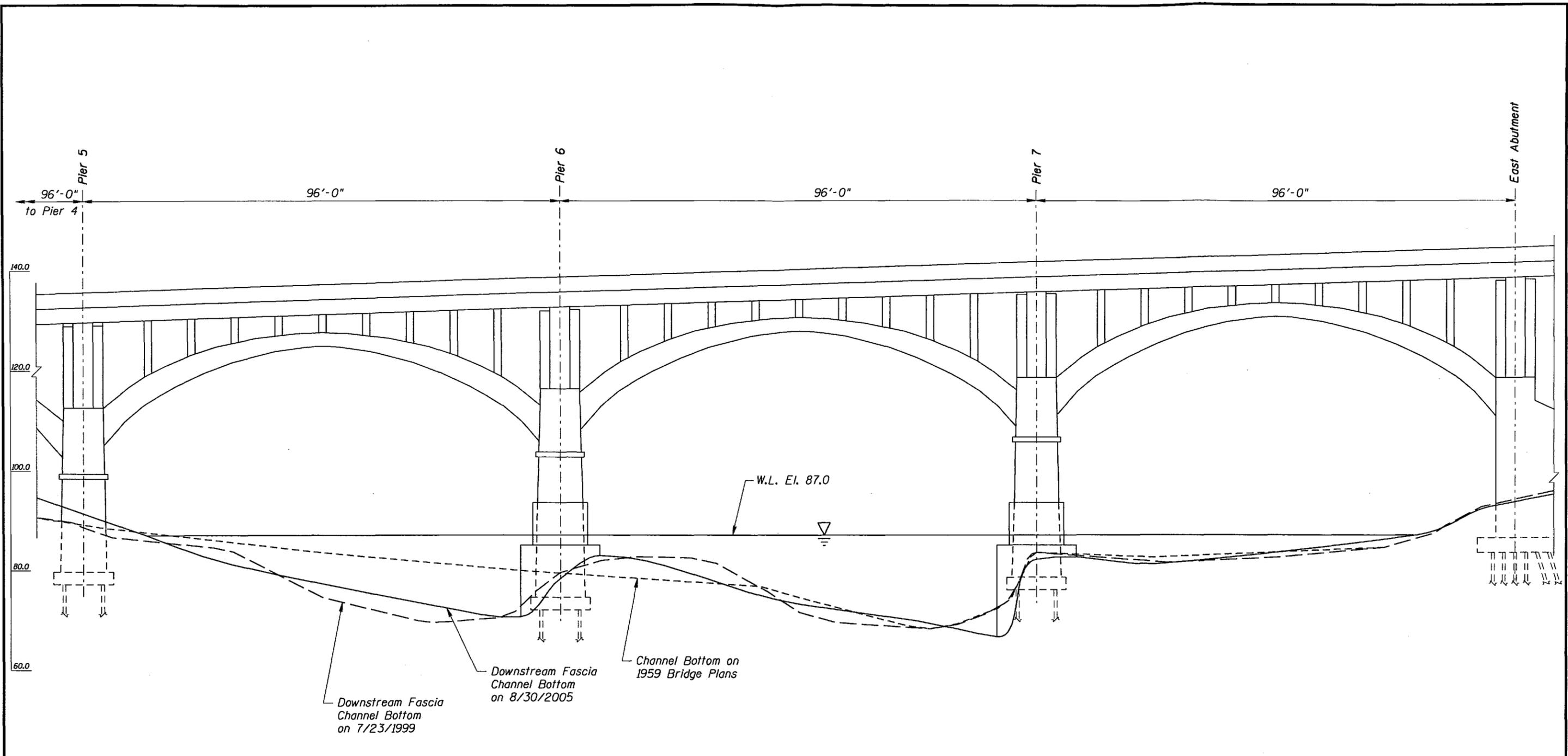
MORGAN STREET BRIDGE
OVER THE ROCK RIVER
IN ROCKFORD, ILLINOIS
STRUCTURE NO. 101-6132
SOUNDING PLAN

Drawn By: DR
Checked By: JEO
Code: 45380001

COLLINS ENGINEERS
123 North Wacker Drive
Suite 300
Chicago, IL 60606
(312) 704-9300
www.collinseng.com
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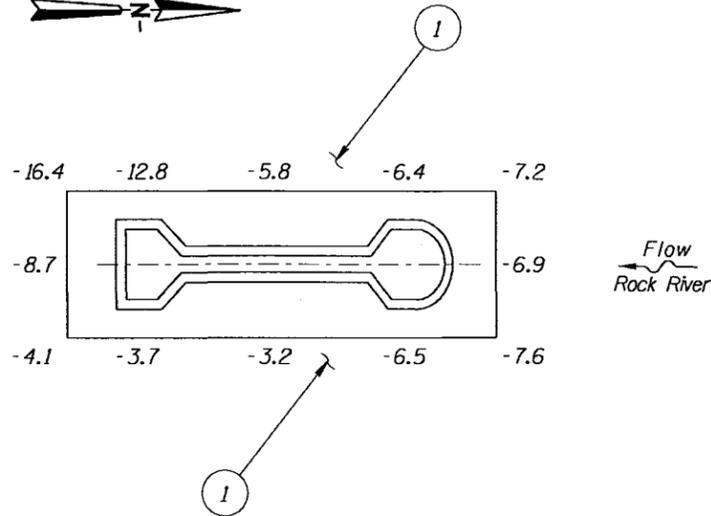
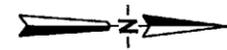
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PLAN



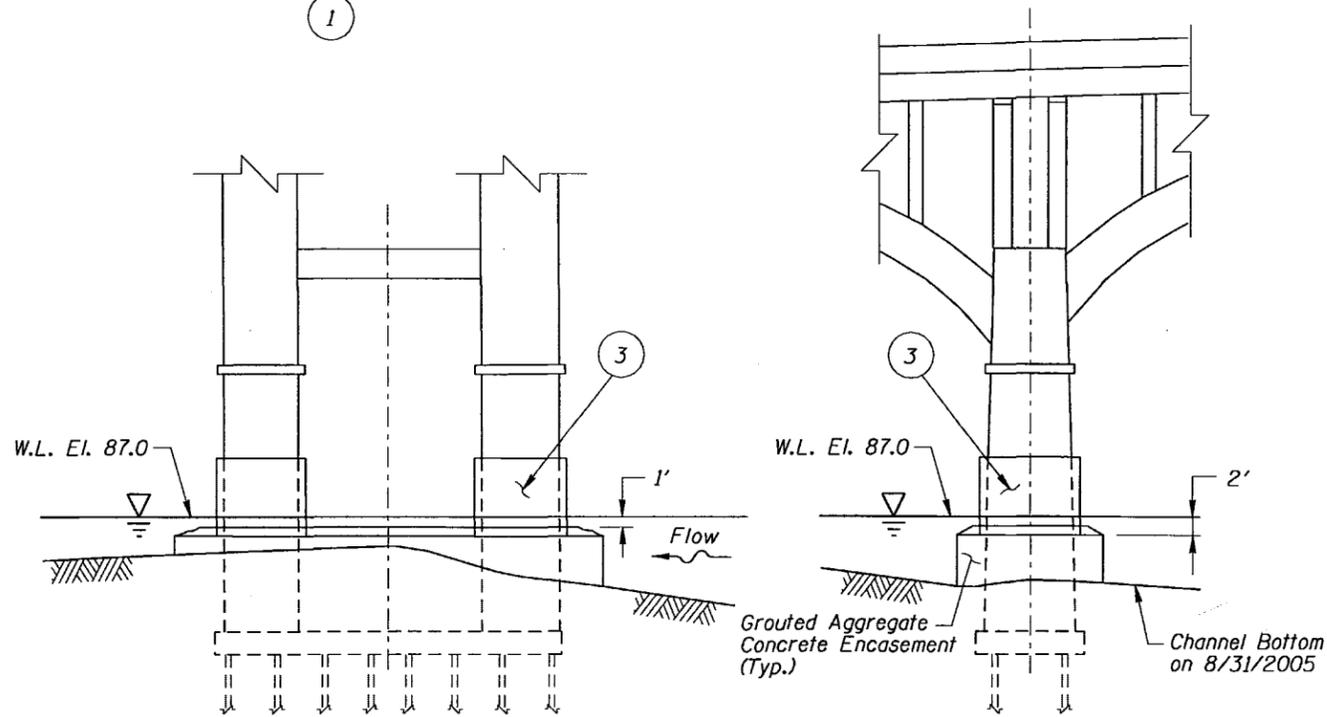
DOWNSTREAM FASCIA ELEVATION

CRAWFORD MURPHY & TILLY, INC.		
MORGAN STREET BRIDGE OVER THE ROCK RIVER IN ROCKFORD, ILLINOIS STRUCTURE NO. 101-6132 CHANNEL CROSS SECTION ALONG DOWNSTREAM FASCIA		
Drawn By: DR	 <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com ILLINOIS PROFESSIONAL DESIGN FIRM LICENSE NO. 184-000993</small>	Date: SEPT., 2005
Checked By: JEO		Scale: 1"=20'-0"
Code: 45380001		Figure No.: 3



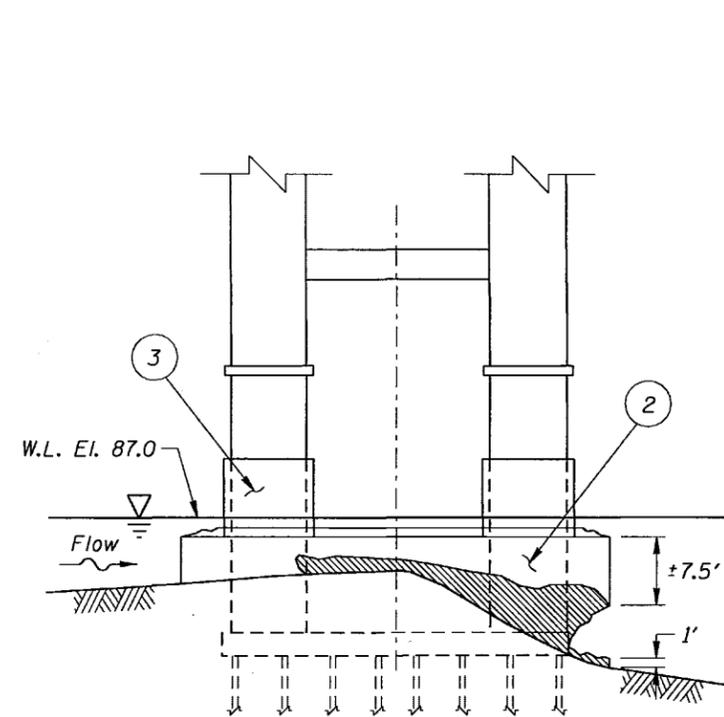
Inspection Notes:

- 1 The channel bottom material typically consisted of concrete rubble with interspersed construction debris, having no probe rod penetration possible.
- 2 The grouted aggregate concrete encasement was in poor condition with heavy section loss along the west side of the pier. Large voids were visible in the vertical encasement face, extending from the center of the upstream column on the west fascia to the downstream nose. The areas of encasement section loss typically extended from the channel bottom to 2 feet below the top of the encasement along the upstream fascia and from 1 foot above the channel bottom to 7.5 feet below the top of the encasement along the downstream fascia and downstream nose. At the southwest corner of the pier where the section loss was heaviest, the void exhibited up to 6 feet of penetration. However, the diver did not observe any timber piles around the perimeter of the pier in accessible areas.
- 3 Above water, the pier exhibited vertical cracks and map cracking with exudation, measuring up to 1/16-inch wide. In addition, random areas of delaminated concrete and associated section loss were also observed around the perimeter of the pier wall.

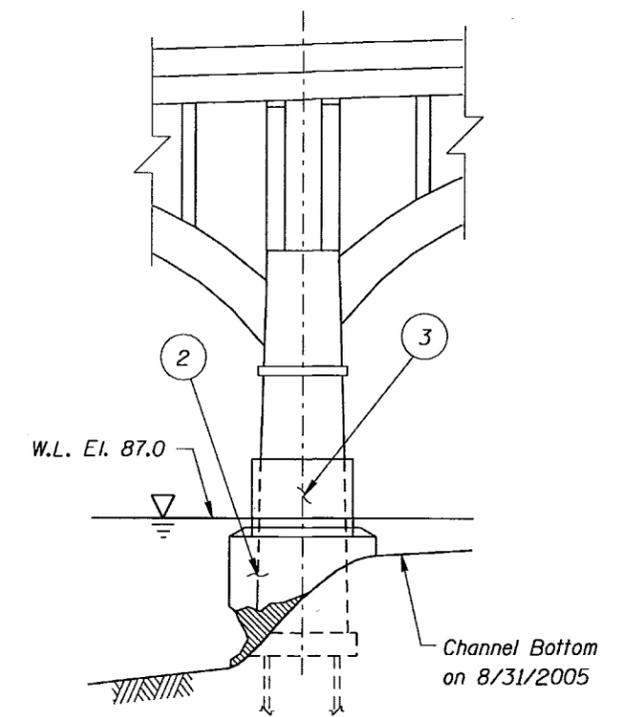


EAST ELEVATION

NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION

General Notes:

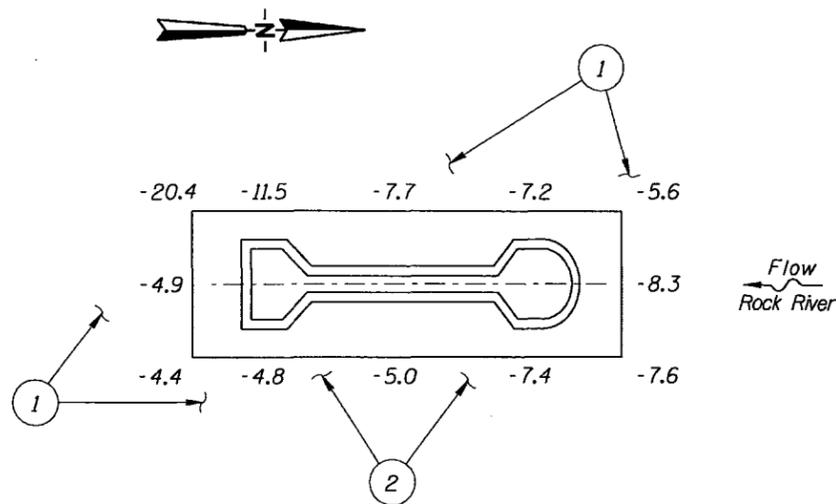
1. At the time of the inspection, the waterline of the Rock River was located approximately 6.5 feet below the top of the first ledge above the waterline at the downstream end of the western Pier 7 fascia. This corresponds to a waterline elevation of 87.0 feet.
2. Soundings indicate the channel bottom depth at the time of inspection and are measured in feet.

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MORGAN STREET BRIDGE
OVER THE ROCK RIVER
IN ROCKFORD, ILLINOIS
STRUCTURE NO. 101-6132

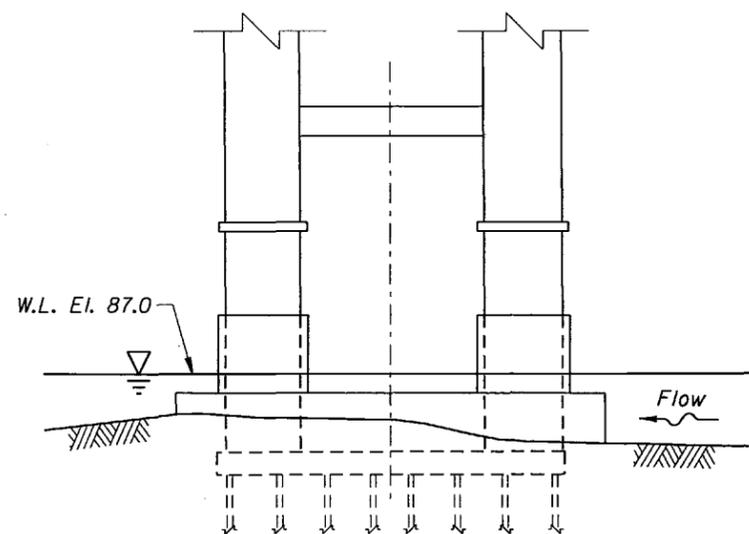
PIER 6 - INSPECTION NOTES

Drawn By: DR	COLLINS ENGINEERS <small>123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 794-9300 www.collinsengr.com</small>	Date: SEPT., 2005
Checked By: JEO		Scale: 1"=20'-0"
Code: 45380001		Figure No.: 4

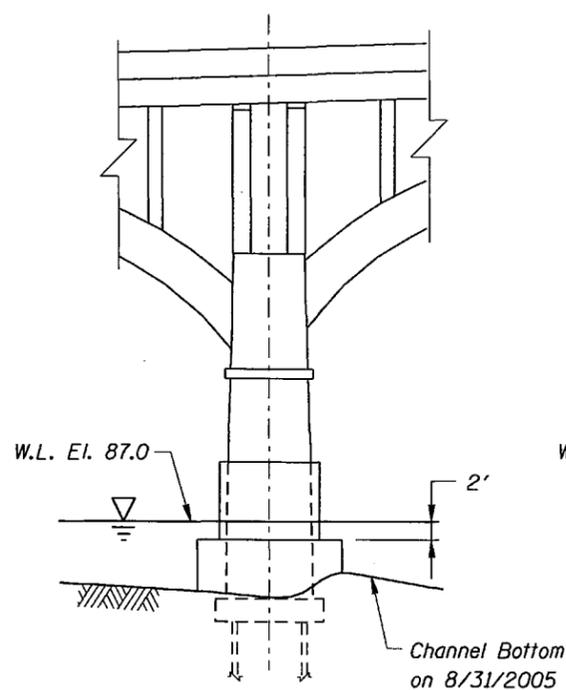


Inspection Notes:

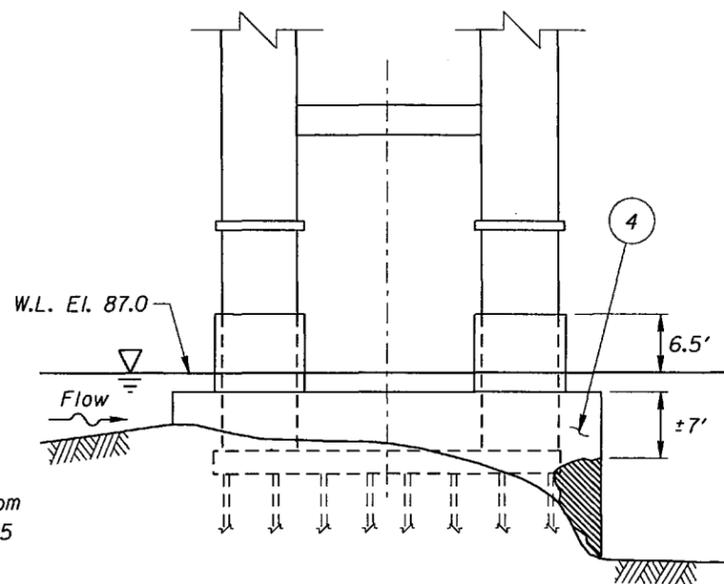
- ① The channel bottom material typically consisted of concrete rubble with interspersed construction debris, having no probe rod penetration possible.
- ② The channel bottom material along the east side of the pier between the columns typically consisted of sandy gravel with up to 2 inches of probe rod penetration.
- ③ Heavy accumulation of timber debris, extending from the channel bottom up 6 feet. This debris consisted of trees measuring up to 8 inches in diameter with associated branches.
- ④ The grouted aggregate concrete encasement was in poor condition with heavy section loss along the west side of the pier. Large voids were visible in the southwest corner of the vertical encasement face, extending from the channel bottom to 7 feet below the top of the encasement. At the southwest corner of the pier where the section loss was heaviest, the void exhibited up to 5 feet of penetration. However, the diver did not observe any timber piles around the perimeter of the pier in accessible areas.



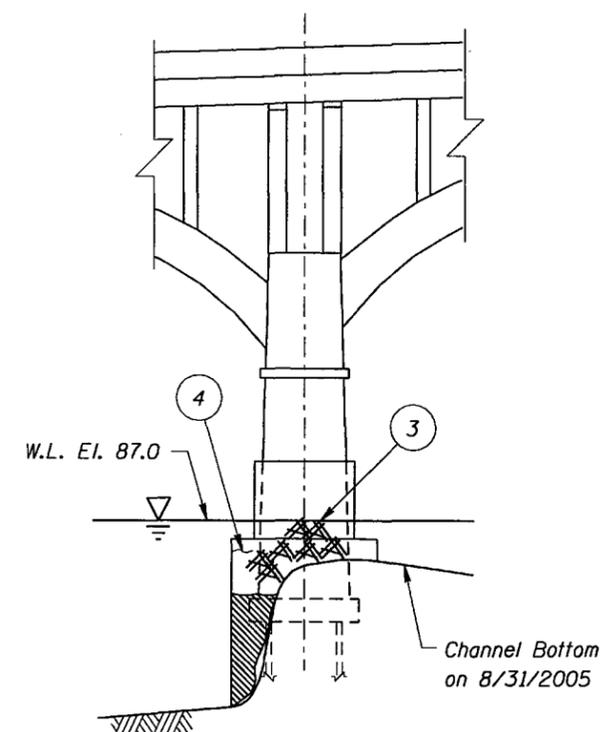
EAST ELEVATION



NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION

General Notes:

1. At the time of the inspection, the waterline of the Rock River was located approximately 6.5 feet below the top of the first ledge above the waterline at the downstream end of the western Pier 7 fascia. This corresponds to a waterline elevation of 87.0 feet.
2. Soundings indicate the channel bottom depth at the time of inspection and are measured in feet.

CRAWFORD MURPHY & TILLY, INC.

MORGAN STREET BRIDGE
OVER THE ROCK RIVER
IN ROCKFORD, ILLINOIS
STRUCTURE NO. 101-6132
PIER 7 - INSPECTION NOTES

Drawn By: DR
Checked By: JEO
Code: 45380001

COLLINS ENGINEERS
123 North Wacker Drive
Suite 300
Chicago, IL 60606
(312) 704-9300
www.collinsengr.com
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Date: SEPT., 2005
Scale: 1"=20'-0"
Figure No.: 5

**APPENDIX B
PHOTOGRAPHS**



Photograph 1. Overall View of Morgan Street Bridge, Looking South.



Photograph 2. Overall Skew of Morgan Street Bridge, Looking Northeast.



Photograph 3. View of Pier 6, Looking Northwest.



Photograph 4. View of Pier 6, Looking Southwest.



Photograph 5. View of Pier 6, Looking Southeast.



Photograph 6. View of Pier 7, Looking Northwest.



Photograph 7. View of Pier 7, Looking Southeast.



Photograph 8. View of Pier 7, Looking Northwest.



Photograph 9. View of Pier 7, Looking East. Note Typical Concrete Condition Along Waterline.

**APPENDIX C
RATING FORMS**

