

# Underwater Inspection Report



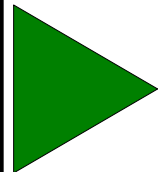
South Carolina Department of Transportation

**I-26**

**Over**

**Saluda River**

No Significant  
Action Required



Developed by:

Lexington County, South Carolina  
**September 24, 2012**



**INFRASTRUCTURE  
ENGINEERS, INC.**

consulting engineers | commercial divers

Job No. 10282SC00.02 - 81

This Underwater Inspection Report was Developed for:

**Bridge No. 3210002600400**

carrying

**I-26 over Saluda River**

in

**Lexington County, South Carolina**

Infrastructure Engineers • 1460 John B White Sr. Blvd, Ste 1C • Spartanburg, SC 29306

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## **2012 UNDERWATER INSPECTION REPORT EXECUTIVE SUMMARY**

Inspection Date: September 24, 2012

NBIS Rating:

- The bridge's submerged components are in **good** condition.

Significant Conditions Observed:

- Up to 10 ft of general scour since construction.

Repair Recommendations:

- Monitor channel bottom for continued scour during future inspections.

## **1.0 INTRODUCTION**

### **1.1 Purpose and Scope**

SCDOT Bridge No. 3210002600400 carries I-26 over the Saluda River in Lexington County. On September 24, 2012, Infrastructure Engineers, Inc. performed a routine underwater investigation at the bridge to evaluate the condition of all substructure units (SSUs) located in the water. This report includes a general description of the structure and the method of investigation, as well as a detailed description of the conditions noted. In addition, this report contains a condition assessment of the evaluated bridge components and presents recommendations for structural repairs.

The scope of the investigation included a visual inspection of all accessible SSUs located in the water from the high water mark to the channel bottom. Depth soundings were also taken along the bridge's upstream and downstream fascias to assist in scour identification and documentation.

### **1.2 General Description of the Structure**

The report cover photograph shows an overall view of the bridge's upstream fascia, and Photograph 1 in Appendix B shows a downstream fascia view.

The bridge consists of ten simple prestressed concrete girder spans. The superstructure is supported by two end bents and nine intermediate bents. Each intermediate bent consists of six reinforced concrete columns and a reinforced concrete cap. Each column at Bents 5-6, and 8-9 is supported by an independent reinforced concrete spread footing. The columns at Bents 4 and 7 are founded on piles. Refer to Photograph 2 in Appendix B for a view of a typical bent.

The report's labeling convention designates the piers following the SCDOT design drawings dated October 1983. The bents are labeled numerically from north to south; the columns are labeled alphabetically from west to east. Refer to Figures 1 and 2 in Appendix A for a bridge plan and elevation sketch.

### **1.3 Method of Investigation**

A dive team, led by a South Carolina-registered professional engineer-diver, conducted the underwater inspection. The inspection team accessed the bridge site from the shore.

The underwater investigation generally consisted of a Level I “swim-by” visual inspection over 100 percent of the accessible SSU surfaces from the high water mark to the channel bottom. Divers performed a Level II visual/tactile inspection on at least 25 percent of the SSUs, which included cleaning marine growth at the waterline, mid-depth, and channel bottom to facilitate an evaluation of the underlying surfaces. Inspectors paid particular attention to any observed areas of excessive deterioration or apparent distress while noting the condition of any repairs.

The inspection team also assessed the waterway and streambed conditions in the bridge vicinity, noting the type of channel bottom material, as well as the location and extent of any observed scour, riprap, or debris.

Inspectors noted the waterline location with respect to a fixed reference on the bridge at the time of the inspection. Depth soundings were taken along the bridge fascias and around each SSU using a digital handheld sounder.

## **2.0 INSPECTION FINDINGS**

At the time of inspection, the waterline was located 19.6 ft. below the top of the deck on the upstream side of Bent 7. Based on the available SCDOT drawings dated

1983, this translates to a waterline elevation of 161.8. The Saluda River flowed with a velocity of up to 0.5 fps during the inspection. Bridge soundings indicate that the maximum water depth was 18.8 ft. on the downstream fascia at Bent 6. Refer to Table 1 in Appendix A for a listing of the sounding measurements relative to the bridge deck.

The banks along the Saluda River in the bridge vicinity are in stable condition. Embankment protection in the form of riprap is present on the north and south banks. The banks are gently sloping and there is no sign of active erosion. Refer to Photographs 3 and 4 in Appendix B for a view of the north and south embankments, respectively. The channel bottom in the bridge vicinity primarily consists of mud and rock.

The SSUs located in water at the time of inspection included Bents 4 through 9. All of the inspected SSUs have 1/8-in. penetration scaling from the channel bottom to 4 ft. above the waterline. There is timber debris throughout the channel. Many of the inspected columns have footing exposure, up to 60 in. high. Refer to Table 2 in Appendix A for detailed footing exposure and remaining embedment measurements. Refer to Figure 1 in Appendix A for detailed inspection notes and a plan view showing the existing conditions at each of the inspected bents.

### 3.0 EVALUATION AND ASSESSMENT

Overall, the submerged components of the bridge SSUs are in **good** condition. The light scaling observed is typical of in-service concrete of this age and does not affect the bridge. Based on a comparison with the original channel bottom profile, there has been up to 10 ft of general scour since construction. The widespread footing exposure is a result of the general scour. Plans call for the footings to be keyed into rock or founded on piles; no undermining was found during the inspection. The footing exposure does not affect the bridge.

The inspected SSUs are rated as **good, Code 7**, in accordance with the FHWA National Bridge Inspection Standards (NBIS) Coding information. Appendix C contains condition rating forms in both NBIS and Bridge Management System (BMS) formats for this bridge.

#### 4.0 RECOMMENDATIONS

It is recommended that the channel bottom be closely monitored for additional scour. In accordance with NBIS recommendations, the next routine underwater inspection for this bridge should be conducted on an interval not to exceed 60 months. In addition, bridge soundings should be taken as part of biennial above-water inspections, as well as following significant flooding events.

Respectfully submitted,

**INFRASTRUCTURE ENGINEERS, INC.**



Jeffrey B. Rowe, P.E.

Table 1

## Bridge Soundings

Bent	Upstream Fascia			Downstream Fascia		
	Waterline to Channel Bottom (ft)	Top of Deck to Waterline (ft)	Top of Deck to Channel Bottom (ft)	Waterline to Channel Bottom (ft)	Top of Deck to Waterline (ft)	Top of Deck to Channel Bottom (ft)
1/2	Dry	Dry	14.1	Dry	Dry	14.6
4	7.7	19.8	27.5	3.3	19.8	23.1
1/2	11.6	19.6	31.2	13.3	19.6	32.9
5	9.8	19.5	29.3	14.6	19.5	34.1
1/2	11.2	19.4	30.6	16.1	19.4	35.5
6	11.5	19.4	30.9	18.8	19.4	38.2
1/2	7.0	19.5	26.5	12.7	19.5	32.2
7	5.3	19.6	24.9	9.2	19.6	28.8
1/2	4.2	19.7	23.9	3.1	19.7	22.8
8	4.9	19.9	24.8	0.8	19.9	20.7
1/2	2.8	20.1	22.9	1.2	20.1	21.3
9	2.7	20.2	22.9	Dry	Dry	16.2
1/2	1.0	20.4	21.4	-	-	-
10	Dry	Dry	16.0	-	-	-

NOTE: The numbers listed in this table represent distances and not elevations. The waterline elevation at the time of the readings was 161.8 based on a measurement taken in the field and calculations using the existing plans.

**Table 2**  
**Vertical Footing/Seal Exposures**

Bent-Column	Northeast Corner (ft)	Northwest Corner (ft)	Southeast Corner (ft)	Southwest Corner (ft)	Remaining Embedment (ft)
4-A	Covered	Covered	1.0	1.0	3.0
5-B	Covered	Covered	1.5	1.0	2.5
5-C	0.5	1.0	2.5	3.3	0.7
5-D	Covered	Covered	2.0	2.0	2.0
5-E	Covered	Covered	2.5	2.5	1.5
5-F	Covered	Covered	0.2	Covered	3.8
6-B	0.3	Flush	Covered	Covered	3.7
6-C	1.5	1.0	0.5	Covered	2.5
6-D	0.3	1.0	Debris	1.5	2.5
6-E	Covered	Flush	0.3	1.0	3.0
7-B	Covered	Covered	Covered	Flush	4.0
7-C	Flush	1.0	0.5	1.0	3.0
8-A	2.5	4.5	4.0	4.0	0.0
8-B	2.5	1.5	2.5	2.5	1.5
8-C	2.0	4.5	1.0	2.7	1.3
8-D	1.0	1.0	Flush	Covered	3.0
8-E	2.0	5.0	1.5	2.0	0.0
8-F	2.0	2.0	2.0	2.0	2.0
9-A	1.5	2.5	Covered	1.0	1.5
9-B	Covered	2.5	Covered	Covered	1.5
9-C	0.8	0.6	0.2	0.4	3.2
9-D	2.2	2.2	1.3	0.5	1.8
9-F	Covered	0.3	Covered	Covered	3.7

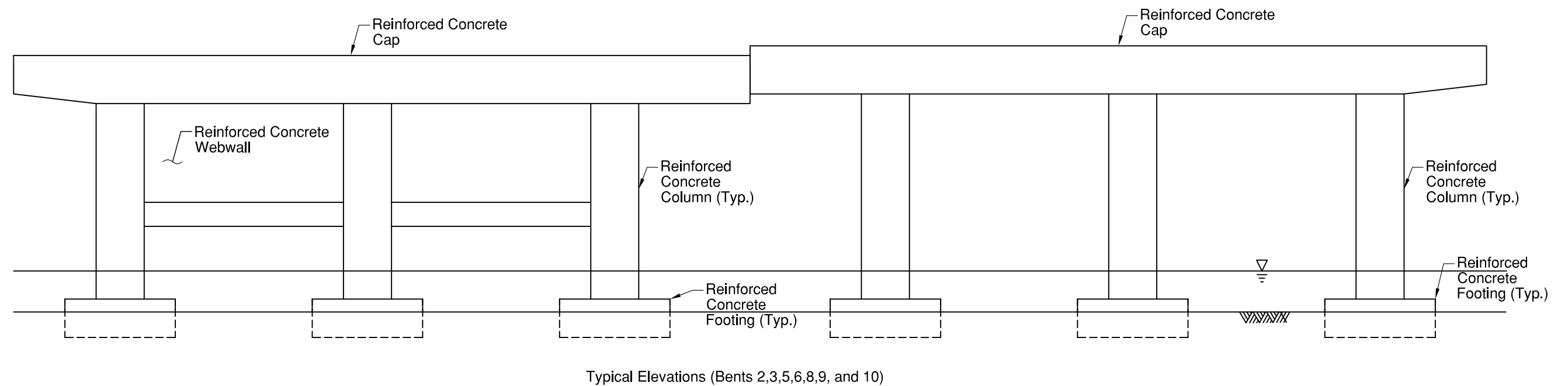
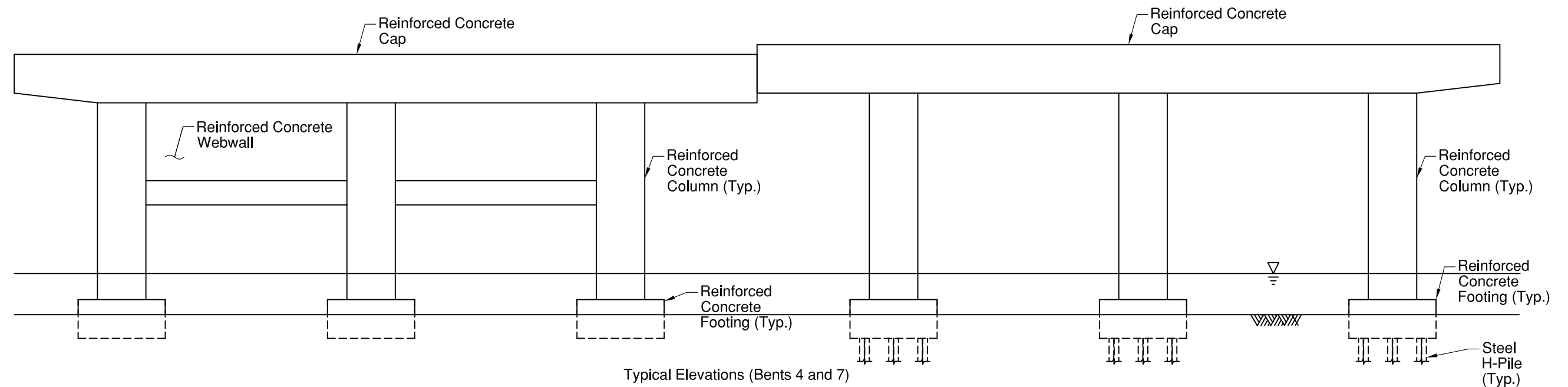
NOTE: Footing exposure measurements are taken from the top of the footing down to the channel bottom. An \* indicates complete footing exposure and partial seal exposure, with measurements taken from the top of the seal to the channel bottom. A † indicates complete seal exposure resulting in undermining, with measurements taken from the bottom of the seal to the channel bottom.

Remaining embedment measurements refer to the minimum amount of soil covering the footing; these measurements do not represent a measure of the footing embedment into the supporting bedrock for Bents 5, 6, 8, and 9. For Bents 4 and 7, these measurements also refer to the minimum amount of soil covering the footing and do not represent a measure of the remaining embedment of the supporting piles. There is no undermining or pile exposure at Bents 4 and 7.









GRAPHIC SCALE	DATE September 2012	 1460 John B. White Sr. Blvd. Ste. 1C Spartanburg, SC 29306 PH: 864.595.8030 FAX: 864.595.8034 INFRASTRUCTURE ENGINEERS, INC. consulting engineers   commercial divers	 SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION Bridge ID: 3210002600400	I-26 over Saluda River Typical Bent Elevations	FIG NO. 3



**Photograph 1. Downstream Fascia.**



**Photograph 2. View of Bent 6, Typical of Bents 4 through 9.**





**Photograph 3. North Embankment.**



**Photograph 4. South Embankment.**



Photograph 5. View Upstream from Under Bridge.



Photograph 6. View Downstream from Under Bridge.

## UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. **3210002600400**  
 WATERWAY: **Saluda River**  
 INSPECTORS: **INFRASTRUCTURE ENGINEERS, INC.**  
 INSPECTION DATE: **September 24, 2012**

**NOTE:** Condition ratings are assigned in accordance with the National Bridge Inspection Standards (NBIS) Coding Information, as presented in Federal Highway Administration Report No. FHWA-PD-96-001 "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges," dated December 1995 (revised April 27, 2001).

### CONDITION RATING

Unit	Substructure Code (Item 60)	Channel and Channel Protection Code (Item 61)	Underwater Inspection Code (Item 92B)	Scour Critical Bridge Code (Item 113)
<b>Bent 4</b>	<b>7</b>	<b>7</b>	<b>Y60</b>	<b>6</b>
<b>Bent 5</b>	<b>7</b>	<b>7</b>	<b>Y60</b>	<b>6</b>
<b>Bent 6</b>	<b>7</b>	<b>7</b>	<b>Y60</b>	<b>6</b>
<b>Bent 7</b>	<b>7</b>	<b>7</b>	<b>Y60</b>	<b>6</b>
<b>Bent 8</b>	<b>7</b>	<b>7</b>	<b>Y60</b>	<b>6</b>
<b>Bent 9</b>	<b>7</b>	<b>7</b>	<b>Y60</b>	<b>6</b>

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site: \_\_\_\_\_ Yes \_\_\_\_\_ ☒ No

(Note: Bridges may also be scour critical if abutment or pier foundations are rated as unstable due to scour potential as determined by a scour evaluation study)

REMARKS: As the result of an underwater inspection, for Item 113, a structure may only be rated as 0, 1, 2, 4, or 6. Other ratings may be assigned only as the result of a scour analysis.

Whenever a rating factor of 2 or below is determined for Item 113 - Scour, the rating factor for Item 60 – Substructure may need to be revised to reflect the severity of actual scour and resultant damage to the bridge.



## UNDERWATER INSPECTION BRIDGE MANAGEMENT SYSTEM CONDITION REPORT FORM

BRIDGE NO. **3210002600400**  
 WATERWAY: **Saluda River**  
 INSPECTORS: **INFRASTRUCTURE ENGINEERS, INC.**  
 INSPECTION DATE: **September 24, 2012**

**NOTE:** Element Condition ratings are assigned in accordance with the AASHTO "Guide for Commonly Recognized (CoRe) Structural Elements", dated December 1997.

### BMS CONDITION REPORT

Element	Total Quantity	Unit	Quantities in Condition State				
			1	2	3	4	5
CoRe Elements (Deck/Super/Sub)							
205 R/C Column or Pile Extension	36	EA	36				
220 R/C Submerged Footing	23	EA	23				
Smart Flags							
361 Scour	1	EA	1				