



Historic Bridge Management Plan for the Red Bayou Bridge

Recall Number: 014900

Structure Number: 04090960110031

Parish: Caddo

Route: LA 170

Crossing Description: Red Bayou



Prepared for

**Louisiana Department of
Transportation and
Development**

Prepared by

**Mead
& Hunt**

www.meadhunt.com

June 2017

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Executive Summary

The Red Bayou Bridge (Recall No. 014900) is located in Caddo Parish, Louisiana, and is owned by the State of Louisiana. The bridge was completed in 1930 and was determined eligible for the National Register of Historic Places (National Register) in 2013. It has significance as an important variation of concrete slab construction. This bridge features pier caps that are integrated into a haunched concrete slab superstructure, which results in a monolithic continuous slab design and represents a distinctive variation within the type.

The bridge carries two lanes of LA 170 over the Red Bayou in Caddo Parish. The continuous, three-span, haunched concrete slab has a total length of 40 feet. Spans 1 and 3 are approximately 8 feet in length and the center span is approximately 24 feet in length. The bridge deck provides a 20-foot clear roadway width as measured from edge of concrete curb to edge of concrete curb. The railing (non-original) is metal thrie-beam guardrail attached to the edge of the concrete slab with metal I-beam posts on both sides of the bridge. The substructure consists of two piers, each consisting of four concrete columns and a reinforced-concrete crib wall behind the piers.

The Red Bayou Bridge is in overall satisfactory condition and appears to adequately serve its purpose of carrying vehicular traffic over the Red Bayou. The major deficiencies are cracking and spalling of the concrete, exposed reinforcing steel, and erosion at the approaches. With proper maintenance and rehabilitation, the Red Bayou Bridge can continue to serve in its present capacity for 20 years or longer.

Any work on the bridge should proceed according to recommendations in this Historic Bridge Management Plan (Plan), which adhere to the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (Secretary's Standards), the *Management Plan for Historic Bridges Statewide* (Statewide Historic Bridge Plan), and the *Programmatic Agreement among the Federal Highway Administration, the Louisiana Department of Transportation And Development, the Advisory Council on Historic Preservation, and the Louisiana State Historic Preservation Officer Regarding Management of Historic Bridges in Louisiana* (PA).

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1. Introduction

This Plan, used in conjunction with the Statewide Historic Bridge Plan, provides guidance on the approach to preservation activities for the Red Bayou Bridge (Recall No. 014900), identified as a Preservation Priority Bridge. Completion of individual management plans for Preservation Priority Bridges and the Statewide Historic Bridge Plan fulfills terms of the PA, which was executed on September 21, 2015.

The PA provides the basis and procedures for the management of historic bridges in Louisiana and outlines the procedures for the treatment of historic bridges, including Preservation Priority Bridges. In accordance with the PA, an owner seeking state or federal funding for Preservation Priority Bridges will be required by the Louisiana Department of Transportation and Development (LADOTD), in cooperation with the Louisiana State Historic Preservation Office (LASHPO) and the Federal Highway Administration (FHWA), to follow the procedures outlined in this Plan and the Statewide Historic Bridge Plan.

The Statewide Historic Bridge Plan outlines the overall approach to bridge preservation through a discussion of the collaboration of the historian and engineer, guidance on assessing preservation needs, and resources and technical guidance on maintenance and rehabilitation activities that are broadly applicable to historic bridges. A glossary of common engineering and historical terms is included in the Statewide Historic Bridge Plan.

This Plan for the Red Bayou Bridge compiles and summarizes the specific historic and engineering information for this Preservation Priority Bridge. It documents the existing use and condition of the bridge, along with assessments of the preservation needs, including cost estimates. Preservation can be accomplished in two manners: preventative maintenance and rehabilitation. Maintenance includes cyclical or condition-based activities that, along with regular structural inspections, are directed toward continued structure serviceability. Rehabilitation activities are near- or long-term steps that need to be taken to preserve and in some cases restore a bridge's structural condition and serviceability. In assessing preservation activities for each Preservation Priority Bridge, a design life of 20 years was considered, which is consistent with the duration of the PA. This Plan provides the bridge owner, and other interested parties, with detailed information related to the historic nature of the bridge and the necessary background to make an informed planning decision. Recommendations within this Plan should be reviewed in 10 years following completion of the Plan to identify any needed updates or revisions.

Existing bridge data sources typically available for Louisiana bridges were gathered for this Plan, and field investigation confirmed the general structural condition and character-defining features of the subject bridge. These sources include:

- The current LADOTD Bridge Inspection Report, and any other similar inspection reports
- Original bridge construction plans, any rehabilitation plans, and record as-built plans, as available
- Existing historical and documentary material related to the historic bridges

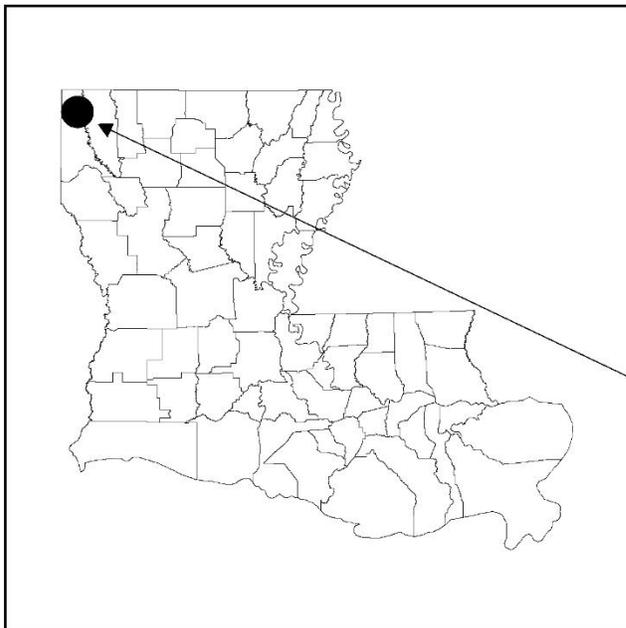
Recommendations within this Plan are consistent with the Secretary's Standards. The Secretary's Standards are basic principles created to help preserve the distinct character of a historic property and its site, while allowing for reasonable change to meet new engineering standards and codes. The Secretary's Standards recommend repairing, rather than replacing, deteriorated features whenever possible. A version of the Secretary's Standards that is specific to historic bridges is included in the Statewide Historic Bridge Plan. Following these standards is a requirement of the PA.

A bridge historian and bridge engineer from Mead & Hunt, Inc. (Mead & Hunt) jointly prepared this Plan under contract to the LADOTD. The LADOTD, FHWA, and LASHPO reviewed and provided input into the final Plan.

2. Location Map



0 1,250 2,500 5,000
Feet



PROJECT LOCATION
Bridge Number: 014900
Structure Number: 04090960109481
Caddo Parish
Route: LA 170
Crossing Description: Red Bayou

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3. Historic Data

A. Identifying information

Structure Number: 04090960110031

Recall Number: 014900

LASHPO Number: 09-02129

Bridge Name: Red Bayou Bridge

Date of Construction: 1930

Main Span Type: Concrete Slab

Contractor: Unknown

Designer/Engineer: Unknown

B. Description of bridge

The Red Bayou Bridge carries two lanes of LA 170 over the Red Bayou in Caddo Parish. The average daily traffic (ADT) is approximately 570 vehicles. The bridge is not load (weight) posted. The total length of the bridge is 40 feet. The continuous, three-span, haunched concrete slab features concrete pier caps that are integrated into the concrete slab superstructure, which results in a monolithic continuous slab design. Spans 1 and 3 are approximately 8 feet in length and the center span is approximately 24 feet in length.

The bridge deck provides a 20-foot clear roadway width as measured from edge of concrete curb to edge of concrete curb. The bridge's replacement railing is metal thrie-beam guardrail attached to the edge of the concrete slab with metal I-beam posts on both sides of the bridge. The concrete slab has been overlaid with asphalt.

The substructure consists of two piers, each consisting of four concrete columns and a reinforced-concrete crib wall behind the piers.

C. History and significance

The Red Bayou Bridge is located approximately 1.5 miles southwest of the Gilliam, Louisiana, village limits. The bridge carries LA 170 over the Red Bayou. LA 170 stretches approximately 10 miles, beginning at its intersection with U.S. Highway (US) 71 in Gilliam and running largely west/northwest before terminating at its intersection with Camp Road in Vivian, Louisiana. The highway is also known as the Gilliam-Vivian Road for the majority of its duration. Less than a mile west of the Red Bayou Bridge,

LA 170 provides access to Interstate Highway 49, a major north-south route connecting Texarkana, Arkansas, to Lafayette, Louisiana. The Red Bayou is one of a number of smaller waterways that ultimately connect Black Bayou Lake in the north with the Red River in the Shreveport area.

The Red Bayou Bridge is a concrete slab bridge constructed in 1930. The concrete slab is the most common beam/girder bridge type in the state, representing 40 percent of the population, and its construction was widespread.¹ While Louisiana's known examples post-date 1910, concrete slabs can date to as early as 1905 in the U.S. The advent of reinforcing aided in the bridge type's popularity for short spans largely because they were economical and simple to erect. Additionally, the concrete slab was promoted as having "advantages of economy, stiffness, resistance to temperature cycles, resistance to shrinkage, and ease of construction."² In concrete slab bridge design, the cast-in-place slab span serves as both the deck and a structural member carrying stresses to abutments and/or piers. Reinforced-concrete slab spans are economical only for short spans of 30 feet or less, as longer spans require more concrete and reinforcing than other beam bridges.³

The Red Bayou Bridge has significance as an important variation of concrete slab construction. This bridge features pier caps that are integrated into a haunched concrete slab superstructure, which results in a monolithic continuous slab design and represents a distinctive variation within the type. This design method was later discontinued by the State due to repair challenges presented by integrated members. As such, the bridge is distinctive and not comparable in design or method of construction to any other extant concrete slab bridges in Louisiana. Although the original concrete railings have been replaced with metal guardrails, which results in a minor loss of integrity, the bridge continues to convey the significant design features of its type and is eligible for the National Register under *Criterion C: Design/Engineering*.

D. Character-defining features

Character-defining features are prominent or distinctive aspects, qualities, or characteristics of a historic property that contribute significantly to its physical character. Features may include materials, engineering design, and structural and decorative details. Elements of the bridge that are not identified as character-defining features may be historic fabric. Historic fabric is material in a bridge that was part of original construction. It is important to consider both character-defining features and the bridge's historic fabric when planning any work.

The Red Bayou Bridge has one character-defining feature: its haunched concrete slab superstructure with integral pier caps (described below). Other elements that represent historic fabric but are not

¹ According to data in the LADOTD's Master Structure File (MSF) database.

² National Research Council, *A Context for Common Historic Bridge Types*, prepared for the National Cooperative Highway Research Program, Transportation Research Council, National Research Council, by Parsons Brinckerhoff and Engineering and Industrial Heritage, 2005, 3-84.

³ Robert M. Frame, *Reinforced Concrete Highway Bridges in Minnesota* (Washington, D.C.: National Register of Historic Places Multiple Property Documentation Form, 1989), E-7.

considered to be character-defining are the bridge's substructure elements including concrete wingwalls, abutments, and two piers. The piers consist of four concrete columns and reinforced-concrete crib wall.

The following is the character-defining feature of this bridge:

Feature 1: Design and construction of haunched concrete slab superstructure with integral pier caps

This feature includes the 40-foot-long slab bridge with three spans and concrete pier caps over the Red Bayou. The pier caps are integrated into the haunched concrete slab superstructure, resulting in a monolithic continuous slab design.



Character-defining Feature Photo 1: The north span of the Red Bayou Bridge, with concrete pier caps integrated into the haunched concrete slab superstructure, which results in a monolithic continuous slab design.



Character-defining Feature Photo 2: Close-up view of integrated pier cap poured monolithically with the concrete slab.

The following images illustrate other bridge features that are historic fabric, meaning they are part of original construction but are not considered to be character-defining features:



Historic Fabric Photo 1: North concrete abutment and wingwall.



Historic Fabric Photo 2: View of south pier with concrete columns and concrete crib wall.

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4. Engineering Data

A. Existing conditions

(1) Structural observations

The Red Bayou Bridge is in overall satisfactory condition and appears to adequately serve its purpose of carrying vehicular traffic over the Red Bayou. The bridge is not load (weight) posted.

The superstructure is in satisfactory condition. The cast-in-place concrete slab has been overlaid with asphalt and is in satisfactory condition. The underside of the slab is honeycombed and has minor concrete cracking. There is minimal green mossy growth covering the entire underside of the concrete slab. There is a large spall on the underside of span 2 at the north end of the bridge on the east side with exposed reinforced steel. The concrete curbing exhibits numerous spalls.

The replacement bridge railing is in good condition. The rail system on the slab is guardrail (three-beam and metal posts).

The substructure is in fair condition. The concrete abutment bents are in fair condition. Based on the most recent inspection report, bent 1 on the west abutment has been mudjacked (filling a void to prevent the loss of material) and the south wingwall is cracked and spalled with exposed steel. Additionally, the south wingwall of bent 4 on the east abutment is also cracked and spalled with exposed steel. The soil at bents 1 and 4 is eroding and undermining the bent and approach roadway. The reinforced-concrete integral bent (pier) caps are in satisfactory condition. The most recent inspection report noted bent caps 1, 2, and 3 exhibit spalls with exposed reinforcing steel. The fill slope between the abutment bents and the concrete columns is retained by the reinforced-concrete crib walls. The crib walls are in overall satisfactory condition. The cribbing wall at bent 3 exhibits concrete spalling with exposed reinforcing steel. The concrete columns are in satisfactory condition. Pile 1 at bent 2 has hairline horizontal cracks.

(2) Non-structural observations

None.

(3) Serviceability observations

The ADT across the bridge is approximately 570 vehicles. The posted speed limit is 30 mph. The bridge clear roadway width of 20 feet provides for two lanes of traffic, one in each direction, with no shoulders. There is a 9-inch concrete curb on the north and south sides of the concrete slab. The bridge adequately handles this traffic volume, although it is structurally obsolete due to the roadway width and absence of shoulders. The horizontal and vertical geometry of the bridge is good.

B. Sources of information

Plans available:	Yes, available at the LADOTD Bridge Section office
Inspection report date:	April 23, 2016
Fracture critical report date:	Not applicable for this bridge
Underwater inspection report:	Not applicable for this bridge
Date of site visit:	September 26, 2016



Condition Photo 1: South approach looking north at the concrete slab bridge overlaid with asphalt.



Condition Photo 2: North approach looking south at the concrete slab bridge overlaid with asphalt.



Condition Photo 3: Elevation view of the bridge, looking east.



Condition Photo 4: Bent 4, east wingwall cracked and spalled with exposed steel, looking north.



Condition Photo 5: Concrete honeycombing on the underside of the span 2 slab, typical condition.



Condition Photo 6: Concrete spall with exposed steel on the underside of the span 2 slab.



Condition Photo 7: Bent 2, concrete columns and crib wall.



Condition Photo 8: Concrete spalling with exposed reinforcing steel at the crib wall at bent 3.



Condition Photo 9: Timber blocking for the guardrail connection along the bridge.



Condition Photo 10: Rubber blocking for the guardrail connection along the roadway approach.



Condition Photo 11: Bent 4, west wingwall, erosion and undermining of the approach roadway.



Condition Photo 12: Bent 1, west wingwall, erosion and undermining of the approach roadway.

5. Recommendations

This Preservation Priority Bridge should remain in use and can meet current and projected transportation needs for the next 20 years or more. Maintenance and rehabilitation activities should be completed in a manner consistent with the long-term preservation of this historic bridge. The Statewide Historic Bridge Plan provides additional guidance and approaches to completing maintenance and rehabilitation activities that adhere to the Secretary's Standards. Work should be conducted under the supervision of a qualified professional historian, as defined in the PA. The bridge engineer, or the bridge engineer's supervising engineer, should have demonstrated expertise in historic bridge projects and must have completed the LADOTD's historic bridge training. When developing plans and specifications for a project, the bridge engineer should follow the recommendations below.

Under the terms agreed upon in the PA, the bridge owner may undertake certain activities that are considered to be best practices without additional consultation or public notification. These activities are documented in Attachment 5 of the PA and are limited to the activities specifically noted. All recommended preventative maintenance and rehabilitation activities for this bridge are included in Attachment 5 and are not expected to alter character-defining features or historic fabric of the bridge. Some cyclical or condition-based maintenance items are noted below under Rehabilitation because they are expected to be completed as part of an overall rehabilitation project for this bridge. These activities may need to be completed as conditions dictate to promote long-term preservation of this historic bridge. Recommendations within this Plan should be reviewed in 10 years following completion of the Plan to identify any needed updates or revisions.

The opinions of probable costs provided below are in 2016 dollars. The costs were developed without benefit of preliminary rehabilitation plans and are based on the above identified tasks using engineering judgment and/or gross estimates of quantities and historic unit prices and are intended to provide a programming level of estimated costs. Refinement of the probable costs is recommended once preliminary plans have been developed. The estimated preservation costs include a 10% contingency and 7% mobilization allowance of the preservation activities, excluding soft costs. Actual costs may vary significantly from those opinions of cost provided herein. Engineering design, historical consultation, and construction administration costs are not included as these may be provided by the owner or consultants.

A. Preventative maintenance

The following are recommendations for cyclical maintenance. Because these activities are routinely done, the cost is not included in the cost estimate. There are no condition-based maintenance recommendations at this time, based on the bridge condition as observed during the site visit and as documented in available information.

1. Remove the debris from the Red Bayou, as necessary.

B. Rehabilitation

The following are recommendations for rehabilitation. These activities should be performed when necessary (estimated to be within the next five years):

1. At bents 1 and 4 wingwalls, inject the cracks with epoxy, clean the exposed reinforcing steel, and remove and repair spalled concrete.
2. Repair erosion at bents 1 and 4 with non-erodible material.
3. Clean the exposed reinforcing steel and remove and repair spalled concrete at bent caps 1, 2, and 3 and the bent 3 crib wall, in a manner that the concrete used for the repair matches the color, texture, and consistency of the adjacent existing concrete.
4. Clean the exposed reinforcing steel and remove and repair spalled concrete on the underside of the slab in span 2, in a manner that the concrete used for the repair matches the color, texture, and consistency of the adjacent existing concrete.
5. Remove and repair spalled concrete on the concrete curb, in a manner that the concrete used for the repair matches the color, texture, and consistency of the adjacent existing concrete.

Bridge Recall No. 014900				Date:	4/24/2017
Red Bayou Bridge					
Opinion of Probable Costs					
Rehabilitation					
Item	Quantity	Unit	Unit Cost	Total	
At bents 1 and 4 wingwalls, inject the cracks with epoxy, clean the exposed reinforcing steel, and remove and repair spalled concrete	1	LS	\$30,000	\$30,000	
Repair erosion at bents 1 and 4 with non-erodible material	2	EA	\$5,000	\$10,000	
Clean the exposed reinforcing steel and remove and repair spalled concrete at bent caps 1, 2, and 3 and the bent 3 crib wall, in a manner that the concrete used for the repair matches the color, texture, and consistency of the adjacent existing concrete	1	LS	\$20,000	\$20,000	
Clean the exposed reinforcing steel and remove and repair spalled concrete on the underside of the slab in span 2, in a manner that the concrete used for the repair matches the color, texture, and consistency of the adjacent existing concrete	1	LS	\$20,000	\$20,000	
Remove and repair spalled concrete on the concrete curb, in a manner that the concrete used for the repair matches the color, texture, and consistency of the adjacent existing concrete	1	LS	\$10,000	\$10,000	
Traffic control, signage, flagger, and drums	1	LS	\$10,000	\$10,000	
Item Subtotal				\$100,000	
Contingency			10.00%	\$10,000	
Mobilization			7.00%	\$7,700	
TOTAL ESTIMATED CONSTRUCTION COST				\$117,700	
			Round to:	\$118,000	

C. Identification of any anticipated design exceptions

No design exceptions were noted, nor are any design exceptions recommended.

Appendix A. Historic Inventory Form

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Louisiana Historic Bridge Inventory

Recall Number: 014900

Structure Number: 04090960110031

SHPO Number: 09-02129

Bridge Name:

Location Data:

District: 04

Parish: Caddo

Feature Crossed: RED BAYOU

Facility Carried: LA0170

Location: 9.19 MI EAST OF LA 1

City, Village or Town (if applicable):

Status: Open

Bridge Owner: State of Louisiana

Latitude: 32.823861

Longitude: -93.854139

Structural Data:

Bridge Type: Concrete Slab

Year Built: 1930

Main Span Configuration (if applicable):

Maximum Span Length (feet): 25

Number of Spans: 3

Overall Structure Length (feet): 42

Approach Span Type (if applicable): N/A

Posted Load:

Current ADT: 000570

Design and Construction Data:

Engineer or Builder:

Unknown

Bridge Plaque:

None

National Register of Historic Places Evaluation:

This bridge has significance as an important variation of concrete slab construction. This bridge features pier caps that are integrated into the concrete slab superstructure, which results in a monolithic design and represents a distinctive variation within the type. Although the original concrete railings have been replaced with metal guard rails that results in a minor loss of integrity, the bridge continues to convey the significant design features of its type. This bridge is eligible for listing in the National Register under Criterion C: Design/Engineering.

No evidence was found during research or data collection activities to indicate that this bridge possesses a direct and important association with historical events or trends. This bridge does not possess significance under Criterion A.

Within/Adjacent to Known Historic District: N/A

National Register Historic District Name: N/A

National Register Determination: Eligible

National Register Determination Date: 2013

Surveyor: Mead & Hunt, Inc.

Date Surveyed: 2013



Louisiana Historic Bridge Inventory

Recall Number: 014900

Structure Number: 04090960110031

Bridge Name:

Parish: Caddo

Bridge Owner: State of Louisiana

Feature Crossed: RED BAYOU

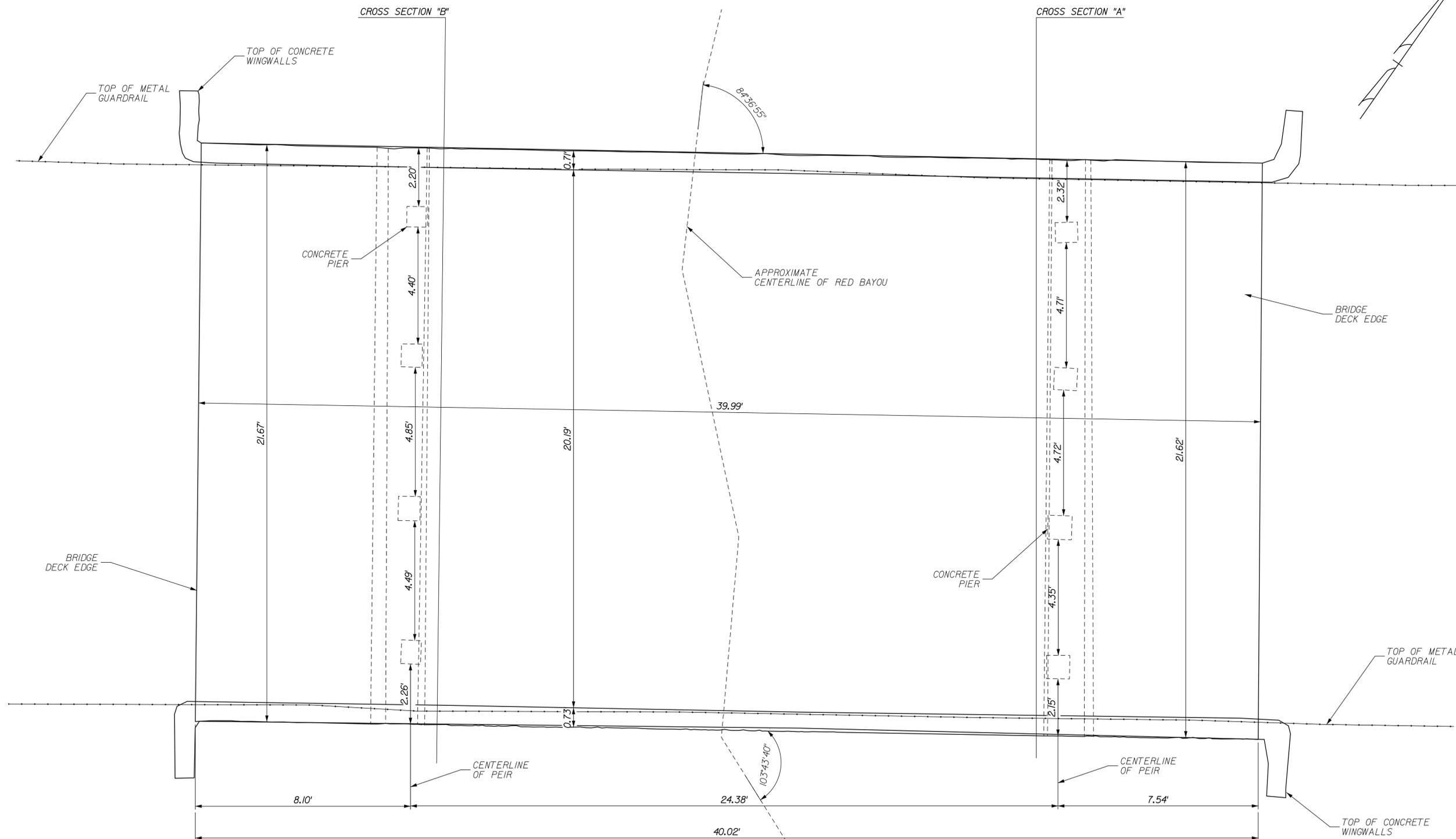
Facility Carried: LA0170

Photographs:



Appendix B. Select Plan Sheets

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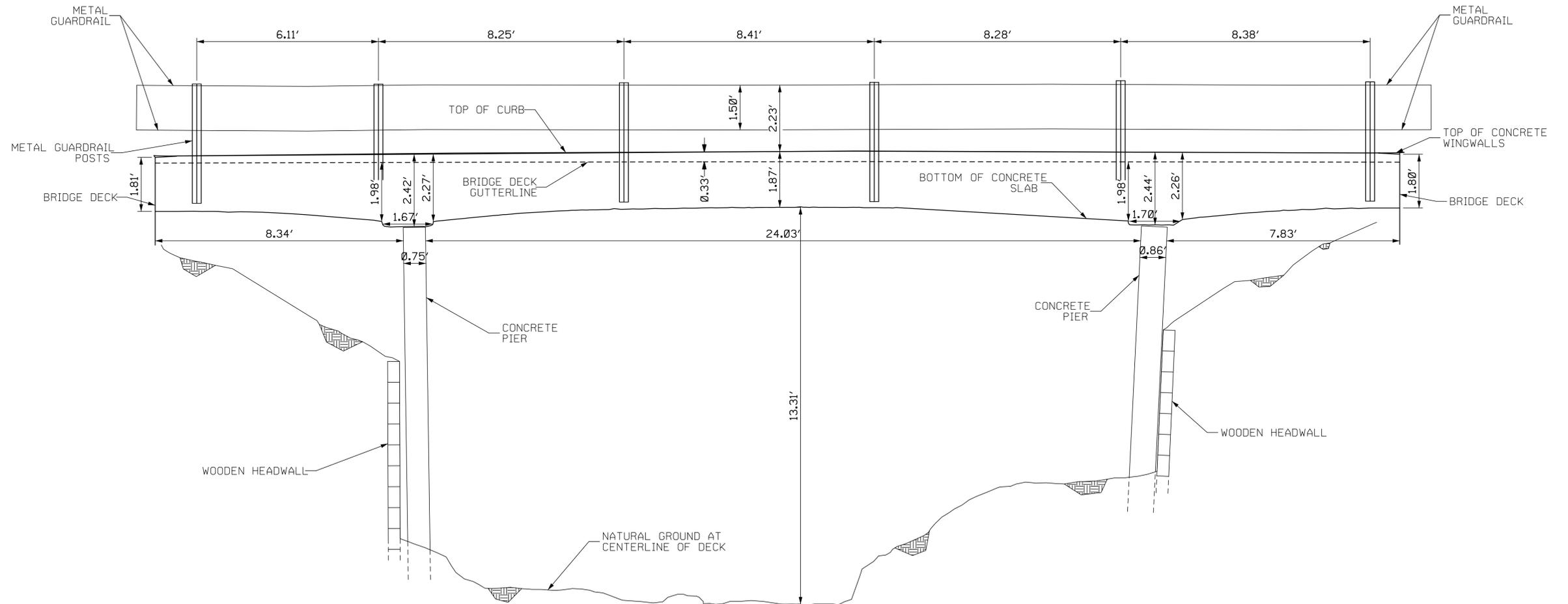


PLAN VIEW
3-SPAN HAUNCHED CONCRETE SLAB BRIDGE

NOT TO BE USED FOR CONSTRUCTION, BIDDING, CONVEYANCE, SALES OR AS THE BASIS FOR THE ISSUANCE OF A PERMIT.

Louisiana Department of Transportation and Development
 COMPANY: SJB GROUP, LLC
 5745 ESSEN LANE, SUITE 200
 BATON ROUGE, LOUISIANA 70810
 ENGINEER: BRADLEY S. HOLLEMAN
 LICENSE #: 5082
 DATE OF SURVEY: 11/10/2015

SHEET NUMBER		CADD	
PARISH	CONTROL SECTION	COMPUTED BSH	THI
STATE	PROJECT	CHECKED BSH	BSH
DATE	SCALE	DATE	SCALE
03/03/2016		03/03/2016	
LASER SCAN PLANS STATE PROJECT H.007020 HISTORIC BRIDGE INVENTORY BRIDGE RECALL NO. 014900 LA 170 OVER RED BAYOU CADDO PARISH			
SJB GROUP, LLC		BY	
REVISION DESCRIPTION		DATE	



PROFILE VIEW
LOOKING NORTH WEST

NOT TO BE USED FOR CONSTRUCTION, BIDDING, CONVEYANCE, SALES OR AS THE BASIS FOR THE ISSUANCE OF A PERMIT.

Louisiana Department of Transportation and Development
 COMPANY: SJB GROUP, LLC
 5745 ESSEN LANE, SUITE 200
 BATON ROUGE, LOUISIANA 70810
 ENGINEER: BRADLEY S. HOLLEMAN
 LICENSE #: 5082
 DATE OF SURVEY: 11/10/2015

SHEET NUMBER		CADD	
COMPUTED	BSH	PARISH	CONTROL
CHECKED	BSH	SECTION	SECTION
DETAILED	THI	STATE	PROJECT
CHECKED	BSH	DATE	SCALE
		03/03/2016	
LASER SCAN PLANS STATE PROJECT H-007020 HISTORIC BRIDGE INVENTORY BRIDGE RECALL NO. 014900 LA 170 OVER RED BAYOU CADD PARISH			
SJB GROUP, LLC			
DATE	REVISION	DESCRIPTION	BY

