NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

FINAL

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in How to Complete the National Register of Historic Places Registration Form (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name **Carrollton Bridge**

other names/site number Carroll County Bridge #132

2. Location

street & number Carrollton Road over Wabash River N/A ☐ not for publication

city or town Delphi ☒ vicinity

state Indiana code IN county Carroll code 132 zip code 46923

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☒ locally. (☐ See continuation sheet for additional comments.)

J. C. Sill 5·2·03

Signature of certifying official/Title Date

Indiana Department of Natural Resources

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

☐ entered in the National Register. ☐ See continuation sheet.

☐ determined eligible for the National Register ☐ See continuation sheet.

☐ determined not eligible for the National Register

☐ removed from the National Register

☐ other, (explain:) _____

Signature of the Keeper Date of Action

Carrollton Bridge
Name of Property

Carroll IN
County and State

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☒ public-local
- ☐ public-State
- ☐ public-Federal

Category of Property
(Check only one box)

- ☐ building
- ☐ district
- ☐ site
- ☒ structure
- ☐ object
- ☐ landscape

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
0	0	buildings
0	0	sites
1	0	structures
0	0	objects
1	0	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

TRANSPORTATION: Road-Related

Current Functions
(Enter categories from instructions)

TRANSPORTATION: Road-Related (vehicular)

7. Description

Architectural Classification
(Enter categories from instructions)

OTHER: Filled Spandrel

Materials
(Enter categories from instructions)

foundation CONCRETE
walls CONCRETE
roof
other ASPHALT

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- ☐ **A** Property is associated with events that have made a significant contriibution to the broad patterns of our history.
- ☐ **B** Property is associated with the lives of persons significant in our past.
- ☒ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- ☐ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)
Property is:

- ☐ **A** owned by a religious institution or used for religious purposes.
- ☐ **B** removed from its original location.
- ☐ **C** a birthplace or grave.
- ☐ **D** a cemetery.
- ☐ **E** a reconstructed building, object, or structure.
- ☐ **F** a commemorative property.
- ☐ **G** less than 50 years of age or achieved significance within the past 50 years.

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

Areas of Significance
(Enter categories from instructions)
TRANSPORTATION
ENGINEERING

Period of Significance
1927-1952

Significant Dates
N/A

Significant Person
(Complete if Criterion B is marked above)
N/A

Cultural Affiliation
N/A

Architect/Builder
Luten, Daniel B.
National Concrete Company

9. Major Bibliographic References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

- ☐ preliminary determination of individual listing (36 CFR 67) has been requested
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Buildings Survey # _____
- ☐ recorded by Historic American Engineering Record # _____

Primary location of additional data:

- ☒ State Historic Preservation Office
- ☐ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Name of repository: _____

Carrollton Bridge
Name of Property

Carroll IN
County and State

10. Geographical Data

Acreage of Property Less than 1 acre

UTM References (Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	16	529020	4499570
2			
3			
4			

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Jonathan Young, Intern

organization Historic Landmarks Foundation of Indiana date 07-09-2002

street & number 643 Wabash Avenue telephone 812/ 232-4534

city or town Terre Haute state IN zip code 47807

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.

A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white** photographs of the property.

Additional items
(Check with the SHPO or FPO for any additional items)

Property Owner

(Complete this item at the request of SHPO or FPO.)

name Carroll County Commissioners

street & number 101 West Main Street, Suite 201 telephone 765/ 564-4851

city or town Delphi state IN zip code 46923

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United States Department of the Interior
National Park Service

National Register of Historic Places
Continuation Sheet

Narrative Description:

The Carrollton Bridge is a six span, concrete filled-spandrel arch bridge (See Photo 1). Spanning the Wabash River about seven miles north of Delphi in Carroll County, Indiana, the Carrollton Bridge connects Carrollton Road on the south with Towpath Road on the north. The bridge runs in a southeast to northwest orientation, perpendicular to the riverbanks, as the Wabash River flows to the southwest at the point of the crossing. Designed by Daniel B. Luten, the bridge was constructed in 1927 by the National Concrete Company of Indianapolis. Luten was a notable engineer and visionary of reinforced concrete bridges during the early twentieth century.

The terrain slopes steeply on both sides of the river from the bridge down to the Wabash River. Mature tree growth surrounds the abutments on either side. On the northwest side of the bridge, a deep indentation reveals evidence of the Wabash and Erie Canal, and on the northeast side, an Indiana Historical Marker marks the location of the canal as well as the former town of Carrollton.

The six arches have the same rise, which is the vertical measurement of an arch, of approximately seventeen feet, while the spans, or horizontal measurement of an arch, vary slightly. From southeast to northwest, the end span measures approximately seventy-nine feet from abutment to pier. The second and third spans measure approximately ninety feet and ninety-four feet respectively from pier to pier. The northwest half of the bridge is symmetrical to the southeast half.

A series of piles act as the foundation for the bridge. The piles extend sixteen feet down below the riverbed while the bottoms of the piers are ten feet below the bed of the river. This depth protects the piles from potential water infiltration. Sitting atop the piles are reinforced concrete bearing plates, on which the piers and abutments rest. Supporting the six-span bridge are five piers, which provide intermediate support, and two abutments, which provide lateral support at both ends. The twenty-two feet wide piers extend approximately two feet beyond the face of the arch on both sides of the bridge (See Photo 2). A rounded cap tops the pier end (See Photo 3). Pilasters extend from the pier caps to the underside of the deck and to the railing above, emphasizing the verticality of the piers, and dividing the spandrels (See Photo 4).

From the joint between the piers and arches, known as the springing, extends the arch structures, the underside of which is known as the soffit. The surface of the soffits was left unfinished, as they are rarely seen. Rough concrete reveals evidence of the framing used in forming the arches during construction. An expansion joint defining the corners is the extent of the soffit detail (See Photo 5). An expansion joint also defines the upper limit, or extrados, of the arch rings or ribs. The rings measure approximately two feet at the center, or crown, and five feet at the edge, or skewback. During construction, the rings were polished with carborundum blocks to make a smooth surface (See Photo 2). Luten finished the filled spandrel with a course concrete finish contrasting with the adjacent smooth surfaces (See Photo 2). Workers accomplished the finish by hammering the surface in a process that broke out the smaller stones and sand in the surface of the concrete. This was a hallmark of Luten's design work. Typically, the interior of the filled spandrel walls

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Description (continued)

contained earth fill that supports the road deck above.

Above the filled spandrel wall, extend cantilevered beam brackets that support the deck above (See Photo 6). Fifteen such beam brackets flank either side of the middle two spans and fourteen on either side of the other four spans. Three beam brackets flank either side of the abutments. The tapered beam brackets measure approximately five feet from the spandrel wall to the face of the deck. The asphalt road deck measures 20 feet 8 inches curb to curb. The roadway to the north has been extended three hundred feet from the bridge with a width of thirty feet and the roadway to the south, two hundred feet. At the time of construction, many bridge contractors would make the fills between the bridge and the roadway short, making an abrupt upward slant at the bridge.

A concrete railing runs on both sides of the bridge (See Photo 7). The railing atop the six spans is divided into three sections per span. A decorative pier that sits in line with the structural pier below (See Photo 8) defines the ends of each span. Two evenly spaced pilasters further divide the span. Six inch by eight inch by eighteen inch balusters spaced at twelve inches on center line the railing between the piers and pilasters (See Photo 9). These balusters add to the architectural detail of the bridge as well as allowing views to the river for vehicular traffic. At the middle of each section is a solid panel, which provides support for the beveled top rail (See Photo 10). At both the north and south entrances above the abutments, Luten used a solid railing (See Photo 11). The railing widens with a slight outward curve welcoming oncoming traffic (See Photo 7). Topping the solid railing, as well as the decorative piers and pilasters, is a flared cap with a single step back. The base detail is the same throughout and consists of a single step back detail (See Photo 8).

The Carrolton Bridge remains today virtually unaltered from its original appearance although there have been some changes due to deterioration. There are indications of freeze-thaw damage at some pier ends, where they are exposed to moisture and salts from the superstructure. Earlier shotcrete repairs are delaminating at these locations. According to core samples taken by Wiss, Janney, Elstner Associates, the majority of the damage is superficial; the interior concrete is in good condition. The original concrete was non-air entrained concrete and therefore vulnerable to freeze-thaw deterioration. The arch rings show indication of moisture penetration and freeze-thaw damage, especially in the southernmost span. Moisture penetrating through the deck has caused extensive cracking and mineral deposits on the underside of the overhanging deck. These observations are indications of extensive freeze-thaw damage. In addition, many of the reinforcing bars have corroded, apparently due to carbonation of the concrete and penetration of moisture laden with salts. Many of the piers and balusters have been damaged as a result of vehicular impact and exposure for seventy years. In some cases, the balusters have been completely destroyed and have been replaced with wooden supports.

Statement of Significance:

Carrollton Bridge No. 132, which opened in 1927, is the product of one the most influential civil engineers of the twentieth century, Daniel B. Luten. In particular, Luten is known for his arch bridges of which he held several design and reinforcement layout patents. As one of the finest examples of filled spandrel concrete bridges in the state of Indiana, the Carrollton Bridge is eligible for inclusion to the National Register of Historic Places under Criteria C for its significance in engineering.

Raised in a farm family of Dutch immigrants near Grand Rapids, Michigan, Luten sought escape from manual labor through education. He earned a Bachelor of Science degree from the University of Michigan in 1894 and served as Instructor of Civil Engineering and Surveying there for the 1894-1895 academic year. He then moved to Indiana to join the faculty of Purdue University, where among other things he taught arch design as Instructor of Architectural and Sanitary Engineering. There he excelled at integrating professional engineering and commercial profitability, arguing that the design of concrete bridges was "largely a commercial proposition."

According to James L. Cooper in Artistry and Ingenuity in Artificial Stone, "Daniel B. Luten did more than any other single person to advance the movement from concrete-steel to reinforced concrete bridge design and to bring the latter to maturity in Indiana during the first decades of the twentieth century." Luten was not the first to develop reinforced concrete bridge construction, however. Engineers first developed reinforced concrete bridge designs in France and Switzerland in the mid-1800s. Ernest Ransome designed the first American concrete arch, built in San Francisco in 1889. American engineers developed several systems of reinforcing in the 1890s, including the use of wire mesh, iron bars, and steel I-beams. As a young engineer, Luten was excited about his introduction to these new designs.

Luten deviated from the widely accepted American practice of open webbed arched girders of concrete-steel. The concrete-steel system tended to split the concrete along the lower edge of the arch ring since steel conducts heat more quickly than concrete. "I consider them (the concrete-steel systems) simply steel structures encased in concrete," said Luten.

Use of the old abutments, absence of massive piers, and lightness of the ribs and columns are all hallmarks of Luten's interest in fitting a structure into its environment with simplicity and economy. Luten defined an engineer as one who best adapts the forces of nature to human needs at the least expenditure of dollars. Appearance mattered to Luten, as did design. Luten stated that "design must be tailored to the site, and the bridge's parts need to work together as an integrated system." From the beginning, Luten advocated the arch bridge, "which can be widened without destroying any of the original structure except the railing."

Luten improved a true reinforced concrete system established by Joseph and Jean Monier that dated back to an 1873 patent for an iron reinforced system for concrete bridges. Early Monier arches were slender and

Statement of Significance (Continued)

typically made from mortar - a combination of cement and sand - with a network of thin rods placed midway between the upper and lower edges of the ring. In the 1890s, Joseph Melan, a noted Viennese engineer, retrograded the priority of iron and concrete for load bearing structures and gave priority to metal. His ribs became a structural skeleton encased in concrete. Americans preferred the Melan system since the Monier system produced a bridge which looked "too light" to carry heavy loads.

Luten incorporated theories on elasticity -- the ability of a material to recover its original size and shape after force has been applied to it. While at Michigan, he was greatly influenced by Charles E. Greene and Professor Malverd A. Howe who wrote *Treatise on Arches* in 1897. Both men were nationally known authorities on the subject. Taking all these theories and training into account allowed him to reduce the amount of metal necessary to reinforce concrete. He also looked at the structure as a whole, not designing each element (spandrels, piers, abutments, wingwalls, etc.) to be functionally independent, thus reducing the amount of material assigned to each part and creating a continuous elastic body. Less could prove to be more where structural members become appropriately integrated.

In 1900, his last year at Purdue, Luten applied for and secured his first patent. It was rare and almost unacceptable for an academician to take that entrepreneurial action at that time. He felt this was one way to publicize new ideas and test them in the market place. Ultimately, he ended his teaching career of five years by moving to Indianapolis where he started the National Bridge Company (later, Luten Engineering Co.). He organized a staff of eleven assistant engineers and twenty-four associate engineers located in every part of the United States.

He became one of America's leading bridge designers, creating spans used all over the world and in the United States. Some of his more notable bridges include: San Luisito Bridge in Monterey, Mexico; Nashua Hudson Bridge in Nashua, New Hampshire; Kennebec Bridge in Waterville, Maine; Pittsburgh Street Bridge in Newcastle, Pennsylvania; and the East Washington Street Bridge in Indianapolis, Indiana.

Daniel B. Luten had put Indiana at the forefront of reinforced concrete bridge design. He held more patents on concrete bridge design than all other Americans combined. Between 1900 and 1933 over ten thousand Luten design bridges were built across the continent, including the Carrollton Bridge.

Historically, the site of the bridge is significant to Carroll County as well as transportation in the United States. This is where the Wabash and Erie Canal, the longest canal in America, crossed the Wabash River. Engineers accomplished this by constructing a large dam approximately six miles to the southwest of the bridge and the dam backed the water up to the bridge. The dammed Wabash River allowed the canal to enter and maintain its course across to where it was locked from the river and continued to the southwest. The Carrollton Bridge was not yet constructed when the canal was still in operation, in fact, it is the third bridge to cross the Wabash River at this location. A wooden covered bridge and an iron bridge preceded the

Statement of Significance (continued)

current concrete structure. The first bridge, constructed 1838-39, at this location was the first span across the Wabash River in Indiana.

The route passing over the bridge was a major transportation route due to the intersection of the canal and the river and it was the primary route to Delphi, the county seat. Menser Tavern, near the bridge, was a popular gathering spot for area residents and travelers (a historical marker stands at the location of the tavern). According to the bridge dedication program, the spot was a "trysting place of lovers, a favorite resort for summer, and winter sleighing parties from Delphi where was spent many pleasant hours in social converse and where amply [sic] refreshments could be obtained." Though the canal, and probably the tavern, had disappeared before the current bridge was built, the history and tradition of the location had not. The county commissioners initially appropriated $140,000 for the construction of the new bridge, which shows that they were prepared to construct a monumental bridge at the location from the outset. In fact, the commissioners felt the opening of the bridge was important enough to warrant asking Governor Ed Jackson to speak at the dedication ceremony.

The history of the current bridge began on February 7, 1926, when the Carroll County Council appropriated $90,000 for a new concrete bridge. The National Concrete Company of Indianapolis was awarded the bid on July 28, 1926 for an amount of $78,000 (the National Concrete Company constructed several of Luten's bridges). The Carrollton Bridge was dedicated on September 4, 1927. According to the September 1, 1927 edition of the Delphi Journal, "people will come from miles around to see this wonderful structure, which will be shown as a typical concrete arch to commissioners, auditors, and other officers from all over the middle west." The structure of the bridge is impressive. At the time of construction, the Carrollton Bridge was over fifteen feet longer than any other bridge in Carroll County. The bridge has an overall length of 619 feet and 4 inches and the six arches span approximately 575 feet from face of abutment to face of abutment. The bridge consists of over 6929 cubic yards of concrete, 220,000 pounds of steel, 4300 cubic yards of fill, and 8660 barrels of cement.

The Carrollton Bridge is an outstanding example of a Luten bridge. Because Luten held several design patents, extant examples of his bridges generally hold a high degree of significance due to their uniqueness. The Carrollton Bridge features a deck extended on brackets beyond the spandrel walls, and is one of the longest such Luten bridges on the state. Though the Carrollton Bridge suffers from some minor cosmetic damage, the defining features (the reinforced rings, the extended deck, and the balustraded rails) of the bridge are intact.

Bibliography:

AECON Engineers and Consultants. Carroll County Bridge Reinspection, 1997. Nashville, IN, 1997.

Cooper, James L. Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900-1942. 1997.

"Daniel B. Luten, Engineer, Dead." Indianapolis News. 4 July 1946: C2 :p. 18: Part 1

" Gov. Jackson is to Open New Wabash Bridge." Delphi Journal. 1 September 1927: p.1.

"Governor Jackson to Dedicate Carrollton Bridge Sunday." Delphi Journal. 1 September: p.1.

Indiana Department of Natural Resources Division of Historic Preservation and Archaeology, and Historic Landmarks Foundation of Indiana. Carroll County Interim Report. 1980.

Kemp, Emory L. "The Fabric of Historic Bridges." The Journal of the Society for Industrial Archeology Vol. 15 no. 2 (1989): p. 17.

Liebenberg, A. C. Concrete Bridges: The Design and Construction. Longman Scientific and Technical, 1992. p. 31.

Manson, Philip P. Great Lakes Book. Detroit, Michigan: 1993. p. 112.

Smith, Dwight A. Historic Highway Bridges of Oregon. Oregon Department of Transportation, 1985. Pp. 19-26.

Smith, William C. Historical Data of the Carrollton Bridge over the Wabash Near Delphi. Carroll County Historical Society.

Souvenir Program New Carrollton Bridge over Wabash River near Delphi, Indiana. Delphi, IN: Journal Print, 1927.

Wiss, Janney, Elstner Associates, Inc. – Engineers, Architects, Material Scientists, Inc. Feasibility Study of Rehabilitating the Carrollton Bridge for the Historic Landmarks Foundation of Indiana. Northbrook, IL. 9 December 1997.

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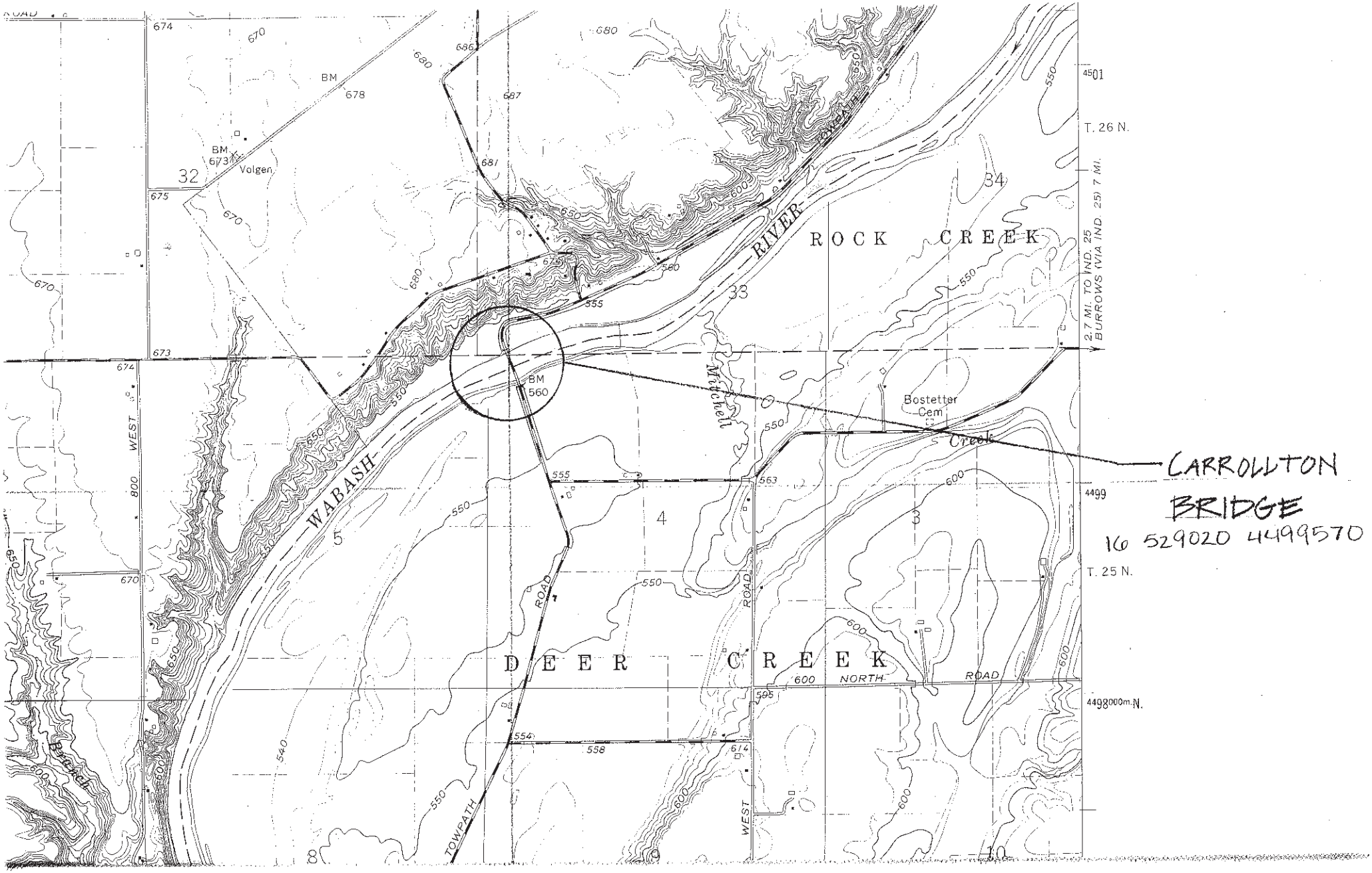
Section number 10 Page 6

Verbal Boundary Description

Located in northwestern Carroll County, Indiana approximately 7.4 kilometers (4.6 miles) north of the city of Delphi. Specifically, the project is located in Section 4, Township 25 North, Range 2 West of Deer Creek Township. The boundary includes the entire bridge, it's right of way, superstructure, supporting piers, abutments, wingwalls, and anchored supports. The boundary also includes 15' of the approaches at each end of the bridge.

Boundary Justification

The Boundary is the extant location of the bridge and enough of the immediate site to convey its significance in transportation and engineering.


ROCK CREEK
RIVER
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DEER CREEK
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