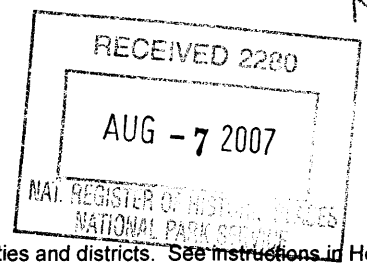
NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

NPS copy
981



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 **Beck's Mill Bridge**

other names/site number Washington County Bridge #105

2. Location

street & number Carries Beck's Mill Road over Mill Creek N/A ☐ not for publication

city or town Salem ☒ vicinity

state Indiana code IN county Washington code 175 zip code

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.)

Signature of certifying official/Title — Date 8/2/07

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 9.20.07

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

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: Concrete Arch

Materials
(Enter categories from instructions)

foundation CONCRETE

walls CONCRETE

roof

other

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
1922-1957

SignificantDates
N/A

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

Cultural Affiliation
N/A

Architect/Builder
Luten, Daniel B.
Montgomery & Parker Contracting 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:

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	573700	4265550
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 John Warner

organization _____ date 04-01-2007

street & number 5018 Broadway St telephone 317/ 283-5450

city or town Indianapolis state IN zip code 46205

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 Washington County Commissioners

street & number Washington County Courthouse, 99 Public Square telephone _____

city or town Salem state IN zip code 47167

United States Department of the Interior
National Park Service

National Register of Historic Places
Continuation Sheet – Beck's Mill Bridge, Washington County, Indiana

Section 7 – Description (continued)

Narrative Description

Beck's Mill Bridge or Washington County Bridge #105 is a two-span, reinforced concrete arch, filled-spandrel structure with an overall length of 156 feet (each span measures 63 feet in length), a roadway width of 20 feet, and a deck width of 22 feet. The bridge is skewed approximately 30 degrees and carries Beck's Mill Road or County Road 29 over Mill Creek in Howard Township; it was completed in 1922 (photographs 1 and 2).

Oriented generally north and south across Mill Creek, the two spans are supported midstream by a single pier. Evident in the slender nature of the arch ring of each span is Luten's design theory that sought a balance between limiting structural materials while meeting safety requirements. Luten's design or pattern of steel reinforcement permitted the designer to shape the slender, elliptical, arch ring that is visible in photographs 3 and 4 (highlighted by the moisture visible between the arch ring and the spandrel) and the relatively slim haunch that completes the arch at the springing line. Both illustrate Luten's efforts to create strength with minimum materials while imbuing his work with some aesthetic value. The internal network of steel bars, not visible to the eye, provides an interlocking system of reinforcement that integrates the abutments, the arch ring, the spandrel and spandrel walls, the deck, the railings, and the pier into a single structure that meets accepted engineering standards of safety and is graceful in its simplicity. In the case of Beck's Mill Bridge, the arches are unsymmetrical, that is, the springing is lower at the abutments than at the pier.

A central feature of the structure is the tapered pier which has a rounded cutwater, a conical cap, and rests on a concrete footing anchored to rock substratum. In accordance with Luten's design, the pier becomes an integral part of the whole structure through the continuation of the reinforcing steel in the arch ring down through the entire length of the pier. The integration of the pier's reinforcement with the rest of the structure allows for a reduction of material needed to support the span (slimmer profile for the pier) which in turn increases the availability of waterway (on navigable rivers) and reduces the surface pressure on the cutwater of the pier (photographs 5 and 6).

The abutments of Luten-design bridges served the traditional anchoring role of any bridge abutment; however, in his designs, they became integral parts of the rest of the substructure and superstructure. Luten also integrated the reinforcement of the abutment with that of the arch ring which allowed him to reduce the mass of both structural elements. The relatively small mass of this bridge's abutments illustrates the success of this practice (photographs 7 and 8). Photograph 8, from a Luten bridge plan, demonstrates the integration of the arch ring with the abutment reinforcing and reinforcing in the spandrel walls and railings.

The economy of Luten's design is demonstrated by the modest depth of the arch ring. Nearly two-thirds of the deck of the bridge extends laterally past the edge of the

arch ring and the spandrel walls; each cantilevered portion of the deck is supported by clusters of concrete brackets on both sides of the spans – one cluster positioned at the juncture of both spans over the pier and one positioned at the outer limit of the spandrel walls near their juncture with the north and south abutments (photographs 5 and 7). Photograph 9, view of the cantilevered road deck from below, shows the narrow arch ring and the placement of the support brackets. Spandrel walls are simply detailed and only the original pattern left by the wooden forms mars their otherwise smooth surface.

The deck of the bridge is bounded on either side by low concrete railings; each railing is divided into six sections by plain railing posts. The exterior surface of the railing has three corbelled courses appearing at its lower edge. The neoclassical balusters between the railing posts rest on a plain bottom rail; the top rail has a plain coping or cap. The railings terminate in plain, unadorned end sections (photograph 10). A square brass plaque is inset in the center post of the eastern railing and lists the county commissioners, the county engineer, and the contracting company at the time of construction (photograph 11).

Photographs 12, 13, and 14 are from a typical Luten plan for one of Washington County's bridges, Crow Ford, built in the 1910s. Photograph 12 demonstrates the typical steel reinforcing system for a wing wall of the Crow Ford Bridge.

Except for some spalling, the bridge is in good condition. In the last decade of the twentieth century, the eastern railing received damage to its southern one-half that required significant restoration. The restoration is visible in the photograph 1 as a lighter portion of the right railing and in photograph 5 in the upper left of the view. The work accomplished to restore the bridge railing to its near-original condition was completed in a sensitive manner under the direction of the Board of Commissioners.

Section 8–Statement of Significance

The concrete arch bridge in Howard Township, Washington County, Indiana known as the Beck's Mill Bridge or Washington County Bridge # 105, is eligible for the National Register of Historic Places under Criterion A for its association with events that made a significant contribution to the broad patterns of our history, in this case, the development of transportation infrastructure within the township and for its association with nearby Beck's Mill. The latter is one of Indiana's earliest-known mills and was established in 1808, serving early settlers in the region. From the beginning of regional settlement, this crossing point of Mill Creek has been on a primary road linking the southern part of the county with the county seat in Salem. The bridge is also eligible for the National Register under Criterion C as a representative example of the work of a nationally-known, noted Hoosier engineer, Daniel B. Luten, who pioneered a significant concept for steel reinforcement of concrete arch bridges that became prominent in the early twentieth century design of such structures. The period of significance is 1922 to 1957.

Criterion A

The area around the site of the bridge has a long history of occupation by some of the earliest Euro-American settlers in southern Indiana. George Beck brought his family to the Howard Township location approximately eight years before Indiana achieved statehood. Traveling from North Carolina, with short stops in Kentucky, George arrived at the future site of his mill in 1807 with his sons. An early newspaper source claims Beck occupied the area known as Beck's Hill as early as 1806. Surviving a few months in temporary quarters of the crudest construction, George returned across the Ohio River and after gathering the rest of his family that was staying near Louisville, he re-crossed the river and spent the early part of 1808 a few miles south of his eventual mill location.[1]

Beck's choice of location for his mill has some unusual characteristics. Although mills of the period were usually located directly on local streams, Beck chose one near the south bank of Mill Creek. Fed by an underground spring, located in a mile-long cave, the spring appeared to be a year-round source of water. By placing a small dam uphill (to the west) of the mill building, Beck created a low head of pressure (from gravity) that turned the overshot wheel of the mill. Water from the dam flowed to the wheel by way of wooden troughs. The original log mill building contained buhr stones brought to the site from Louisville. At various times during its active life the mill supplied power for a carding machine and an up-and-down saw. [2]

Beck's Mill and its immediate environs, along with the ford across Mill Creek, offered more to the regional community than merely a place to grind its corn. Like

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[1] Warder W. Stevens, *Centennial History of Washington County, Indiana* (Indianapolis: B.F. Bowen & Company, Inc., 1916), 576-578; *The Salem Democrat*, 19 June 1922.
[2] *Ibid.*

similar situations in the early years of Indiana settlement, mill locations often developed into places of social gathering and economic growth fueled by settlers needs for consumer goods. Often, farmers and their families arrived at Beck's Mill and waited their turn due to the overwhelming number of folks needing the services of the mill stones; these visits often extended to two or three days. To occupy this spare time, informal contests became a major source of entertainment to those waiting and they "... would amuse themselves with horse racing, gander pulling, foot races and shooting matches...." Traditional gatherings similar to these, started early in the nineteenth century, continued on near the mill location until early in the twentieth century. A comment in the local newspaper in 1919 thanked the Beck family for the use of their grounds for a dinner that welcomed a local soldier back from France where he served in the army for ten months and noted that nearly 500 hundred people attended.[3]

Criterion C

Without actual plans or other direct information such as newspaper accounts, the ability to determine the pedigree of a concrete arch bridge from this period is somewhat limited. In the case of Beck's Mill Bridge, available information supports the argument that this bridge was built according to a steel-reinforcement system and concrete bridge design attributed to a noted Hoosier engineer, Daniel B. Luten.

Born in Michigan in 1869, Luten studied engineering at the University of Michigan in the early 1890s where he also spent the academic year 1894-95 on the faculty. Following this time, he moved to Purdue University where he taught arch design.

Luten did not conjure up elastic theory. First quantified by 17th century Englishman Robert Hooke, the natural law of elasticity deals with the ability of a material to return to its original shape and size after force is applied to it. As early as the mid-nineteenth century, bridge designers began to take into account the elasticity of materials and the design forms used in their bridges. Simply put, elasticity of materials became a positive component in calculations engineers performed to derive safe limits for the forces of compression and tension. Luten, in his search for a more efficient means of dealing with tension in the arch ring of his concrete bridges, designed a "single, continuous reinforcing system" to significantly reduce the amount steel required, yet maintain the integrity of the structure.[4]

Through his detailed study of traditional elastic theory, Luten inferred two corollaries of the same theory which he applied to his design of the arch as a whole, not just to the arch ring. One corollary posited that "elastic activity occurs in all parts of a structure, and changes made in one part affect others." The second corollary, paraphrased, says that the more molecules in the material involved in dealing with strain,

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[3] Stevens, *Centennial History*, 584; *The Salem Democrat*, 13 August 1919.
[4] James L. Cooper, *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900-1942* (Greencastle, IN: DePauw University, 1997), 41.

the less "any given cluster of interlocked molecules will be stretched or compressed." The practical application of these corollaries demonstrated Luten's belief that integration of his arch rings, spandrel walls, piers, abutments, and wing walls into a single reinforcement system that withstood the forces applied against it, could achieve his goal of a leaner (more efficient) structure that was designed well within safe limits.[5]

In spite of Luten's successes both as an engineer and as an entrepreneur, there were folks who did not agree with him. The architect-influenced City Beautiful movement, an attempt to bring American cityscapes to a "cultural parity" with European standards, was in full swing during Luten's early professional life. A preference for elaborately decorated, stone-faced, concrete bridges in Indianapolis parks and parkways of the period resulted in massive structures that Luten found professionally lacking. Luten accused those in power of "violating the engineer's first principles of utility and efficiency." Luten's criticisms raised the ire of some contemporaries in his professional arena. The Wabash River Flood of 1913 gave some of his opposition a venue for response to his criticisms.[6]

The 1913 flood created a wealth of business opportunities for bridge designers and builders in the ensuing years. In 1914, the Marion County commissioners accepted the National Concrete Company's bid for a Luten-designed concrete bridge to carry the highly-traveled Washington Street over the White River in Indianapolis. Applying his corollaries of elasticity, Luten's design of this bridge included his reinforcing system that tied the complementary parts of the bridge into a single loading-bearing entity using less material than would other designs. Luten used the spandrel walls to stiffen the arch ring, reduced the size of the rings and the walls, and by continuing his reinforcement into the substructure, he was able to employ "slim piers and somewhat modest abutments."

Throughout his career, Luten's designs were challenged on several fronts. One oft-repeated claim concerned the reduction in materials needed to build a Luten bridge. In particular, one city engineer claimed that Indianapolis' Washington Street Bridge suffered from this reduction in material and it created a bridge "much inferior in strength and stability" than did the design of other plans. Collectively, some of his critics claimed his arch rings and piers were too thin and his design for the reinforcing was "inappropriately placed and too sparse." Even after filing for an injunction against construction of the bridge, the final volley from his critics fell short of its target, and a ruling of the county circuit court decided the argument over design for this bridge. Ironically, Luten had the final victory when a professional engineering firm evaluated the Washington Street Bridge in 1989 and found, after seven decades, "no signs of distress in the concrete arch rings or spandrel walls." [7]

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[5] Cooper, *Artistry and Ingenuity*, 36-47.
[6] Cooper, *Artistry and Ingenuity*, 72-75.
[7] Cooper, *Artistry and Ingenuity*, 72-75

Despite his battles in court, Luten made an indelible impression on the engineering world of concrete bridge design. By the mid-1910s, he had designed approximately 6,000 bridges in the Western Hemisphere, and had written many articles for professional journals. Luten held more US patents for concrete bridge design than any other American. As one authority notes in his work on Indiana's concrete bridges, "Luten never claimed to be the first [engineer] to place metal in concrete to resist tension." However, as this author also notes Luten, as an inventive/innovative engineer, ranked economic efficiency along with safety in applying the core concept of elastic theory.[8]

In 1920, the condition of the previous metal truss bridge across Mill Creek at Beck's Mill became an urgent matter on the calendar of the county commissioners. A newspaper report in March of that year noted a vehicular accident at the bridge that caused Mr. Patterson and his wife, a couple from Iowa, some injury and "the car was badly wrecked." Just how urgent is no doubt a matter of perspective, but the commissioners likely ordered an inspection of the condition of the bridge to determine further actions required of them.[9]

In January 1921, the tale of the current concrete arch bridge begins. On 3 January 1921, the Board of Commissioners of Washington County determined that the metal bridge at Beck's Mill was "... in dangerous condition and repair would be a continuous expenditure ...." The Board, being fully advised, ordered the county engineer "to prepare plans and specifications for a concrete bridge at said Beck's Mill in Howard Township." The county engineer presented the plans and specifications to the Board on 7 February 1921 and they approved them. Concurrently, the Board ordered the county auditor to call a special session of the County Council for later in the month "to consider a bond issue for the construction of said bridge." [10] Normally, a county council would approve expenditures for a forthcoming year as a matter of routine business; however, in this case it appears the commissioners felt the need for a new bridge argued against waiting for the regular budgeting process to take effect.

The County Council met in special session on 21 and 22 February, 1921 and authorized the bond issue. With this authorization in place, on 7 March 1921, the Board directed the auditor to advertise for sealed bids"... to be received up to 2 PM Monday, the 2 May, 1921..." according to the plans and specifications on file in the auditor's office.[11]

The first discovered evidence of Luten's professional presence in Washington County appears in the 1910s. At the May 1914 opening of sealed bids for the construction of six concrete bridges, all proposals used one of two designs – either "county plans" or "Luten plans". One of the bidders under the heading for Luten plans was the Montgomery and Parker (M&P) firm from Rockport, Indiana. M&P did not get any

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[8] *Ibid*, 44.
[9] *The Salem Democrat*, 24 March 1920.
[10] *Washington County Commissioner's Records*, Volume S, January 1921– May 1937, 3-5.
[11] *Ibid*, 10.

contracts from this bidding cycle but the records notation by the Board closed with a stipulation/reminder to all contractors that "All of said bridges to be built according to the Luten Plans." An earlier notation in official records did award the contract for five concrete arch bridges to M&P, all to be built "on Luten Plans." [12] Plans for the Beck's Mill Bridge are missing and not available for review but many plans for county bridges constructed in the 1910s are available; in a number of cases, files for these bridges included Luten plans.

Montgomery and Parker's association with Washington County continued for many years; they received contracts to build concrete bridges well into the 1920s. A final "In the Matter Of" notation on bridge contracting, in this volume, awarded two contracts in June 1920, one to M&P and one to the National Concrete Company, for concrete bridges using Luten plans.[13] From evidence in the official records it appears that the Washington County commissioners were highly satisfied with the professional abilities of M&P and with the acceptability of Luten designs to meet their needs. The Board's "normal business" requirement for Luten plans argues positively for the pedigree of Beck's Mill Bridge.

On 2 May 1921, the Board met to open the sealed bids. As it turned out they received five bids for the basic structure from contractors and three separate bids for dirt fill alone. The bids ranged in amounts from as low as $15,300.00 to as high as $21,998.00 for the sub-and superstructures; some of the bids included amounts for the dirt fill required to form the base for the roadway and the approaches to the bridge. The notation in the record that detailed the bids and the award of the contracts included the phrase –Ten day Luten Plans – the meaning of the words "Ten day" is an unknown and not viewed or explained anywhere in the records but the reference to "Luten Plans" is an obvious requirement. Contractors submitting bids included the Burk Construction Company, a New Castle, Indiana firm that built bridges throughout southern Indiana and the Montgomery and Parker Contracting Company (M&P), from Rockport, Indiana. The last company built concrete arch bridges in Washington County as early as the 1910s. After due consideration, the Board selected the bids offered by M&P in the amount of $17,894.00, which included the structure and the required dirt fill.[14]

The typical means to fund public projects such as this bridge is the issuance of bonds. The Board determined, in early June, that their announcement of the proposed bond issue in the local newspaper had garnered no remonstrance or objection from local taxpayers and therefore, they approved the bond issue in the amount of $18,400.00. With the bond issue approved, the Board moved to appoint a construction superintendent, James M. Voyles, and approved his surety bond of $5,000.00. With all the elements in place, M&P proceeded with the work.[15]

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[12] *Washington County Commissioner's Records*, Volume R, 1911 – 1920, 193 and 198.
[13] *Ibid*, 535.
[14] *Ibid.*
[15] *Ibid*, 31, 36, 40 and 44.

Once started, the construction of the bridge moved forward quickly. On 3 July 1922, the construction superintendent and county engineer reported construction of the bridge complete as of 23 June 1922 and the Board in turn "... accepts [the bridge] as completed according to the plans and specifications." A subsequent report by the two officials to the Board on 4 September 1922 confirmed the completion of the fill work, again "... according to the plans, specifications, and contract." In January 1923, the Board directed the county engineer to prepare plans, specifications, and an estimate "...for the removal, repair and [re]location of said bridge to the Miller Ford in Howard Township."[16]

Plans for disposing of the metal bridge never were finalized. A notation dated 3 June 1929 and titled "In The Matter of Beck's Mill Bridge," in the *Commissioner's Records*, addressed a Board decision to sell "...the old high truss steel bridge at that place [Beck's Mill]." They ordered the auditor to announce this cash sale at the courthouse on 7 August 1929 to the lowest bidder but they stipulated "... not less than $35.00 will be accepted." The Board sold the bridge to a local firm owned by the Purslee brothers but the actual amount is unknown. For some unspecified reason the Board never directed the actual removal, and reuse, of the metal bridge at Beck's Mill.[17]

Luten and Beck's Mill Bridge

Other reinforcement for a Luten-pedigree for Beck's Mill Bridge appears in bridges credited to him in many locales. The Luten plans, reviewed by the author, for bridges built in the 1910s often contained solid railings with bush-hammered panels to add texture to an otherwise flat surface and did not display any specific architectural style. The railings of Beck's Mill Bridge demonstrate a definite neoclassical style in its balusters, as demonstrated in other Luten bridges.

The narrow arch ring and the cantilevered deck of Beck's Mill Bridge are other signatures of a Luten design of the period. Four examples that demonstrate similar Luten designs are the Cottonwood Falls Bridge (1914) in Kansas, built by the Missouri Valley Bridge Company (photograph 15);Bridge #26E1330N2890002 (1910s) near Chickasha, Oklahoma (photograph 16); the Canyon Padre Bridge (1914) near Winona, Arizona that was built by the Topeka Bridge & Iron Company (photograph 17); and the bridge over Grey Horse Creek (unknown), Osage County, Oklahoma (photographs 18 and 19). All four bridges incorporate narrow arch rings/cantilevered decks with brackets, a design attributable to many Luten bridges. The Arizona and Oklahoma bridges incorporate exactly the same railing configuration as Beck's Mill Bridge.[18]

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[16] *Ibid*, 102, 109 and 143.
[17] *Washington County Commissioner's Records*, Volume S, January 1921 – May 1937, 369.
[18] Nicholas Jansberg "Stucturae" @ en.structurae.de/photos/index.cfm; Spans Of Time @okladot.state.ok.us/hqdiv/p-r-div/spansotime/shiftingdir.htm; Cottonwood Falls Dam and Bridge @ kansastravel.org/cottonwoodfalls.htm; and Concrete Arch Bridge across Grey Horse Creek, Osage County @ okbridges.wkinsler.com.

In summary, Beck's Mill Bridge is eligible for the National Register of Historic Places under Criteria A and C for its association with a site of early Indiana settlement and as an example of the work of Daniel B. Luten, a Hoosier engineer whose application of his engineering corollaries revolutionized the design internal steel reinforcement in concrete bridge, nationwide, in the early years of the twentieth century.

Section 9 – Bibliography

Cooper, James L. *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges, 1900 –1942*. Indianapolis: Pierson Printing, 1997.

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Stevens, Warder W. *Centennial History of Washington County, Indiana*. Indianapolis: B.F. Bowen & Company, Inc., 1916.

The Salem Democrat, 24 March 1920 and 19 June 1922.

"The City Beautiful Movement" @ xroads.virginia.edu. 16 February 2007.

Washington County Commissioner's Records, Volume R, 1911 – 1920.

Washington County Commissioner's Records, Volume S, January 1921– May 1937

Section 10 – Geographical Data

Boundary Description:

From a start point 40 feet north and 20 feet east of the northeast corner of the bridge; proceed south across Mill Creek to a point 20 feet east and 40 feet south of the southeast corner of the bridge; turn west and proceed across Beck's Mill Road to a point 20 feet west and 40 feet south of the southwest corner of the bridge; turn north and proceed across Mill Creek to a point 20 feet west and 40 feet north of the northwest corner of the bridge; turn east and proceed across Beck's Mill Road to close on the start point.

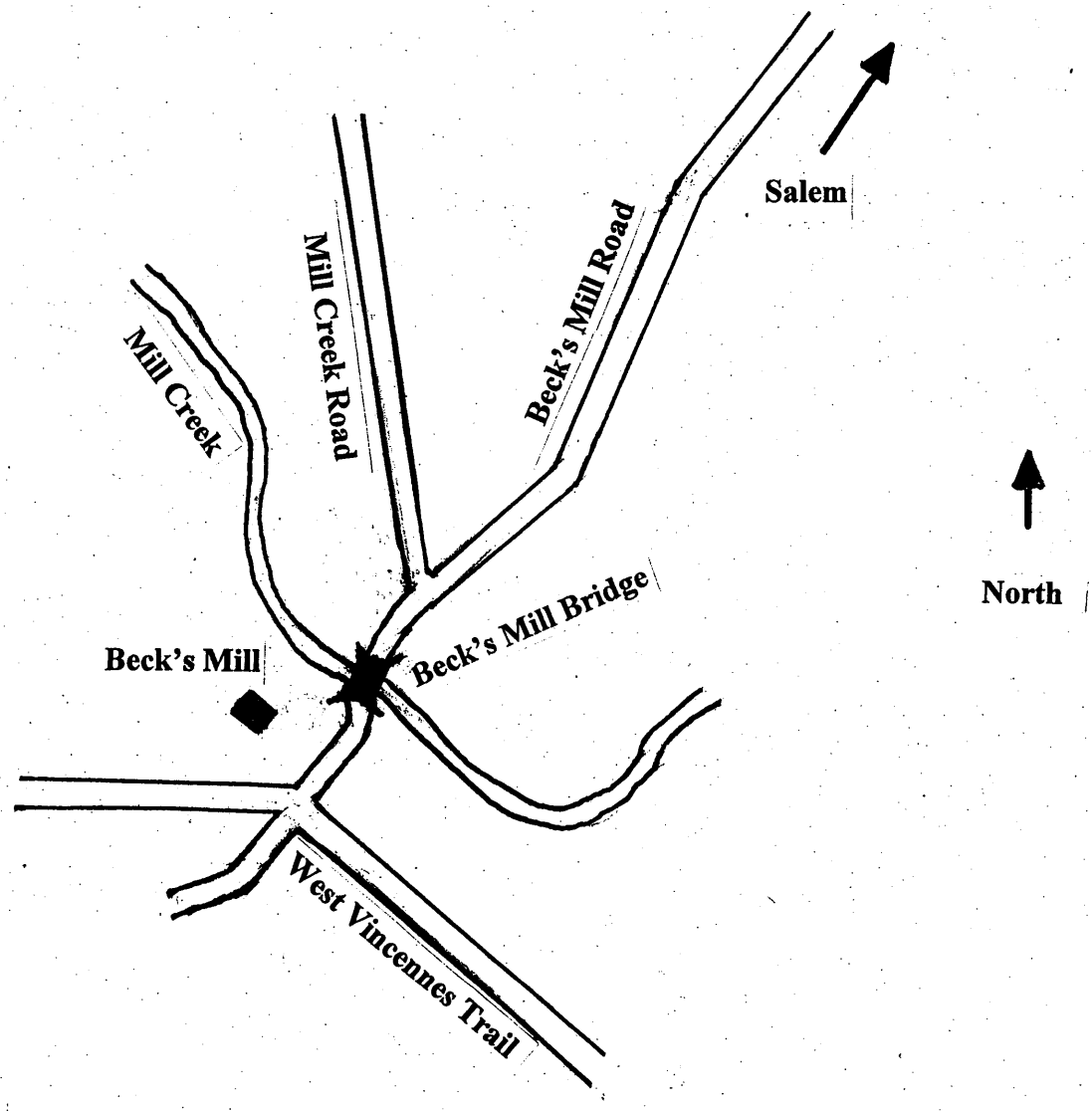
Boundary Justification:

The boundary as described includes the abutments, piers, and spans of the bridge and its immediate environs.

Photo Directory – Beck's Mill Bridge, Washington County, Indiana

Photographer – John Warner
Computer Disc at Division of Historic Preservation and Archeology, Department of Natural Resources, State of Indiana, 402 West Washington Street, Indianapolis, IN 46204.
Date of Photographs – 25 January 2007

1. Looking north, from the vicinity of Beck's Mill, at the bridge and its surrounding terrain.
2. Looking northeast at the bridge railings, deck, and pier.
3. Looking northwest at the east railing, the pier, and the north and south abutments.
4. Looking south at the relationship between the top of the pier, the center cluster of brackets, the road deck, and the railing.
5. Looking northwest, the view demonstrates the configuration of the arch ring and the spandrel wall (note the moisture that defines the separation) at a point where the haunch meets the pier.
6. A view of the bottom of the pier and its footing mid-stream of Mill Creek.
7. A view looking northwest at the north abutment. The relatively small size of the abutment and the arch ring results from Luten's designs that interconnected the various parts of a concrete bridge, with an integral system of steel bars, into a single structure that was stronger than the sum of its parts.
8. A portion of a Luten plan that demonstrates the reinforcing scheme connecting the railing, the arch ring, spandrel wall, and the abutment.
9. A view from beneath the bridge showing the cantilevered deck, the narrow arch ring, and a cluster of support brackets.
10. A close-up view of the balusters in the bridge railings.
11. A view of the memorial plaque noting the county commissioners, the county engineer, and the construction company that built the bridge.
12. A portion of a Luten plan showing the reinforcing schemes of a railing, the crown of the deck, and the wing walls at the north and south abutments.
13. A Luten plan for one of Washington County's bridges showing the reinforcing scheme for a complete bridge and demonstrates the changing placement of the arch ring steel bars as they move outward from the crown to the haunch.
14. Luten's name and professional status as the engineer of a Washington County Bridge in the mid-1910s.
15 through 19. Views of various bridges attributed to Luten and spread throughout the nation, showing the similarities between Beck's Mill Bridge and other design work done by Luten.



NOT TO SCALE

Beck's Mill Bridge
Washington County, Indiana