Cloud Creek Warren with Polygonal Top Chord Pony Truss
Structure #51E0950N4130009
Southeast of Boynton
Muskogee County
Oklahoma

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Oklahoma State Historic Preservation Office
Oklahoma Historical Society
Oklahoma History Center, 2401 N. Laird Ave.
Oklahoma City, Oklahoma 73105

DOCUMENTATION
BRIDGE #51E0950N4130009

I. INTRODUCTION

Location:	Spans Cloud Creek on section line road EW-95 approximately 1/2 mile southeast of Boynton. (Range 16E, on the boundary between T14N and T13N, at the point where sections 31, 32, 5, and 6 meet). UTM: Zone 15, 3947089N, 260745E
Map Reference:	U.S.G.S. 7.5' series, *BOYNTON, OKLA.* (1971)
Date of Construction:	1914
Present Owner:	Muskogee County Commissioners Muskogee County Courthouse Muskogee, Oklahoma
Present Use:	Non-extant
Significance:	The Cloud Creek bridge is significant for its rare Warren with polygonal top chord pony truss design, and for its construction by a nationally important bridge company, the Missouri Valley Bridge and Iron Company.
Preparer:	Anna Marie Eddings, Historian/ Architectural Historian, Oklahoma Department of Transportation Cultural Resources Program, July 24, 2013

II. HISTORICAL SUMMARY

Bridges represent the evolution of the transportation system, as well as the social and commercial patterns which shaped that system. Muskogee County is part of the Creek Nation in the former Indian Territory, which was sparsely settled in the years after the Civil War. Roads were only trails that were often winding, detouring around the inhabitants' fenced enclosures, and maintenance was haphazard under a law that required all men to spend four days a year working on the roads, supervised by a foreman. Numerous remote small towns or trading centers served the local citizenry. Wellington was one of these small towns in the area where the Cloud Creek Bridge would later be located. It was the location of the district court, a store, and a stage stop on the line from Muskogee to Okmulgee. It acquired a post office on 3 June 1890, and its name changed to Lee on 22 July 1892, after David A. Lee, judge of the court and postmaster. As was happening throughout the Indian Territory, in the Creek Nation the process of allotting the Indians' land and the expansion of the railroads brought many more non-Indian residents, and led to the formation of new towns that were larger than the older settlements. In 1902-1903, the Shawnee, Oklahoma and Missouri Coal and Railway Company (later acquired by the Saint Louis-San Francisco Railway Company) built forty miles of track from Okmulgee to Muskogee. Townsite promoters selected a site on the rail line approximately three miles southeast of Lee for the new town of Boynton, named after E. W. Boynton, chief engineer of the Shawnee, Oklahoma and Missouri Coal and Railway Company. The Boynton post office was established on 10 September 1902, and by 1903 the town included a school and soon it had two banks, a weekly newspaper, grain elevators, and numerous retail establishments. Boynton had eclipsed Lee, although the Lee post office continued in operation until 1911.[1]

It was during these early years, when Oklahoma's population expansion and urban growth necessitated transportation improvements, that the state benefitted from the numerous bridge-building companies that reached their mature stage around 1890-1918. By this time, steel manufacturers were producing uniform rolled beams, plates, bars, and rods that facilitated standardization in bridge design.[2] According to engineering historians, these mass-produced metal truss bridges are "America's greatest engineering and manufacturing achievement."[3] Bridge companies purchased the steel components and organized production by means of specialized departments. These departments included drafting, where bridge plans were drawn; forging, where small parts like eye-bars and pin nuts were made; and the truss shop, where the bulk of the work such as sizing beams, drilling holes, and riveting took place to prepare the bridge for quick on-site assembly.[4]

The Missouri Valley Bridge and Iron Company was among the largest and most influential of these bridge-building companies. Its founder was Edwin I. Farnsworth, who had been a city official in Leavenworth, Kansas, and had also held positions with the Wrought Iron Bridge Company and the King Iron Bridge Company. He saw advantages in manufacturing bridges in Kansas instead of relying on these eastern firms, so in 1874 he partnered with D. W. Eaves to form the Missouri Valley Bridge and Iron Works in Leavenworth. Although Farnsworth soon left the company and it came under the control of a banking establishment, it carried on under the leadership of A. J. Tullock, who was chief engineer and manager. He bought out other shareholders to become sole proprietor in 1888. After his death in 1904, the company incorporated under Kansas law and its name changed to Missouri Valley Bridge and Iron Company. It gained prominence for constructing numerous railroad and highway bridges throughout the West, South, and Southwest, and developed expertise in difficult underwater foundations from its work on bridges across the Mississippi and Missouri Rivers. Although the company was well-known for large bridges like these, Oklahoma also has many examples of its smaller bridges such as the Cloud Creek Bridge. In 1913, its plant in Leavenworth had multiple buildings indicating specialized departments. At its manufacturing complex there were two machine and erecting shops, a rivet shop, a blacksmith, a carpenter shop, a separate building for iron rods, and a large warehouse next to a railroad siding and a loading platform. The main office was off-site in its own building closer to the commercial district of Leavenworth. This company, along with other bridge companies headquartered in nearby Kansas City, became the dominant bridge builders in Oklahoma, aided by factors such as convenient rail connections and low freight rates, aggressive marketing, and good reputations.[5]

Oklahoma's expansion coincided not only with the growth of bridge building companies, but also with the growth of the good roads movement, which sought to improve the country's roads that were generally not very well-constructed or consistently maintained. In the 1890s into the early 1900s, the National Good Roads Association was headquartered at Saint Louis, Missouri, while in 1908, the Democratic Party made good roads a part of their platform. In 1904, the first Oklahoma territorial good roads convention met at Guthrie and organized the Oklahoma-Indian Territory Good Roads Association. This association held its annual conference in Muskogee in December of 1906, attended by the state constitutional convention's committee on public roads. The push for road improvements in Oklahoma came largely from merchants desiring more business for their own establishments and their communities; consequently, local good roads associations were active. In 1910, Muskogee businessmen formed the Muskogee Good Roads Association to campaign for the passage of a proposed bond issue for bridge construction. The Muskogee Retailers' Association also promoted the bond issue. These supporters repeated the arguments of good roads advocates that improved roads making it easier for farmers to bring crops to market and patronize a town's merchants were a benefit to everyone.[6]

Boynton continued to grow in the years around 1910, and as a trading center for the surrounding farmland, good roads were important to it. By this time, the town had a cotton gin, grain elevators, and a flour mill, as well as a blacksmith and a lumber company. The Francis Vitric Brick Company had a plant there that excavated from a nearby shale bed. A weekly newspaper informed the area residents and promoted the town. Besides general stores, Boynton had specialized stores such as drugstores, grocery stores and meat markets, hardware stores, furniture stores, and a confectionary. Road improvements around the town advanced as well. In August of 1910, the *Boynton Index* newspaper reported that "road interests" in Okmulgee and the Muskogee Motor Club were cooperating to maintain the road between these two towns, which passed through Boynton. In 1911, County Commissioner W. T. Cole was working to improve the roads north of town leading to Haskell with grading and good bridges. In September of 1913, Cole was also appointed by his fellow county commissioners to attend the International Good Roads Congress in Detroit, Michigan, which indicates he was particularly interested in road work.[7]

Area residents often saw metal truss bridges like the one that was built to span Cloud Creek as evidence of progress which brought them into a world of commerce and influence beyond the limitations of unimproved, poorly-maintained roads. The roads southeast of Boynton were receiving attention in 1913. In June, P. B. Wolfinger took W. T. Cole and the other Muskogee County Commissioners to see the recent grading work on these roads. The citizens of Brown Township, which included the area southeast of Boynton, petitioned the county commissioners for a bridge over Cloud Creek approximately one mile southeast of Boynton, and the commissioners granted this petition in their meeting on 2 September 1913. At this meeting, they directed the County Surveyor to perform the prerequisite survey and prepare plans and specifications for this bridge. The *Boynton Index* newspaper expressed the opinion that a bridge here was long overdue, since Boynton lost business to the town of Wainwright approximately five miles to the southeast because people in this area could only cross Cloud Creek and get to Boynton conveniently when the weather was dry. In their meeting on 2 December 1913, the commissioners awarded the $1,168 contract for this bridge to the Missouri Valley Bridge and Iron Company, stipulating completion before 5 March 1914. For some unknown reason they were delayed, as shown by a newspaper report on 13 March 1914 that the bridge's abutments were complete, its metal beams had arrived, and construction was proceeding. A man named Chas. (Charles) Wahl had constructed the bridge's brick abutments, a choice of material which probably reflects the nearby Francis Vitric Brick Company. Workmen completed the bridge on 24 March 1914 and it only awaited fill for the roadway approaches.[8]

The Cloud Creek Bridge is a Warren with polygonal (curved) top chord pony truss, a rare type of bridge that helps to illustrate the variety of standard bridge designs produced during the heyday of American bridge building companies. By the late 19th and early 20th centuries, the Pratt and

Warren truss designs and their variants had proven their effectiveness and were ubiquitous. A basic Warren with verticals pony truss has a flat top chord and diagonal beams that form a “W” pattern. The diagonals alternate between carrying compressive and tensile forces as loads travel over the bridge. Vertical beams strengthen the truss by supporting the top and bottom chords between the diagonals. Although basic Warren with verticals pony trusses are common, Warren with polygonal top chord pony trusses are rare: the 2007 Oklahoma Historic Bridge Survey identified only ten bridges of this type out of a total of 1,061 truss and arch bridges documented in the state. Their rarity results from a combination of factors. The polygonal top chord was developed because it is an efficient use of metal, in that it allows for more height at the center of the truss where forces are strongest, and less height at the ends of the truss where the forces are weaker and the extra metal is not needed. However, the polygonal top chord design, because it requires verticals and diagonals of differing lengths, meant more shop work on the bridge and a higher fabrication cost. Therefore, it was usually cost-effective to use flat top chords on shorter bridges like pony trusses. Conversely, more through truss bridges (Parker through trusses for example) have polygonal top chords because the savings resulting from the decrease in material for these longer and taller bridges offset the higher fabrication costs. But when the increase in automobile traffic in the 1920s and 1930s necessitated heavier and wider pony truss bridges, the decrease in material cost that a polygonal top chord afforded again offset the increased fabrication costs caused by differing vertical and diagonal lengths, and polygonal top chord pony trusses became more common. In Oklahoma, however, the polygonal top chord variants of the Pratt pony truss (known as camelback or Parker pony trusses) became the commonly used, state-standard design, rather than the polygonal top chord Warren. [9]

III. DESCRIPTION

The Cloud Creek Bridge is a single-span Warren with polygonal top chord pony truss that is 70 feet long. Following is a description of its truss members:

> Top Chord: Pair of C-beams with a riveted top plate and zig-zag lacing on bottom
> Inclined End posts: Same as the top chord
> Bottom Chord: Pair of L-beams connected with batten plates, except in the middle panel, where there are two pair of L-beams connected with batten plates
> Diagonals: Two pair of L-beams connected with zig-zag lacing
> Verticals: Two pair of L-beams connected with zig-zag lacing

The composition of the truss members is noteworthy because it helps to depict how the bridge functions. In a bridge with riveted connections such as the Cloud Creek Bridge has, all of the beams are heavily-built because riveted connections do not allow for a free transfer of forces between beams like pinned connections do. Therefore, all of the beams must withstand stronger compressive forces as well as tensile forces, so there is not a great deal of difference in the composition of its beams. Additionally, as described above, in the Warren with verticals design, the diagonals alternate between carrying compressive and tensile forces as loads travel over the bridge. Vertical beams strengthen the truss by supporting the top and bottom chords between the diagonals.

The bridge is 14 feet wide, and has a wood deck. Underneath the deck there are I-beams running longitudinally the length of the truss, and larger I-beam floor beams spanning the width of the truss. The floor beams are connected to the verticals above the bottom chord, which gives the bridge more strength and is characteristic of riveted bridges. Bottom lateral bracing consists of rods in an “X” pattern between the floor beams.

The bridge rests on full-height brick abutments. A bridge’s wing walls extend out from the front wall of the abutment and are designed to retain roadway fill. The Cloud Creek Bridge’s wing walls are also brick, and extend out from the abutment forming an acute angle with the road.

The Cloud Creek Bridge carried a county road in a rural setting southeast of the small town of Boynton. Under a Memorandum of Agreement with the Oklahoma State Historic Preservation Office, it has been replaced by a modern two-lane bridge. Before its removal, the bridge retained historic integrity, having no significant alterations. It had no bent or damaged beams, but some beams did have heavy rust and pitting.

IV ENDNOTES

1. Michael J. Cassity, “Route 66 and Associated Historic Resources in Oklahoma,” (Multiple Property Documentation Form, on file at the Oklahoma State Historic Preservation Office, Oklahoma City, Oklahoma, 2003), 64; Angie Debo, *The Road to Disappearance* (Norman, OK: University of Oklahoma Press, 1941), 287, 289-90; Indian Pioneer History Collection, Grant Foreman, ed., vol. IV, p. 321, vol. XXXV, p. 233, vol. LX, p. 195, Research Division, Oklahoma Historical Society, Oklahoma City, Oklahoma; George H. Shirk, *Oklahoma Place Names*, 2d ed. (Norman, OK: University of Oklahoma Press, 1974), 30, 139, 253;Ohland Morton, “Reconstruction in the Creek Nation,” *Chronicles of Oklahoma* 9 (June 1931): 174; Chester M. Davis, *Railroads of Oklahoma* (Oklahoma City, OK: State of Oklahoma Department of Transportation Survey Division, 1976), 66-67, 69, 79; John Downing Benedict, *Muskogee and Northeastern Oklahoma*, vol. 1 (Chicago, IL: S. J. Clarke Publishing Company, 1922), 485-86; Odie B. Faulk, *Muskogee: City and County* (Muskogee, OK: The Five Civilized Tribes Museum, 1982), 75, 77; *R. L. Polk & Co.’s Oklahoma and Indian Territory Gazetteer and*

Business Directory, 1907-08 (Memphis, TN: R. L. Polk & Co., 1907), 523-24.

2. Joseph E. King, *Spans of Time: Oklahoma Historic Highway Bridges* (Oklahoma City, OK: Oklahoma Department of Transportation Planning Division, 1993), 34; Joseph E. King, *Oklahoma Historic Bridge Project Preservation and Management Plan* (Oklahoma City, OK: Oklahoma Department of Transportation Planning Division, 1993), 9; Lichtenstein Consulting Engineers, Inc., *Delaware's Historic Bridges: Survey and Evaluation of Historic Bridges with Historic Contexts for Highways and Railroads*, 2d ed., revised (n.p.: Delaware Department of Transportation, Division of Highways, Location and Environmental Studies Office, 2000), 71.

3. Eric Delony and Michael J. Auer, "Historic Bridges: Preservation Challenges," *CRM* 14 (Number 1): 1.

4. *The Ohio Historic Bridge Inventory Evaluation and Preservation Plan* (Columbus, OH: Ohio Department of Transportation, 1983), 49; *Historic Highway Bridges in Wisconsin*, vol. 2, part 1 (n. p.: Wisconsin Department of Transportation, 1998), 67, 71; Dan Grove Deibler, *A Survey and Photographic Inventory of Metal Truss Bridges in Virginia 1865-1932*, vol. 1 (Charlottesville, VA: Virginia Highway & Transportation Research Council, 1975), 13.

5. Larry Jochims, "Metal Truss Bridges in Kansas, 1861-1939," (National Register of Historic Places, Multiple Property Documentation Form, on file at the Kansas State Historic Preservation Office, Topeka, Kansas, 1990), section E, page 3; Robert W. Jackson, "Yequa Creek Bridge (Tommelson Creek Bridge), Washington County, Texas" (Historic American Engineering Record, National Park Service: 1997), 5, accessed at http://memory.loc.gov/ammem/collections/habs_haer/index.html ; John D. Hartley, "Hominy Creek Bridge, Osage County, Oklahoma" (Historic American Engineering Record, National Park Service: May 1990, on file at the Oklahoma Department of Transportation Cultural Resources Program, Norman, Oklahoma), 17; Bridge Survey Files, Oklahoma Department of Transportation Cultural Resources Program, Norman, Oklahoma; "Leavenworth, Kansas: 1913," sheet numbers 16, 38, Kansas Sanborn Fire Insurance Maps, Kansas Collection, Kenneth Spencer Research Library, University of Kansas, accessed at http://luna.ku.edu:8180/luna/servlet/allcollections ; King, *Spans*, 10, 12.

6. King, *Spans*, 14; William Paul Corbett, "Oklahoma's Highways: Indian Trails to Urban Expressways," (Ph.D. dissertation, Oklahoma State University, 1982),169-172; Cassity, "Route 66," 9; *Muskogee Times-Democrat*, 10, 14, 18 November 1910.

7. *Boynton Index*, 17 August 1910, 10 March 1911, 25 August 1911; *R. L. Polk & Co.'s Oklahoma and Indian Territory Gazetteer and Business Directory, 1907-08*, 523-24; Muskogee

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8. King, *Spans*, 49; *Boynton Index*, 6 June 1913, 13, 27 March 1914; Muskogee County Commissioners, *Commissioners' Record*, vol. 3, September 2 1913, December 2 1913.

9. Sivanuja S. Sundaram, "Laroque Bridge, Bristol, Addison County, Vermont" (Historic American Engineering Record, National Park Service: 1991), 3, accessed at http://memory.loc.gov/amem/collections/habs_haer/index.html ; King, *Spans*, 34, 44-46; James L. Cooper, *Iron Monuments to Distant Posterity: Indiana's Metal Bridges,1870-1930* (n.p.: DePauw University, Federal Highway Administration, Indiana Department of Highways, Indiana Department of Natural Resources, National Park Service, 1987), 70, 91; FRASERdesign, *Missouri Historic Bridge Inventory: Draft Inventory Report*, vol. 1 (n. p.: Missouri Highway and Transportation Department, April 1996), 102; Bridge Survey Files, Oklahoma Department of Transportation Cultural Resources Program, Norman, Oklahoma; Iowa Department of Transportation, "Historic Bridges of Iowa: Warren Trusses," http://www.iowadot.gov/historicbridges/moreinformation.aspx?13 (accessed 26 April 2013).

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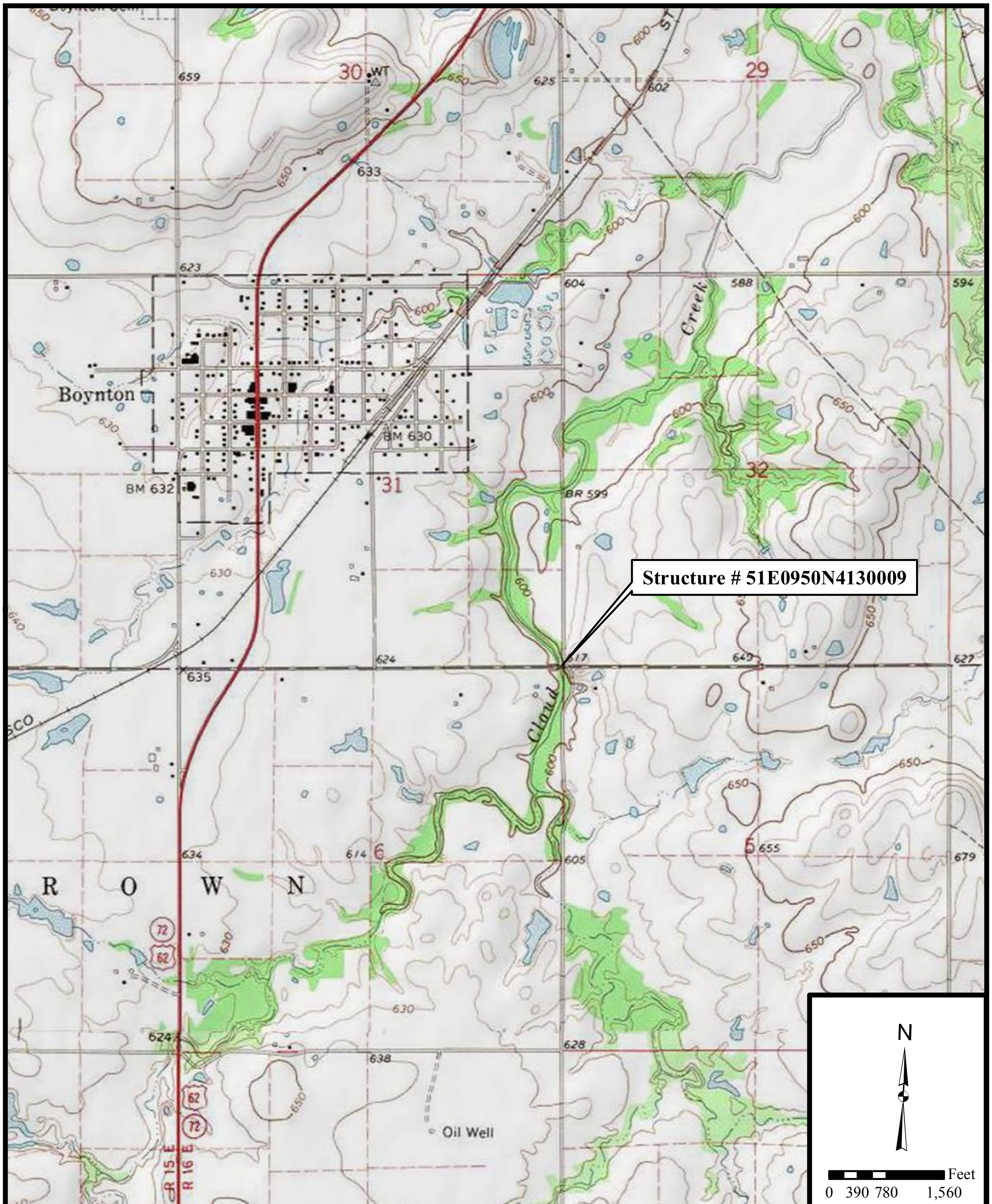

Cloud Creek Bridge
Structure # 51E0950N4130009
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Basemap: 1971 Boynton 7.5' USGS Quadrangle. Intersection of sections 31-32 T14N R16E and sections 5-6 T13N R16E.

Cloud Creek Warren with Polygonal Top Chord Pony Truss
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LIST OF PHOTOGRAPHS

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7. Detail of end panel, looking NE
8. Detail of missing bridge plate location, looking E-SE
9. Side view, looking NW
10. Detail of top chord, looking NW
11. Setting view, looking W-SW
12. Detail of bottom chord-inclined end post connection, looking E


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