

McPhaul Suspension Bridge - Yuma County

---

B R I D G E S

---

ARIZONA HISTORIC BRIDGE INVENTORY

submitted to:  
Arizona Department of Transportation  
205 South 17<sup>th</sup> Avenue  
Phoenix, Arizona 85007

produced by:  
**FRASER**design  
420 South County Road 23E  
Loveland, Colorado 80537

in association with:  
EcoPlan Associates, Inc.  
701 West Southern Avenue Suite 203  
Mesa, Arizona 85210

January 2008

**United States Department of the Interior  
National Park Service**

**National Register of Historic Places  
Multiple Property Documentation Form**

This form is for use in documenting multiple property groups relating to one or several historic contexts. See instructions in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Complete each item by entering the requested information. For additional space, use continuation sheets (Form 10-900-a). Use a typewriter, word processor, or computer to complete all items.

\_\_\_ New Submission     Amended Submission

**A. Name of Multiple Property Listing**

Vehicular Bridges in Arizona 1880 - 1964

**B. Associated Historic Contexts**

Vehicular Bridges in Arizona 1860 - 1964

**C. Form Prepared By**

name/title Clayton B. Fraser, Principal  
organization FRASER design date 15 January 2008  
street & number 5700 Jackdaw Drive telephone 970.669.7969  
city or town Loveland state Colorado zip code 80537

**D. Certification**

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards for Archeology and Historic Preservation. ( \_\_\_ See continuation sheet for additional comments.)

\_\_\_\_\_  
Signature of certifying official date

\_\_\_\_\_  
State or Federal agency or bureau

I, hereby, certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

\_\_\_\_\_  
Signature of commenting or other official date

**Table of Contents**

Provide the following information on continuation sheets. Cite the letter and the title before each section of the narrative. Assign page numbers according to the instructions for continuation sheets in *How to Complete the Multiple Property Documentation Form* (National Register Bulletin 16B). Fill in page numbers for each section in the space below.

Section	Page number
<b>E. Statement of Historic Contexts</b>	
1. Introduction	1
2. Bridge Development in America	2
3. Territorial Road and Bridge Construction in Arizona: 1880-1912	8
Figure 1. Solomonville Road Overpass	11
Figure 2. Alchesay Canyon Bridge	13
Figure 3. Black River Bridge	16
Figure 4. Tempe Bridge	17
4. Early State Bridge Construction and Transcontinental Highways: 1912-1920	17
Figure 5. Map of proposed highway system of Arizona, 1912	19
Figure 6. Map of proposed state highways of Arizona, 1916	21
Figure 7. Antelope Hill Bridge	22
Figure 8. Santa Cruz River Bridge	24
Figure 9. Clason's Guide Map of Arizona, 1918	29
Figure 10. Map of proposed Phoenix-Yuma Highway, 1920	31
Figure 11. Truck pulling train of cars across Gillespie Dam apron, circa 1926	33
Figure 12. Chevelon Creek Bridge	34
Figure 13. Jacks Canyon Bridge	35
Figure 14. Letterhead of Omaha Structural Steel Bridge Company, 1919	37
Figure 15. Canyon Padre Bridge	38
Figure 16. Gila River Bridge	39
Figure 17. Kelvin Bridge	40
Figure 18. Black Gap Bridge	41
Figure 19. Broadway Bridge	42
Figure 20. Cameron Suspension Bridge	43
Figure 21. Yuma Bridge	46
Figure 22. Topock Bridge	47
5. Federal Aid and the Arizona Highway Department in the 1910s and 1920s	47
Figure 23. Old Trails Wash Bridge	50
Figure 24. Granite Creek Bridge	52
Figure 25. Map of state highway system of Arizona, 1920	53
Figure 26. Concho Bridge	54
Figure 27. Cienega Bridge	55
Figure 28. Map of Arizona's 7 percent system, 1922	57
Figure 29. Map of Arizona highway system, 1932	60
Figure 30. Dead Indian Canyon Bridge	61
Figure 31. Midgley Bridge	62
Figure 32. Mormon Flat Bridge	63
Figure 33. Verde River Bridge	64
Figure 34. Pine Creek Bridge	65
Figure 35. Gillespie Dam Bridge	68
Figure 36. Navajo Bridge	70
Figure 37. Dome (McPhaul) Bridge	71
Figure 38. Mill Avenue Bridge	72

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 2

### VEHICULAR BRIDGES IN ARIZONA

## 2

### Bridge Development in America

Bridges, as integral elements of a developing transportation network, have played a pivotal part in the development of America. Generally the most sophisticated components of any overland transportation system, they are also the most prominent. Bridges not only function as gauges of technological advancement in design and construction, they reflect the tenets, values and ambitions of the people who erected them. "There can be little doubt that in many ways the story of bridge building is the story of civilization," President Franklin Roosevelt stated in 1932. "By it we can readily measure an important part of a people's progress." While descriptive of the United States in general, this was especially true for Arizona, a state in which overland transportation forms a central historical theme. From the earliest wooden spans on the territorial toll roads to the later steel trusses and concrete arches on early state routes to the precast bridges on the interstate highway network, bridges have facilitated, and in some instances created, settlement across the state.

A plethora of bridge forms, variously employing such materials as stone, timber, iron, steel and concrete, has been developed in America through years of empirical usage. The first wooden bridges were merely plank structures—the equivalent of a log thrown across a stream. Limited in span to the wooden beam's length and carrying capacity, they were used for only the shortest crossings. Without proper support, they became unduly strained by bending moment forces, leading to structural failure: i.e., the log broke. An advancement over this was the first significant bridge form used extensively in America, the pier bridge, also called the pike-and-beam bridge. Another ancient bridge type, it consisted of heavy timber or log stringers spanning between timber pile bent piers, spaced at intervals of between 10 and 30 feet. In places where loose or shifting sediment proved unsuitable or was too deep for stone foundations, vertical wooden piles were driven into the riverbed to support the roadwork and joined to form bents. A variation on the pile design, the crib bridge, used stacked logs for the piers in lieu of driven piles, often with stone ballast in the piers' centers. Timber stringer bridges were used extensively throughout America and continue to be commonly used for minor bridges.

The use of stone as a building material was also transferred to America from Europe. Long known for its superior compressive strength, stone (or more specifically the mortar joints between the stones) has virtually no tensile strength and must rely on compressive forces through arching. Although used extensively in Europe, stone was largely eschewed in this country in favor of timber and was used only marginally for bridge superstructures. While some stone bridges were built in situations in which strength and permanence outweighed the importance of initial cost, the use of stone was generally restricted to substructural work. There its rigidity and resistance to scouring from water made it the preferred material for piers and abutments until the development of concrete early in the 20<sup>th</sup> century.

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 8

### VEHICULAR BRIDGES IN ARIZONA

In 1900 the complexion of the industry changed radically. That year financier J.P. Morgan created the enormous American Bridge Company by consolidating two dozen smaller firms, including the Wrought Iron Bridge Company (Canton, OH), the Edge Moor Bridge Works (Wilmington, DE), the Milwaukee Bridge & Iron Works (Milwaukee, WI), the Groton Bridge & Manufacturing Company (New York, NY) and the Youngstown Bridge Company (Youngstown, OH). This effectively molded most of the competing firms into one gargantuan company, which then fabricated and erected thousands of railroad and vehicular bridges across the country. Against this giant of the industry several smaller firms still managed to compete, mostly from the West and Midwest. These included companies such as the Missouri Valley Bridge & Iron Works (Leavenworth, KS), the Midland Bridge Company (Kansas City, MO), and the Canton Bridge Company (Canton, OH).

After 1900 the bridge companies had two more decades of intense activity before the industry was again transformed. Following passage of the Federal Aid Highway Act in 1916, the responsibility for bridge design generally fell to the state highway departments or to the federal government. While bridge design thus became more centralized, bridge contracting became more localized. National bridge firms offering design/build services to the counties could no longer remain competitive in this changing market, and an entirely new group of bridge builders quickly developed. Additionally, the industry transformation marked a shift from the design of wagon bridges in the 1910s to those intended specifically for automobile use. These two trends amounted to what was essentially an evolution from 19<sup>th</sup> century to 20<sup>th</sup> century practice.

As recent as America is in terms of bridge development, Arizona is far younger still. In the 1840s, when most of the major truss types were invented, Arizona was not even a part of the United States territory. When the rest of the country was experiencing what was probably the greatest period of roadway bridge construction in the 1880s and 1890s, Arizona was not yet a member of the union. When Indiana engineer Daniel Luten patented his first horseshoe arch in 1900, Arizona Territory had built only a few permanent crossings. And by the time Arizona was admitted as a state in 1912, bridge technology was already well developed in America. Despite this, a number of outstanding bridges have been constructed on Arizona's roads and highways, principally by the state highway department. Fortunately, most of the best of these have survived.

### 3

#### Territorial Road and Bridge Construction in Arizona: 1880-1912

From 1848, when much of Arizona territory was acquired from Mexico by the Treaty of Guadalupe, until 1863, with the enactment of the Federal Organic Act that designated the Territory after its separation from New Mexico, Arizona was crossed by only two major overland routes. Both traversed the region from east to west and both had been developed by the military. The first wagon road through the area was built in 1846 as a route between Santa Fe and San Diego. This road, constructed hurriedly by Capt. Phillip Cooke and the Mormon Brigade during the war with Mexico, entered the territory in the southeast

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 9

### VEHICULAR BRIDGES IN ARIZONA

corner, extended north to the Gila River and then west to the Yuma Crossing of the Colorado River. Known as Cooke's Wagon Road or simply as the Gila Trail because it largely paralleled the Gila River, this southern route was later made popular by those traveling to California in search of gold.

The northern route followed Lieutenant Edward Beale's 1857 survey along the 35<sup>th</sup> parallel for a wagon road between Fort Smith, Arkansas, and the Colorado River. With camels as pack animals, Beale's troops traversed the region as they charted a wagon road between Fort Defiance in New Mexico Territory to the Colorado River. In 1859 Beale's expedition returned to construct a 10-foot-wide track, largely by clearing vegetation and loose rocks from the route they had scouted two years earlier. Called Beale's Road, this route was used by hunters, trappers and military troops before construction of a railroad along the route in 1883. Beale reflected the prevailing view of the area when he reported back to Congress in 1858: "The region is altogether valueless. After entering it, there is nothing to do but leave." Other secondary routes—no more than trails, really—developed across the region through intermittent use. Road maintenance, such as it was, was performed on these routes by travelers as the need occurred. Bridges were virtually nonexistent.

At the point where the Gila Trail crossed the Colorado River, John Gallatin built a toll ferry in 1849, supplanting earlier Indian-operated ferries at this point. Louis Jaeger started his own ferry service here a year later, after the Indians exacted their own toll on Gallatin by scalping him. A settlement called Jaegerville soon developed on the California side of the ferry. In December 1850 the U.S. Army established a small encampment, called Fort Yuma, a mile upriver. The town of Colorado City was platted on the Arizona side of the river four years later. This community changed names three times before its incorporation in 1871 as Yuma. In addition to its role as a port for riverboats that plied the Colorado River, Yuma served as a funnel for overland travelers between southern California and the East. Thousands of immigrants traveled westward on foot, wagons or horseback across the Gila Trail, and the Butterfield Overland Stage followed the trail through Yuma on its route between St. Louis and San Francisco. The arrival of the Southern Pacific to Yuma, with the construction of the new railroad bridge over the Colorado, further bolstered the small city's role as a Southwestern transportation nexus.

Meanwhile, in the Salt River Valley some 180 miles east, another colony was growing around an agriculturally based economy. The origins of Anglo settlement in central Arizona date from 1867. That year William John Swilling, flamboyant Confederate army officer, prospector, Indian fighter and entrepreneur, formed the Swilling Irrigation Canal Company with John Y.T. "Yours Truly" Smith, the post sutler at Fort McDowell. They opened the Swilling Ditch by clearing an ancient Hohokam Indian canal, supplying water to a growing number of farms that sprang up along the ditch's length. Three years after the inception of the Swilling Ditch, the townsite of Phoenix was platted. Phoenix grew steadily with the rest of the Central Valley through the 1870s and 1880s. The city's future as Arizona's central metropolis was guaranteed when in 1889 the Arizona Territorial Capital was moved to Phoenix from Prescott. Although not directly on the Gila Trail, Phoenix was close enough to connect it by a relatively short wagon road to the south. The Gila Trail thus served to link Phoenix with Yuma and points west, and eventually the northern swing through Phoenix became the main line through common use.

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 10

### VEHICULAR BRIDGES IN ARIZONA

**A**fter its formation in 1863, the Arizona Territorial Assembly immediately recognized the need for transportation routes to connect the widely scattered settlements and foster economic growth. Money for road construction was scarce, however. The First Territorial Assembly did what government bodies have traditionally done when short of funds themselves: it licensed others to build the roads and bridges for profit. Privately held toll companies were given exclusive rights to build and administer toll roads and collect fees based upon predetermined price rates. To raise capital for construction, they were allowed to issue stock. To protect their investments, the companies were granted franchises for specified periods of time. In return for these exclusive rights, the territorial auditor collected a part of the gross proceeds from each road, to be applied to the school fund. During the first legislative session, six toll road ventures, such as the Santa Maria Toll Road Company and the Arizona-Central Toll Road Company, were thus chartered, most of which extended from the territorial capital at Prescott.

Toll rates were generally set on a per-mile basis, depending on the mode of transportation. As a free-market function, the tolls varied from road to road, but usually reflected the road's use, location and difficulty of construction. The acts of incorporation were similarly structured for all toll companies, containing the same general provisions: Roads were to be completed and improved within a designated period. Water wells were to be dug and maintained and facilities provided for use by both people and animals. The roads were to be kept safe and passable. Finally, exclusive rights to maintain the roads and collect tolls would be granted as long as they did not encroach on other existing toll roads.

The law did little to encourage excellence in road construction, however, and the toll road operators tried to avoid bridge construction as an unnecessary expense. The bridges that were built rarely lasted beyond the statutory limits of the franchises. Poorly constructed and unevenly maintained, these rudimentary timber or masonry structures typically washed out in floods or collapsed under load. Only two such structures from the territorial period are known to exist still. Both were built in 1907 in Graham (now Greenlee) County on the Clifton-Solomonville Road [see Figure 1]. The Solomonville Road Overpasses [8150 and 8151] are unusual in that they were built to carry wagon traffic over railroads (the earliest datable grade separations in Arizona), they used concrete arch construction, and they were built relatively late in the toll road milieu.

**I**n a region in which government revenues were minimal, toll roads were generally regarded as a necessary evil, a costly but temporary way to develop a much-needed road system. But the First Territorial Assembly was also aware of the need for free highways to promote transportation and settlement. The Assembly tried to legislate a balance between roads built by private capital and supported by tolls and those over which no tolls could be extracted. To prevent toll operators from monopolizing travel by incorporating every road in the territory, the lawmakers designated several existing roads—developed solely by prior use—as free routes. This formed the basis for a free-highway network in Arizona, which subsequent legislatures would expand by incorporating toll road companies and simultaneously declaring other roads as toll-free.

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 11

### VEHICULAR BRIDGES IN ARIZONA



■ Figure 1. Solomonville Road Overpass, 2003.

Arizona's territory-level management soon proved burdensome, however. In 1866 the Assembly began transferring responsibility for building roads to the individual counties by authorizing the counties to establish road districts and appoint overseers to supervise roads and bridges within each district. To fund construction and maintenance, the county boards of supervisors were empowered to issue bonds of indebtedness. Additionally, they could assess a yearly road tax of \$6 on every able-bodied man, which could be defrayed by labor on the roads. In 1871 the Assembly transferred even more autonomy to the counties, giving them the right to incorporate toll road proprietors themselves.

The conditions for incorporation were generally the same as those for the territory, and the counties retained the option to purchase the privately built roads after five years. With this, the county administrators possessed all the tools needed to pursue active road and bridge programs. They rarely used them well. Seldom following a premeditated plan, county supervisors authorized the surveying and clearing of roads and construction of bridges as needed, usually in response to urgent local petitions. Arizona State Engineer Lamar Cobb later characterized the situation:



United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 12

### VEHICULAR BRIDGES IN ARIZONA

Every two years the personnel of the various boards of supervisors is almost completely changed. They go in imbued with the idea that their predecessors squandered the county road funds and go out with the public equally confident that they have. With both more or less correct in their opinions, but it has not been the fault of the supervisors. With county road funds of limited proportions to repair hundreds of miles of road, and with every man in the county clamoring for work in his locality, it has been next to impossible for them to set aside a sum, in any amount, for permanent work.<sup>7</sup>

Maricopa County could afford a degree of road improvement and bridge construction, and in 1877 the Territorial Assembly authorized the county to issue \$15,000 in bonds to finance construction of four wagon roads. In the sparsely populated areas outside of the major cities, however, few vehicular bridges were erected before the turn of the century. Many of these earliest county-built bridges, like those on the toll roads, tended more to the flimsy than the substantial. Some consisted of little more than two parallel boards laid across a streambed to carry the vehicles' tires. Often made up of wood stringer spans on timber piles or crude concrete abutments and piers, these questionable structures failed with distressing regularity. Only a handful proved more permanent. For longer spans, the counties erected simple kingpost or queenpost pony trusses, with timber compression members and wrought iron tension rods. None is known to have survived.

**D**uring the 1870s and 1880s, the Territorial Legislature seemed content to leave road and bridge construction to the individual counties. Between 1877 and 1881 the territory issued bonds totaling only \$70,000 to fund road construction. In an uncharacteristic act of largesse, however, the Thirteenth General Assembly in 1885 appropriated \$15,000 toward construction of a bridge over the Gila River at Florence in Pinal County. This, along with a \$12,000 appropriation for a wagon road, prompted Territorial Governor Conrad Zulick to comment that the expenditure of funds on road and bridge work represented a "wanton misappropriation of public funds."<sup>8</sup> The bridge was constructed that year; in 1905 the legislature authorized a \$19,000 bond issue to fund repairs to the Florence Bridge. But other than these tentative steps, the territorial government made only minimal impact on overland transportation in Arizona. Indeed, no territorial organization or staff had even been established to administer roads and bridges.

Construction of the Florence Bridge marked a watershed event in Arizona bridge history. Not only was it the first wagon bridge undertaken wholly by the territory, it was probably the earliest all-metal wagon truss in Arizona. The structure consisted of two 180-foot Pratt spans, with an extensive timber trestle over an island and slough. Consuming 30 tons of iron and 174,000 feet of lumber, the Florence Bridge was soon followed by other wagon trusses. Apache County built a pinned Pratt truss over Clear Creek south of Winslow. After

---

<sup>7</sup>Arizona State Engineer, *Report of the State Engineer of the State of Arizona: July 1, 1909, to June 30, 1914* (Phoenix: Arizona State Press, 1914), 72.

<sup>8</sup>As quoted by Jay J. Wagoner, *Arizona Territory 1863-1912: A Political History* (Tucson: University of Arizona Press, 1970), 239.

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 13

### VEHICULAR BRIDGES IN ARIZONA

its separation from Apache County in 1895, Navajo County built a Pratt through truss to carry the Winslow-Holbrook road over Chevelon Creek and another truss over the Little Colorado River. Similarly, Greenlee County built a four-span Pratt through truss over the Gila River at Duncan to replace an earlier wooden structure. Virtually all of the early metal trusses built by the counties featured relatively modest dimensions, standard Pratt configurations and prefabricated, pin-connected detailing. None is known to have survived.

One surviving bridge from the territorial period was constructed, not by the territorial government or by a county road district, but by the federal government—specifically the U.S. Reclamation Service (USRS, predecessor to the Bureau of Reclamation). In 1902 the USRS began planning a dam over the Salt River, one of the first dams authorized by Congress under the Newlands Act. The site for what would become the Theodore Roosevelt Dam was located in the mountains east of Phoenix. Before construction could begin on the immense structure, an access road had to be graded from the railhead at Mesa to the damsite. Routed along the ancient Apache Trail, the road wound its way through the rugged mountain range. Near its top, on a switchback curve in Alchesay Canyon, the USRS constructed a modestly scaled concrete arch structure in 1905. The Alchesay Canyon Bridge [1532] is today Arizona's oldest dateable vehicular bridge [see *Figure 2*].




■ Figure 2. Alchesay Canyon Bridge, 2003.

United States Department of the Interior  
National Park Service

## National Register of Historic Places Continuation Sheet

section number E page 14

### VEHICULAR BRIDGES IN ARIZONA

fter the turn of the century, it became apparent that many major road and bridge projects were beyond the capacity of the individual counties. Further, the counties were building roads on a piecemeal basis, without regard to the roads in adjacent counties. This tended to create an uneven patchwork of dissimilar routes, making travel difficult for all but a few destinations. To fund the development of regional highways, the Territorial Assembly in March 1909 levied a property tax varying from 5 to 25 mills. (A mill is .001 or 1/1,000th of a dollar; a five mill tax is equivalent to five dollars per one thousand dollars.) The 5 mill tax was fixed in counties in which no highway work was contemplated, and the higher rates were applied proportionately to counties in which work was to be undertaken. In force until June 1912, this tax raised about \$519,000.

The Assembly also created the office of the territorial engineer to administer the design and construction of territorial roads. Appointed by the governor, the position carried a two-year term. J.B. Girand was Arizona's first (and only) Territorial Engineer. His staff consisted of a clerk and a draftsman. Soon after his appointment, Girand began the planning and construction of several territorial highways in Arizona. The strategy was to link the county seats and more populous towns through a network of graded roads that would vary in width from 16 to 24 feet according to terrain and traffic. "Inadequate and crude as the law is," Girand stated in 1911, "much progress has been made in establishing a system of highways, which, if continued, will result in this department being the most important of all, from the standpoint of revenue."<sup>9</sup> In connection with this highway construction, Girand supervised construction of a handful of bridges over key crossings on the territorial network. Curiously, none of these bridges resembled each other even remotely.

One of the first territorial bridges was a replacement structure for the trusses at Florence, built in 1885 and then rebuilt in 1905. In November 1909 Girand designed a multiple-span, concrete girder structure, submitted the plans and specifications to the Board of Control and advertised for competitive bids. Five contractors responded, with proposals ranging from \$48,000 to \$62,000. Girand then rejected all bids and convinced the board to build the Florence Bridge using convict labor. With a territorial prison in nearby Florence, the idea had merit. In March a small force of prisoners began excavating for the foundations. The crew was increased to 36 men in April, when full-scale construction began, and averaged 55 men as the work continued on the bridge throughout the rest of the year.

---

<sup>9</sup>J.B. Girand, "Arizona Roads," *Arizona*, July 1911, 2. Girand continued:

Nearly one thousand miles of roads have been surveyed and mapped, running through various counties, as follows: Cochise, Gila, Graham, Maricopa, Pima, Pinal, Yavapai and Yuma, and nearly one hundred miles of road have been actually built and in use, and in addition thereto, three bridges have been or are being constructed, across the more important streams of the territory. Already scores of letters of praise have been received, commending the good work being done, and while as usual, public enterprises of this character meet with opposition, still, as a whole, the better element is body and soul with this work and it will be crowned with success.