

United States Department of the Interior
National Park Service

For NPS use only

National Register of Historic Places
Inventory—Nomination Form

received MAY 8 1986

date entered JUN 5 1986

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

1. Name

historic Cameron Suspension Bridge

and/or common Cameron Suspension Bridge

2. Location

street & number U.S. Highway 89 N/A not for publication

city, town Cameron vicinity of

state Arizona code 04 county Coconino code 005

3. Classification

Category	Ownership	Status	Present Use
<input type="checkbox"/> district	<input type="checkbox"/> public	<input type="checkbox"/> occupied	<input type="checkbox"/> agriculture
<input type="checkbox"/> building(s)	<input checked="" type="checkbox"/> private	<input type="checkbox"/> unoccupied	<input type="checkbox"/> commercial
<input checked="" type="checkbox"/> structure	<input type="checkbox"/> both	<input type="checkbox"/> work in progress	<input type="checkbox"/> educational
<input type="checkbox"/> site	Public Acquisition	Accessible	<input type="checkbox"/> entertainment
<input type="checkbox"/> object	<input type="checkbox"/> in process	<input checked="" type="checkbox"/> yes: restricted	<input type="checkbox"/> government
	<input type="checkbox"/> being considered	<input type="checkbox"/> yes: unrestricted	<input type="checkbox"/> industrial
		<input type="checkbox"/> no	<input type="checkbox"/> military
			<input type="checkbox"/> museum
			<input type="checkbox"/> park
			<input type="checkbox"/> private residence
			<input type="checkbox"/> religious
			<input type="checkbox"/> scientific
			<input checked="" type="checkbox"/> transportation
			<input checked="" type="checkbox"/> other: pipeline

4. Owner of Property

name Four Corners Pipeline Company

street & number 5900 Cherry Avenue

city, town Long Beach N/A vicinity of state California

5. Location of Legal Description

courthouse, registry of deeds, etc. Coconino County Courthouse

street & number Aspen and North San Francisco Streets

city, town Flagstaff state Arizona

6. Representation in Existing Surveys

title Arizona Historic Engineering Site has this property been determined eligible? yes no
Inventory

date May 18, 1978 federal state county local

depository for survey records History of Engineering Program, Texas Tech University

city, town Lubbock state Texas

7. Description

Condition		Check one	Check one
<input type="checkbox"/> excellent	<input type="checkbox"/> deteriorated	<input checked="" type="checkbox"/> unaltered	<input checked="" type="checkbox"/> original site
<input checked="" type="checkbox"/> good	<input type="checkbox"/> ruins	<input type="checkbox"/> altered	<input type="checkbox"/> moved date _____
<input type="checkbox"/> fair	<input type="checkbox"/> unexposed		

Describe the present and original (if known) physical appearance

SUMMARY

The Cameron Suspension Bridge spans the Little Colorado River north of the town of Cameron, which is located fifty-two miles north of Flagstaff on U.S. Highway 89 in north-central Arizona. The 1911 suspension bridge has a main span of 660 feet with a clear roadway width of 14'2" between curbs. To conquer the long span, engineers used a unique hybrid system of suspension cables combined with a through truss design. One of three suspension bridges in the state, the Cameron Suspension Bridge is the only example of this design type in Arizona.

PRESENT DESCRIPTION

The gorge of the Little Colorado River has vertical rock cliffs which separate the banks of the river from the elevated plateau that U.S. Highway 89 traverses. The rock cliffs are higher on the northern side of the bridge. For this reason, the south end of the bridge is lower than the north end by approximately ten feet. The river bed is nearly 100 feet below the deck at the center of the bridge.

Total length of the bridge is 680 feet, consisting of a single main span 660 feet long and two approach spans of ten feet each. These small approach spans serve to provide a link between the fixed ends of the bridge at the abutments and the expansion ends located at the tower piers. Abutments are reinforced concrete.

The superstructure is a hybrid suspension and truss design. A single-intersection Pratt through truss is held by the suspension cables. This truss consists of 44 fifteen-foot panels providing a vertical clearance of 15 feet between the portal and the deck. The main suspension cables are composed of seven individual two and one-quarter inch steel strands. These seven strands are individually anchored to seven eye-bars embedded in concrete footings cut into the solid rock of the upper canyon walls. The seven cables are clamped together to form one intertwined cable stay prior to passing over saddles supported by rollers on individual steel-frame towers at each end.

The four towers which hold up the suspension cables are constructed of structural steel mounted on reinforced concrete piers anchored in solid rock. Diagonal angle bars link the towers at each end, framing the main end portals. Distance from the near end of the eye-bar to the center of the tower on the south end of the bridge is 218' 2" and 165' 1" on the north end, a difference required by the geologic configuration of the canyon.

Upper and lower chords of the truss system consist of two vertical steel plates held together with riveted horizontal lacing. Vertical members are comprised of four angles laced and riveted together. Vertical panel posts and upper and lower chords are pin-connected to the steel beams which support the deck structure.

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

**National Register of Historic Places
Inventory—Nomination Form**

For NPS use only

received

date entered

Continuation sheet 1

Item number 7

Page 2

The present decking of the bridge is aluminum, replacing the original timber deck. Closed to all public access, the bridge now carries a sixteen-inch oil pipeline suspended between the upper and lower chords of the through truss. A chain link fence topped with barbed wire surrounds approaches at both ends of the bridge. The bridge is no longer used for vehicular or pedestrian traffic passage and serves only to carry the oil pipeline.

INTEGRITY

The Cameron Suspension Bridge retains its original appearance and integrity although some changes have been made over time. Most of the changes are structural in nature and are not readily apparent. The major change to the bridge is the addition of the oil pipeline in 1958. The presence of the oil pipeline is somewhat intrusive; however, it does not appreciably alter the setting or feeling or engineering attributes of the bridge design. The pipeline does provide a viable economic reason for the continuing use of the Cameron Suspension Bridge, which was abandoned to vehicular traffic after 1958 when a new bridge was constructed to the east.

Over the years, routine maintenance and constant overloading led to changes in the structural portions of the bridge. In 1927 the original wood decking (1911) was replaced by a new wood deck. The purpose of this change was to reinforce the floor structure in order to carry heavy loads of structural steel destined for the Navajo Bridge construction site at Lees Ferry on the Colorado River (NR 8/13/81).

In 1936 the bridge decking was again replaced with new wood flooring. The supporting deck stringers were changed from nine lines of 3"x12" stringers to sixteen lines of 4"x12" stringers. Shortly thereafter, in early 1937, the bridge was the victim of a "sheep jam." The entire span of the bridge became tightly packed with sheep as they were being driven across the bridge. This massive overload caused the bridge to slip from one to five inches at all cable clamps. In March 1937 all of the clamps were jacked back into position and safety clamps were added. In 1948 the wood decking was replaced with aluminum sections.

After the abandonment of the bridge in 1958, it was purchased from the State of Arizona by the Four Corners Pipeline Company. The company used the bridge to carry a sixteen-inch oil pipeline across the Little Colorado River. The pipeline carried oil from fields in Farmington, New Mexico, to refineries in southern California. When the Atlantic-Richfield Company acquired the pipeline and bridge in 1977, the flow of oil was reversed. Due to a lack of refinery capacity in California, crude oil is piped from Long Beach, California, to Houston, Texas, refineries. The present Four Corners Pipeline Company, which holds title to the bridge, is a wholly owned subsidiary of ARCO.

8. Significance

Period	Areas of Significance—Check and justify below			
<input type="checkbox"/> prehistoric	<input type="checkbox"/> archeology-prehistoric	<input type="checkbox"/> community planning	<input type="checkbox"/> landscape architecture	<input type="checkbox"/> religion
<input type="checkbox"/> 1400-1499	<input type="checkbox"/> archeology-historic	<input type="checkbox"/> conservation	<input type="checkbox"/> law	<input type="checkbox"/> science
<input type="checkbox"/> 1500-1599	<input type="checkbox"/> agriculture	<input type="checkbox"/> economics	<input type="checkbox"/> literature	<input type="checkbox"/> sculpture
<input type="checkbox"/> 1600-1699	<input type="checkbox"/> architecture	<input type="checkbox"/> education	<input type="checkbox"/> military	<input type="checkbox"/> social/
<input type="checkbox"/> 1700-1799	<input type="checkbox"/> art	<input checked="" type="checkbox"/> engineering	<input type="checkbox"/> music	<input type="checkbox"/> humanitarian
<input type="checkbox"/> 1800-1899	<input checked="" type="checkbox"/> commerce	<input type="checkbox"/> exploration/settlement	<input type="checkbox"/> philosophy	<input type="checkbox"/> theater
<input checked="" type="checkbox"/> 1900-	<input type="checkbox"/> communications	<input type="checkbox"/> industry	<input type="checkbox"/> politics/government	<input checked="" type="checkbox"/> transportation
		<input type="checkbox"/> invention		<input type="checkbox"/> other (specify)

Specific dates 1911

Builder/Architect

Midland Steel Company

Statement of Significance (in one paragraph)

SUMMARY

The Cameron Suspension Bridge, constructed in 1911, is significant for its association with the initial growth of Arizona's highway system as a major bridge which opened up the northern portion of the state to development. It also represents a large early construction project of the Office of Indian Affairs, which later went on to construct numerous other engineering projects on Indian reservations in Arizona and throughout the western states. A hybrid of suspension and truss forms, the bridge has engineering significance as the oldest surviving highway suspension bridge in the state and one that utilized novel engineering techniques to cross the wide canyon of the Little Colorado River. It is eligible for listing on the National Register under criteria A and C because of its historic associations and unique method of construction.

HISTORIC BACKGROUND/CONTEXT

The Office of Indian Affairs built the 680 foot long Cameron Suspension Bridge in 1911. The Office wanted to create both a communication link and transportation access between the Navajo and Hopi Reservations in northeastern Arizona and the city of Flagstaff. Located on the Santa Fe railroad line, Flagstaff was the transportation center of northern Arizona. Agricultural lands near Tuba City on the Moenkopi Plateau were starting to be developed by the Indian Irrigation Service and needed markets for their products as well as access to materials and services. The gorge of the Little Colorado River, though not so wide or deep as the Grand Canyon of the Colorado, nonetheless proved to be a formidable barrier to economic development of the reservations in northeastern Arizona because it kept them isolated from the rest of the Arizona Territory.

In 1911 the Office of Indian Affairs contracted with the Midland Steel Company of Kansas City, Missouri, to construct the bridge. The firm designed the longest single span suspension bridge in the territory. Because of the great distance involved in crossing the Little Colorado River Gorge, the firm utilized a combination Pratt through truss with the suspension design. To ensure maximum strength, the suspension cable used a bundle of seven individual cables twisted together, each with its own individual anchor. Despite these design precautions, the firm would only rate the capacity of the bridge at ten tons. Yet, the design proved successful, and by 1941 it carried a posted limit of 15 tons and routinely handled loads of 20 tons. At one time it carried a 25 ton load.

9. Major Bibliographical References

See continuation sheet 4.

10. Geographical Data

Acreeage of nominated property 1.5 acres

Quadrangle name Cameron

Quadrangle scale 1:62500

UTM References

A

1	2	4	6	2	9	0	0	3	9	7	0	2	7	5
Zone		Easting				Northing								

B

1	2	4	6	2	8	5	0	3	9	7	0	0	7	5
Zone		Easting				Northing								

C

Zone		Easting				Northing								

D

Zone		Easting				Northing								

E

Zone		Easting				Northing								

F

Zone		Easting				Northing								

G

Zone		Easting				Northing								

H

Zone		Easting				Northing								

Verbal boundary description and justification The boundaries for this nomination are a line and all the area 50 feet on either side of a line between points A and B. This will create a rectangle 100 feet wide and 660 feet long, and the bridge will be within that rectangle.

List all states and counties for properties overlapping state or county boundaries

state N/A code county N/A code

state code county code

11. Form Prepared By

name/title Don Abbe, Research Assistant

Revised by: Roger Brevoort, Arch.Hist., and Doug Kupel, Hist., Arizona SHPO

organization History of Engineering Program Texas Tech

date June 1980

March 1986
(602) 255-4174

street & number P.O. Box 4089

University

telephone (806) 742-2994

city or town Lubbock

state Texas

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

 national X state local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature

Donna J. Schuber

title State Historic Preservation Officer

date May 5, 1986

For NPS use only

I hereby certify that this property is included in the National Register

Entered in the
National Register

date

6/5/86

Keeper of the National Register

Attest:

date

Chief of Registration

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

**National Register of Historic Places
Inventory—Nomination Form**

For NPS use only
received
date entered

Continuation sheet 2

Item number 8

Page 2

ENGINEERING/STRUCTURAL SIGNIFICANCE

The Cameron Suspension Bridge is significant as a combination of two prevailing structural designs. In the early twentieth century, the Pratt truss and its variants became the standard truss design for highway bridges of many lengths. The depth of the canyon, however, required an innovative means of center support, a problem which the suspension design could resolve. It was chosen as the only practical type of support system which could be constructed without the substantial falsework required for a conventional long span steel arch. The depth of the Little Colorado River Gorge would have made that option prohibitive. At the same time the truss system would resolve the requirement for lateral strength and provide wind stiffening. The Cameron Suspension Bridge is significant in terms of bridge engineering due to its unique combination of two contemporary bridge forms to accommodate a long-span structure which utilized the structural advantages of both designs.

The success of the hybrid design of the Cameron Bridge also provides a clear design precedent for the McPhaul Suspension Bridge over the Gila River east of Yuma, Arizona (NR 8/13/81). Designed by the State of Arizona in 1928, the McPhaul Bridge uses the same combination of a suspension span with an internal stiffening truss. In this case, the unstable geology of the river bottom precluded any type of center support, so the suspension span as used at Cameron was again a practical choice.

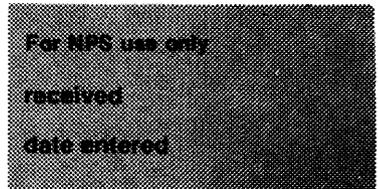
HISTORIC SIGNIFICANCE

The completion of the Cameron Suspension Bridge had a profound impact on the commerce and transportation needs of a geographically rugged, remote, and isolated area. Combined with the growth of Arizona after the territory achieved statehood in 1912, the bridge proved instrumental in opening up the northeastern corner of the state to transportation and commerce.

Political leaders now looked beyond the Little Colorado to the state of Utah. Closely related by economic and social ties, the states of Utah and Arizona were separated by the Grand Canyon of the Colorado. The completion of the Cameron Suspension Bridge encouraged leaders of both states to bridge the Colorado and open the isolated Arizona strip country to development and to provide closer communication with Utah. By this time state route 89 was the only north/south highway in the state, starting at the town of Nogales on the Mexican border and continuing through Tucson, Phoenix, and Flagstaff.

The key to crossing the Colorado was the construction of the Navajo Bridge. Encouraged by the success of the Indian Service at Cameron, the state began contemplating a bridge across the Colorado as early as 1923. In 1924 preliminary survey work was completed,

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



**National Register of Historic Places
Inventory—Nomination Form**

Continuation sheet 3

Item number 8

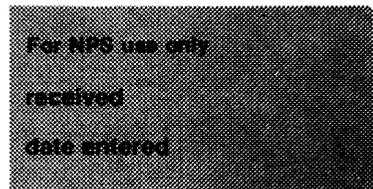
Page 3

and in 1927 construction of the Navajo Bridge began. Supplies for the construction project crossed the Cameron Bridge, strengthened for the job. Completed in 1928, the Navajo Bridge is listed on the National Register.

The completion of this vital transportation network assured that the growth of the northern portion of the state would continue. Because the route became a major state highway, the State of Arizona took over maintenance of the bridge in the late 1930's. The Cameron Suspension Bridge continued to carry traffic on the major northern highway between Arizona and Utah until 1958 when a new bridge was constructed immediately to the east. Today the Cameron Suspension Bridge continues its useful life, carrying a petroleum pipeline across the Little Colorado.

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

**National Register of Historic Places
Inventory—Nomination Form**



Continuation sheet 4

Item number 9

Page 1

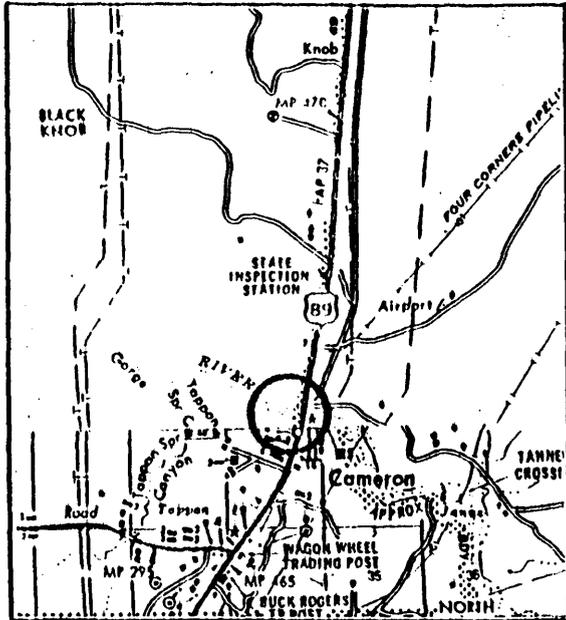
BIBLIOGRAPHICAL REFERENCES

- McLane, G.L., Senior Highway Engineer, to C.H. Sweeteer, District Engineer, San Francisco, California, October 3, 1941. Manuscript letter and reports on Cameron Suspension Bridge, from "Antique Bridges" Files, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.
- Parker, Bud, Representative of Four Corners Pipeline Company, to Don Abbe. Oral Interview 5-27-80.
- Price, William N. and Martin, Toney to John V. Young, August 5, 1968. Manuscript letter, 2 lvs. "Antique Bridges" File, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.
- Wesch, W.P., "Little Colorado Bridge at Cameron," October 3, 1941, 2 lvs. "Antique Bridges" File, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.
- Wesch, W.P., et al, to W.R. Hutchins, et al, December 1, 1941. Manuscript report on Cameron Bridge, 6 lvs. "Antique Bridges" File, Structures Section, Arizona Department of Transportation, Phoenix, Arizona.
- Wesch, W.P. and Hartford, F.D., "Report on Cameron Bridge," Phoenix, Arizona Department of Transportation, 1941, 10 p.

10. NAME(S) OF STRUCTURE

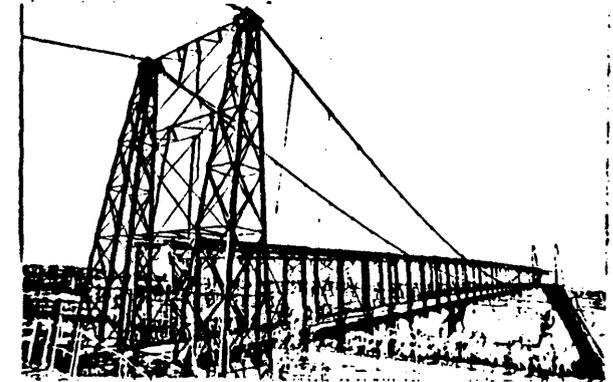
Cameron Bridge (Little Colorado River Bridge)

11. PHOTOS (W/ FILM ROLL & FRAME NO.) AND SKETCH MAP OF LOCATION



LOCATION MAP

TAKEN FROM DEPARTMENT OF TRANSPORTATION
GENERAL HIGHWAY MAP



Don Abbe , Roger Brevoort and Doug Kupel, National Register nomination for Cameron Bridge, June 1980.

Byrd Howell Granger, Arizona's Names, (Tucson: Treasure Chest Publications, 1983), page 111.

Field inspection by Clayton Fraser, 7 December 1986.

12. SOURCES

13. INVENTORIED BY:

Clayton B. Fraser

AFFILIATION

Fraserdesign Loveland Colorado

DATE

1 April 1987