HISTORIC BRIDGE INVENTORY

Boulder Dam Arizona Spillway Bridge

PROPERTY IDENTIFICATION

county	Mohave	inventory number	03003
milepost	0.10	inventory route	US 93
location	0.1 MI E Nevada St Lane	feature intersected	Hoover Dam Spillway
city/vicinity	Boulder	USGS quadrangle	Hoover Dam
district	86	UTM reference	11.703950.3987960

STRUCTURAL INFORMATION

main span number	1	main span type	111
appr. span number	0	appr. span type	
degree of skew	0	guardrail type	6
main span length	115.0	superstructure	concrete two-rib, open-spandrel arch
structure length	124.0	substructure	concrete abutments set into spillway walls
roadway width	38.0	floor/decking	concrete deck with asphalt overlay
structure width	47.8	other features	steel pipe guardrails with concrete bulkheads

HISTORICAL INFORMATION

construction date	1935	designer/engineer	US Bureau of Reclamation
project number		builder/contractor	Six Companies, Inc.
information source	USRS bridge records	structure owner	US Bureau of Reclamation
alteration date(s)		alterations	

NATIONAL REGISTER EVALUATION

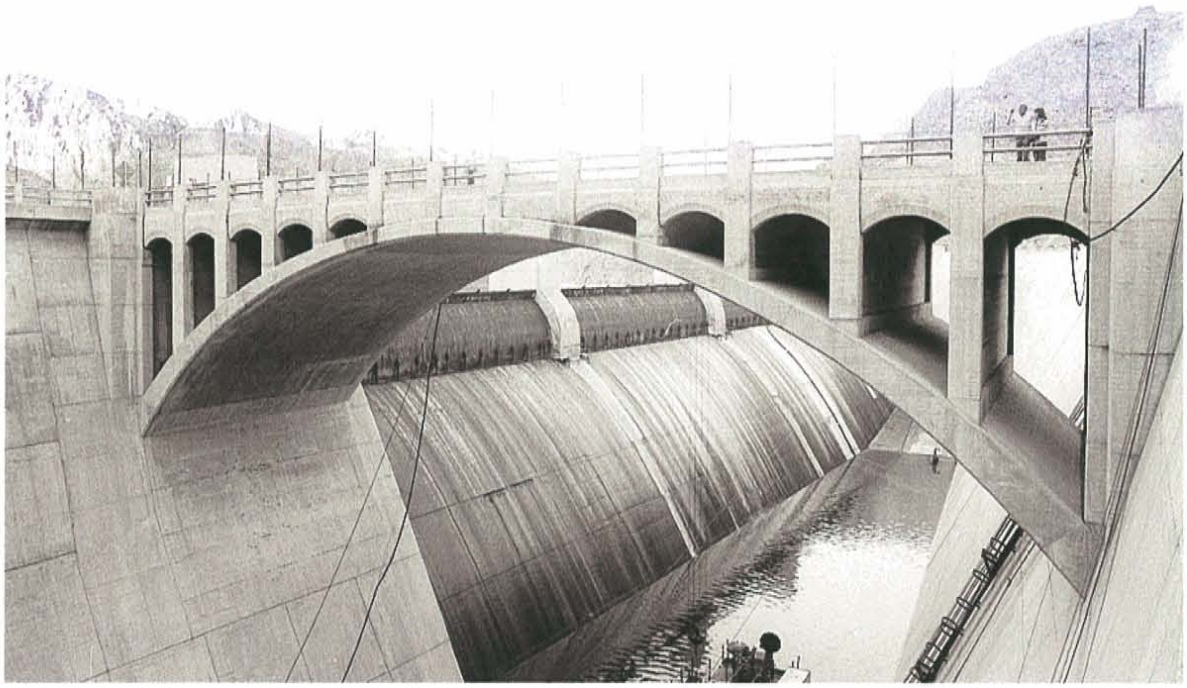
For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form

inventory score	72	NRHP eligibility	listed
		NRHP criteria	A x B ____ C x
		signif. statement	designated as part of Hoover Dam NHL complex

FORM COMPLETED BY

Clayton B. Fraser, Principal

FRASERdesign
420 South County Road 23E
Loveland, Colorado 80537
31 October 2004



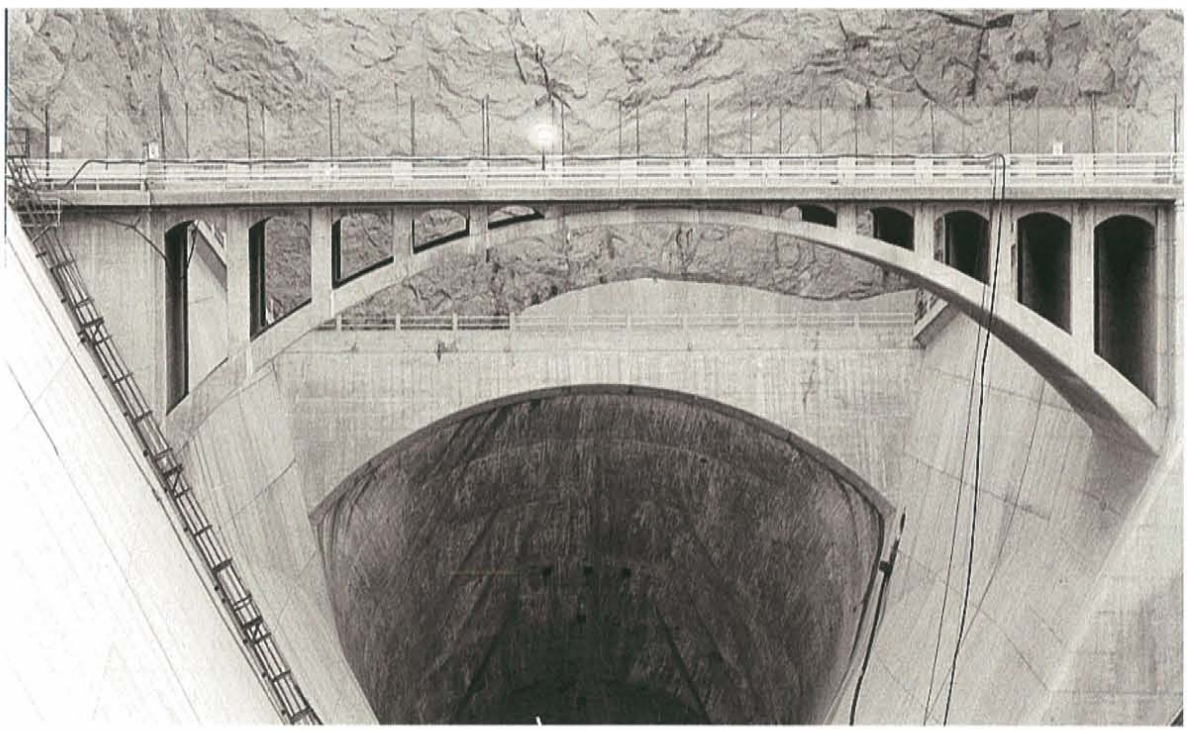


PHOTO INFORMATION

date of photo.: November 2002 view direction: southwest southwest photo no.: 02.11.180 02.11.182

CONSTRUCTION HISTORY

As early as 1902, California business and agricultural interests began eyeing Boulder Canyon in northwest Arizona as an impoundment site for the Colorado River. After years of agitating and maneuvering, Congress in December 1928 enacted the Swing-Johnson Act authorizing construction of Boulder Dam. While the State of Arizona fought the dam up to the Supreme Court, Bureau of Reclamation engineers moved the site 10 miles downstream to a more suitable location in Black Canyon and designed the immense curved gravity structure. One of the main components of the project was the Arizona Spillway—a tunnel blasted in the rock wall at the dam's eastern flank to discharge overflow around the dam.

To carry the dam crest highway (US 93) over this spillway, the engineers designed a medium-span concrete arch. This arch featured a handsomely proportioned open spandrel design with a continuous arch rib that extended 115 feet between the spillway walls. The Art Moderne concrete detailing was delineated by Los Angeles architect Gordon Kaufmann in his first large-scale engineering project. To build the mammoth dam and its appurtenant structures, BOR awarded the largest construction contract to date in America—some $31 million—to a consortium of major Western builders called Six Companies, Inc. Construction of the dam began in 1931. The last concrete was poured on May 29, 1935, and Boulder Dam was dedicated on September 1. Officially renamed Hoover Dam in 1947, it has functioned in place since. The Arizona Spillway is virtually unused and the bridge over it continues to carry traffic in unaltered condition.

SIGNIFICANCE STATEMENT

With a base thickness of 660 feet of solid concrete, Hoover Dam is far thicker than necessary to hold the Colorado River at this point and can hardly be considered a model of engineering efficiency. The modestly proportioned Arizona Spillway Arch thus stands in stark contrast with the behemoth to which it is attached. This bridge is the shortest and latest of the four open spandrel concrete arches identified in the inventory (others: Cienega Bridge [**8293**], Mill Avenue Bridge [**9954**], and Queen Creek Bridge [**abd.**]). In its dimensions and configuration, it is technologically undistinguished in its engineering design. Kaufmann's Art Moderne detailing is skillfully handled, distinguishing this structure among its concrete peers in Arizona. The true significance of the Arizona Spillway Bridge derives from its association with Hoover Dam as an original and integral component. One of the most technologically and historically important of America's dams, Hoover Dam has been designated a National Historic Landmark. The Arizona Spillway Bridge is listed as part of the Landmark designation.

NATIONAL REGISTER EVALUATION

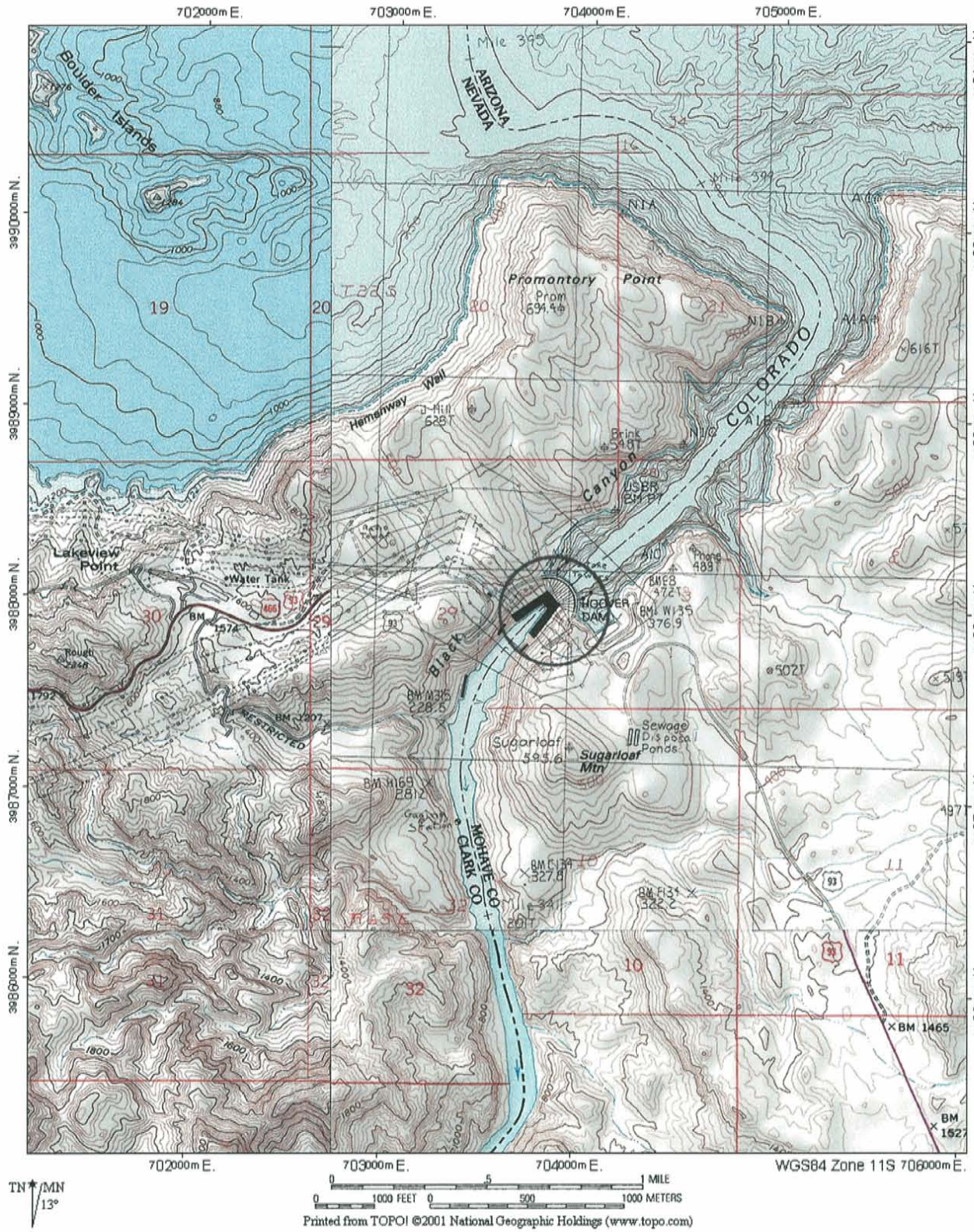
TECHNOLOGICAL SIGNIFICANCE
___ represents the work of a master
___ possesses high artistic values
_x_ represents a type, period or method of construction

HISTORICAL SIGNIFICANCE
___ associated with significant persons
_x_ associated with significant events or patterns
___ contributes to historical district

NATIONAL REGISTER CRITERIA
_x_ Criterion A
___ Criterion B
_x_ Criterion C

NATIONAL REGISTER ELIGIBILITY
individually eligible _x_ yes ___ no
contributes to district ___ yes _x_ no

AREA OF SIGNIFICANCE: Transportation; Engineering
PERIOD OF SIGNIFICANCE: 1935-1964
THEME(S): Transportation: Highways



Location Map

HISTORIC BRIDGE INVENTORY

Old Trails Wash Bridge

PROPERTY IDENTIFICATION

county	Mohave	inventory number	08594
milepost	0.00	inventory route	Old Trails Road
location	0.2 mi S of SB 40	feature intersected	Old Trails Wash
city/vicinity	Kingman	USGS quadrangle	Kingman
district	86	UTM reference	11.768303.3897547

STRUCTURAL INFORMATION

main span number	2	main span type	201
appr. span number	0	appr. span type	
degree of skew	30	guardrail type	6
main span length	13.0	superstructure	concrete rail-top slab
structure length	30.0	substructure	concrete abutments, wingwalls and pier
roadway width	20.7	floor/decking	concrete deck with asphalt overlay
structure width	23.1	other features	steel pipe guardrails

HISTORICAL INFORMATION

construction date	1918	designer/engineer	Arizona Highway Department
project number		builder/contractor	state work force
information source	ADOT bridge records	structure owner	City of Kingman
alteration date(s)		alterations	

NATIONAL REGISTER EVALUATION

For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form

inventory score	64	NRHP eligibility	eligible
		NRHP criteria	A x B ____ C x
		signif. statement	well-preserved example of early standard structural type

FORM COMPLETED BY

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31 October 2004

OLD TRAILS WASH BRIDGE

Structure No. 8594

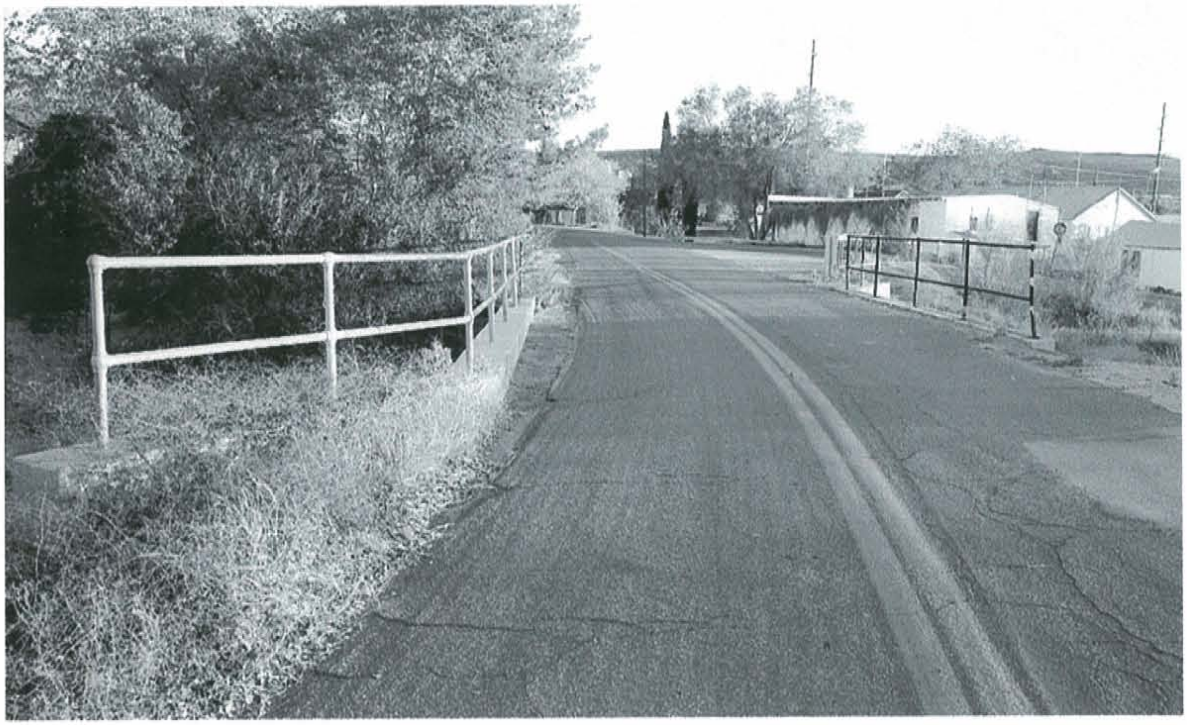


PHOTO INFORMATION

date of photo.: November 2002 view direction: north southeast photo no.: 02.11.217 02.11.219

CONSTRUCTION HISTORY

This small-scale concrete bridge carries the original Old Trails Highway over Old Trails Wash in Kingman. Built from a standard design by the Arizona State Engineer dated September 21, 1917, its two-span superstructure is comprised of concrete slabs with steel railroad rails embedded at the slabs' bottom edge for reinforcing. The spans are simply supported by concrete abutments and pier, and the concrete deck is bounded on both sides by original steel pipe guardrails. The Old Trails Wash Bridge was reportedly built as part of Federal Aid Project 5. This early project entailed construction of roadway and structures on 2.2 miles of the Kingman-Oatman Highway. Completed in 1918 or 1919 by a state work force, the bridge and adjacent roadway carried mainline traffic until a subsequent rerouting of the road. Today it bears local traffic in essentially unaltered condition.

SIGNIFICANCE STATEMENT

Alternately known as the Santa Fe Highway (in Arizona) and the National Old Trails Highway (its national designation), this transcontinental route has served historically as the principal east-west artery across northern Arizona. Only the Ocean-to-Ocean Highway, which passed through Yuma, Phoenix and Safford, carried more traffic in the state in the 1910s and 1920s. The Old Trails Wash Bridge in Kingman formed a minor but integral link in the road and is historically significant as the earliest structure known in Arizona from the original route. The bridge is also significant as part of one of Arizona's earliest forays into the federal aid program. The first federal aid project involved building an extension onto the existing Florence Bridge. Subsequent projects included work on the Phoenix-Tempe Highway, the Holbrook-St. Johns Highway and the Phoenix-Yuma Highway. As part of only the fifth federal aid project in Arizona, the Old Trails Wash Bridge is distinguished as the oldest intact bridge in the state known to have been built with federal aid funds.

The bridge is technologically important as a well-preserved example of an unusual structural subtype—the rail top slab. Arizona started developing standards for concrete bridges as early as 1910, with designs for small-scale concrete slab and girder structures. One of the more esoteric of these early structural types was the rail top slab. Using railroad rails spaced at 24" o.c. as reinforcing, the rail top slab is by nature a short-span structure, used in secondary road situations. Soon superseded by more mainstream structural types, relatively few of these bridges were ever built, and only a handful has been identified by the inventory. The earliest of these is the Jacks Canyon Bridge [**abd.**], built in 1913 on the Old Trails Highway in Navajo County. Though modest in size and appearance, the Old Trails Wash Bridge is an important representative of early bridge construction in Arizona.

NATIONAL REGISTER EVALUATION

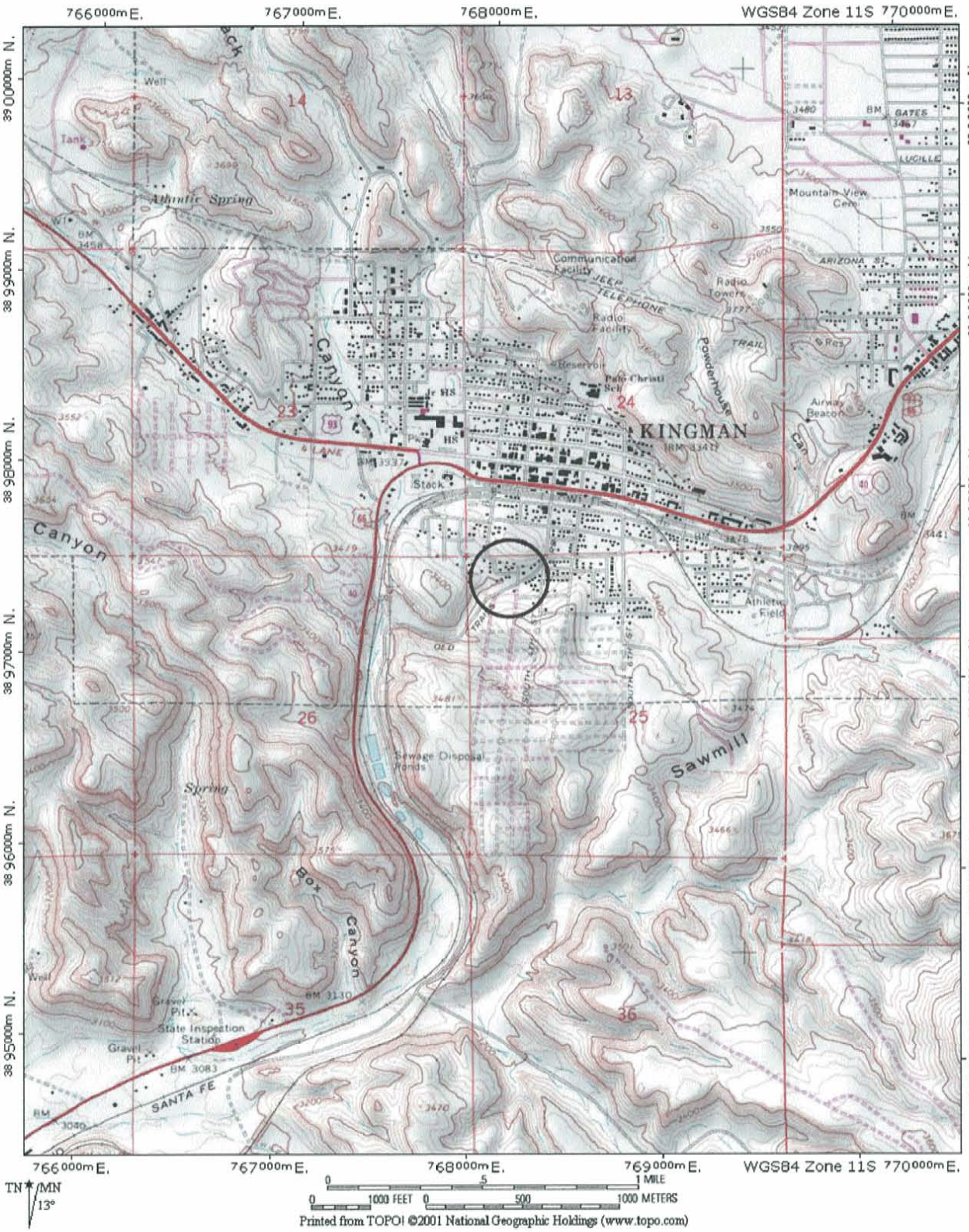
TECHNOLOGICAL SIGNIFICANCE
___ represents the work of a master
___ possesses high artistic values
_x_ represents a type, period or method of construction

HISTORICAL SIGNIFICANCE
___ associated with significant persons
_x_ associated with significant events or patterns
___ contributes to historical district

NATIONAL REGISTER CRITERIA
_x_ Criterion A
___ Criterion B
_x_ Criterion C

NATIONAL REGISTER ELIGIBILITY
individually eligible _x_ yes ___ no
contributes to district ___ yes _x_ no

AREA OF SIGNIFICANCE: Transportation; Engineering
PERIOD OF SIGNIFICANCE: 1918-1964
THEME(S): Transportation: Highways



Location Map

HISTORIC BRIDGE INVENTORY

London Bridge

PROPERTY IDENTIFICATION

county	Mohave	inventory number	08630
milepost	0.00	inventory route	McCulloch Boulevard
location	in Lake Havasu City	feature intersected	Lake Havasu Channel
city/vicinity	Lake Havasu City	USGS quadrangle	Lake Havasu City South
district	85	UTM reference	11.743550.3817630

STRUCTURAL INFORMATION

main span number	3	main span type	111
appr. span number	0	appr. span type	
degree of skew	0	guardrail type	0
main span length	152.0	superstructure	concrete filled spandrel arch
structure length	952.0	substructure	concrete abutments, wingwalls and piers
roadway width	32.6	floor/decking	asphalt roadway over earth fill
structure width	35.0	other features	stone masonry veneer with decorative voussoirs, copings, corbel brackets, guardrails and balusters

HISTORICAL INFORMATION

construction date	1831	designer/engineer	John Rennie
project number		builder/contractor	city (London) work force
information source	city bridge records	structure owner	City of Lake Havasu City
alteration date(s)	1971	alterations	bridge dismantled and moved to this location

NATIONAL REGISTER EVALUATION

For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form

inventory score	63	NRHP eligibility	eligible
		NRHP criteria	A x B ____ C x
		signif. statement	unique adaptation of European bridge to Western setting

FORM COMPLETED BY

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31 October 2004

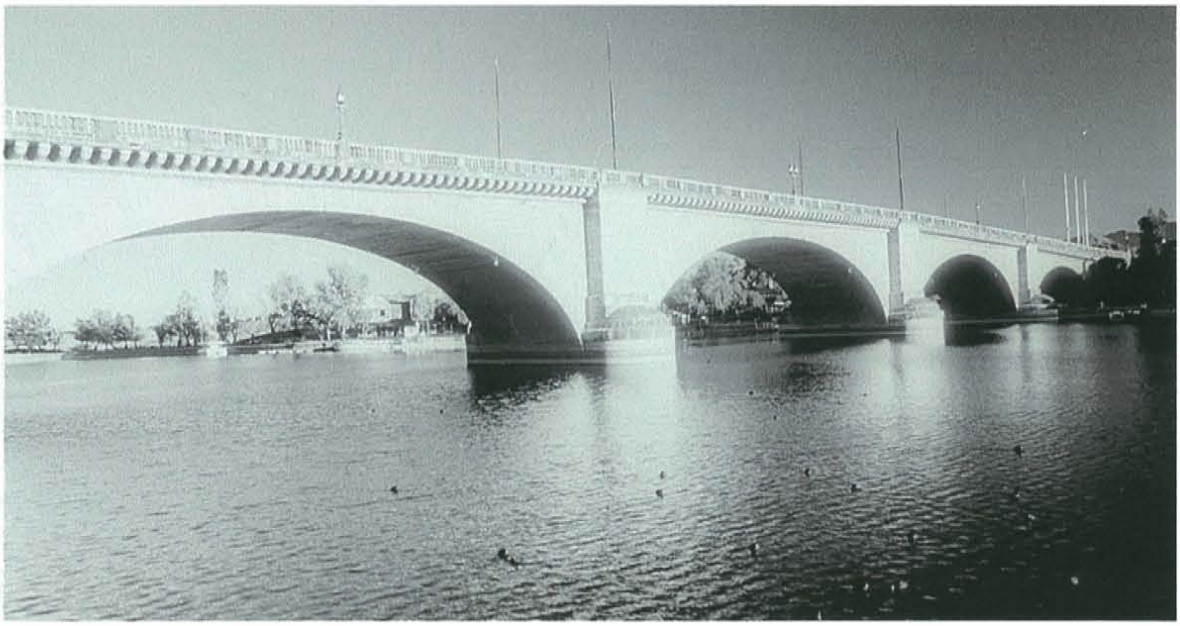


PHOTO INFORMATION

date of photo.: November 2002 view direction: northwest north photo no.: 02.11.190 02.11.191

CONSTRUCTION HISTORY

The first timber bridge over the Thames River in London may have been constructed as early as the 1st Century. In 1209 the first stone bridge was completed, and by the end of the 18th Century it had aged to the point of replacement. After a design competition by the city, Scottish engineer John Rennie was retained to design the replacement bridge, an immense stone arch structure with the longest span extending some 130 feet. The first stone on the new bridge was laid ceremoniously on June 15, 1825, and the structure was completed seven years later by Rennie's son after the father's death. The five-span arch structure was formally dedicated on August 1, 1831.

By far the busiest among London's major bridges, this structure carried numerous royal events. The London Bridge withstood a terrorist bombing in 1834 and German air raids in World War I and World War II. In 1967 the City of London moved to replace the 133-year-old stone bridge, offering it for sale. What followed was one of the most bizarre episodes in world bridge history, as developer Robert P. McCulloch purchased the London Bridge for $2.5 million and endeavored to move it to Arizona. Workers marked the individual face stones and crated and shipped them to the state, rebuilding the structure over a reinforced concrete armature in a desert community beside the Colorado River. Lacking a real river for the bridge to cross at Lake Havasu City, a decorative lagoon was dredged and filled with water. Completed in 1971, the London Bridge has since functioned as a tourist attraction and city center.

SIGNIFICANCE STATEMENT

As a pivotal crossing of the Thames in the heart of London, the historical significance of the London Bridge can hardly be overstated. Although its present function in Lake Havasu City is substantially less important, the bridge does serve as a focal point for this thriving western Arizona community and as a well-known tourist attraction in America. Technologically, the London Bridge represented a conservative engineering approach, even for its relatively early date. Its monumental nature, however, made it a showcase of 19th century stonemasonry. The dismantling, shipping and reconstruction of the bridge in the 1960s presented a tremendous exercise in logistics and engineering. Celebrated in literature, history and song, the London Bridge is unquestionably the most famous bridge in the world. In London, it would be considered internationally significant. In Arizona, where it is a radically different setting, it is significant for different reasons.

NATIONAL REGISTER EVALUATION

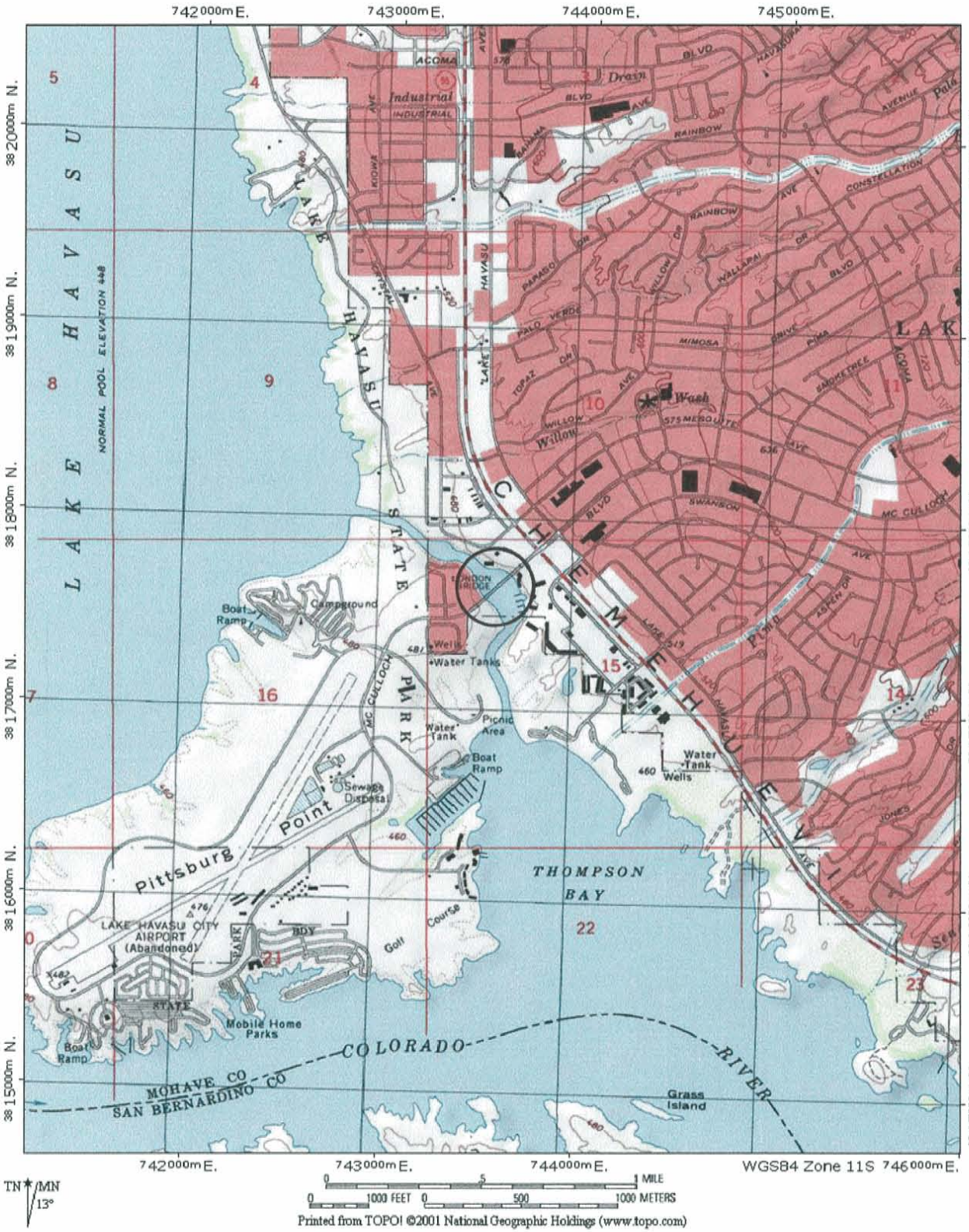
TECHNOLOGICAL SIGNIFICANCE
___ represents the work of a master
___ possesses high artistic values
_x_ represents a type, period or method of construction

HISTORICAL SIGNIFICANCE
___ associated with significant persons
_x_ associated with significant events or patterns
___ contributes to historical district

NATIONAL REGISTER CRITERIA
_x_ Criterion A
___ Criterion B
_x_ Criterion C

NATIONAL REGISTER ELIGIBILITY
individually eligible _x_ yes ___ no
contributes to district ___ yes _x_ no

AREA OF SIGNIFICANCE: Transportation; Engineering
PERIOD OF SIGNIFICANCE: 1971
THEME(S): Transportation: Highways



Location Map

HISTORIC BRIDGE INVENTORY

Sand Hollow Wash Bridge

PROPERTY IDENTIFICATION

county	Mohave	inventory number	08662
milepost	0.00	inventory route	Old Hwy 91
location	2.9 mi E of Az State Ln	feature intersected	Sand Hollow Wash
city/vicinity	Littlefield	USGS quadrangle	Mesquite
district	85	UTM reference	11.767027.4080110

STRUCTURAL INFORMATION

main span number	2	main span type	309
appr. span number	4	appr. span type	303
degree of skew	0	guardrail type	6
main span length	80.0	superstructure	steel rigid-connected Warren deck truss
structure length	370.0	substructure	four-bent steel piers on concrete spread footings
roadway width	20.0	floor/decking	concrete deck over steel stringers
structure width	21.0	other features	upper chord: 2 channels w/ cover plate and lacing; lower chord: 2 channels w/ batten plates; vertical/diagonal: wide flange; strut and lateral bracing: 1 angle; floor beam: I-beam; steel lattice guardrails

HISTORICAL INFORMATION

construction date	1930	designer/engineer	Arizona Highway Department
project number	FAP 92-A	builder/contractor	James J. Burke & Company, Salt Lake City UT
information source	ADOT bridge records	structure owner	Mohave County
alteration date(s)		alterations	

NATIONAL REGISTER EVALUATION

For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form

inventory score	77	NRHP eligibility	listed
		NRHP criteria	A x B ____ C x
		signif. statement	well-preserved example of uncommon structural type, on regionally important highway

FORM COMPLETED BY

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Loveland, Colorado 80537
31 October 2004

SAND HOLLOW WASH BRIDGE

Structure No. 8662

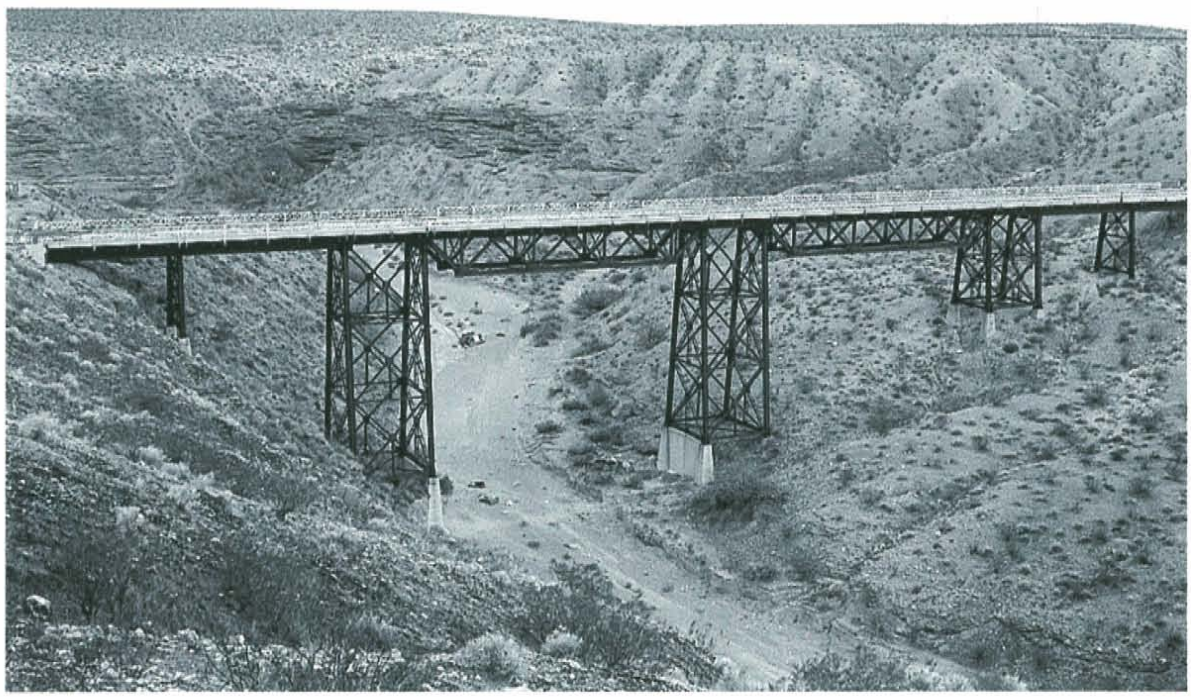


PHOTO INFORMATION

date of photo.: November 2002 view direction: southwest northeast photo no.: 02.11.173 02.11.175

CONSTRUCTION HISTORY

In 1929 the Arizona Highway Department undertook construction of the Utah-Nevada State Line Highway, a 30-mile-long road that cut across the extreme northwest corner of the state. The work was designated Federal Aid Project 92-A and was divided into three intermediate sections, or schedules. Schedules 1 and 3 involved grading and surfacing; Schedule 2 entailed the construction of several bridges. Largest of these was the structure over Sand Hollow Wash, a wide ravine about seven miles northeast of Littlefield. For this AHD designed a steel trestle comprised of rigid-connected deck trusses supported by braced steel piers. The trusses used a Warren configuration, with built-up box beams for the upper and lower chords. These trusses carried a 20-foot-wide concrete deck, which was carried by steel I-beams and bounded by steel lattice guardrails. The four-bent, braced steel piers that supported the trusses bore on tapered concrete pedestals with spread footings.

In February 1929 the highway department contracted with Salt Lake City bridge builder James J. Burke for the Sand Hollow Wash Bridge and others along the route for about $44,000. Burke's crew began excavation for the concrete abutments and piers on March 31. Though scheduled for completion in September, construction problems delayed the work, and Burke had completed less than 25 percent at the deadline. In February 1930 he finally finished the Sand Hollow Wash Bridge. As built, the bridge used some 306,000 pounds of superstructural steel, 47,000 pounds of reinforcing steel and 411 cubic yards of concrete. The highway and bridge carried mainline traffic until they were superseded by Interstate 15 in 1962. The Nevada-Utah route has now been reduced to a county road, carrying local traffic near Littlefield. The roadway is today in deteriorated condition, but the Sand Hollow Wash Bridge remains essentially intact.

SIGNIFICANCE STATEMENT

Although its impact on Arizona settlement was minimal, the Nevada-Utah Highway (U.S. Highway 91) was a major thoroughfare in the Southwest, connecting Las Vegas with the East. The Sand Hollow Wash Bridge is historically important as the major feature on that route in Arizona. It is technologically significant as one of four multiple-span, deck-trussed trestles identified in the inventory (others: Querino Canyon Bridge [**8071**], Dead Indian Canyon Bridge [**0032**], and Black River Bridge [**3128**]). All were erected within a five-year period at rural crossings in the northern half of the state, all featured moderate span lengths and all were designed either by AHD or the Bureau of Public Roads using industry-standard truss detailing. The Sand Hollow Wash Bridge is distinguished as a well-preserved example of this noteworthy bridge-building trend.

NATIONAL REGISTER EVALUATION

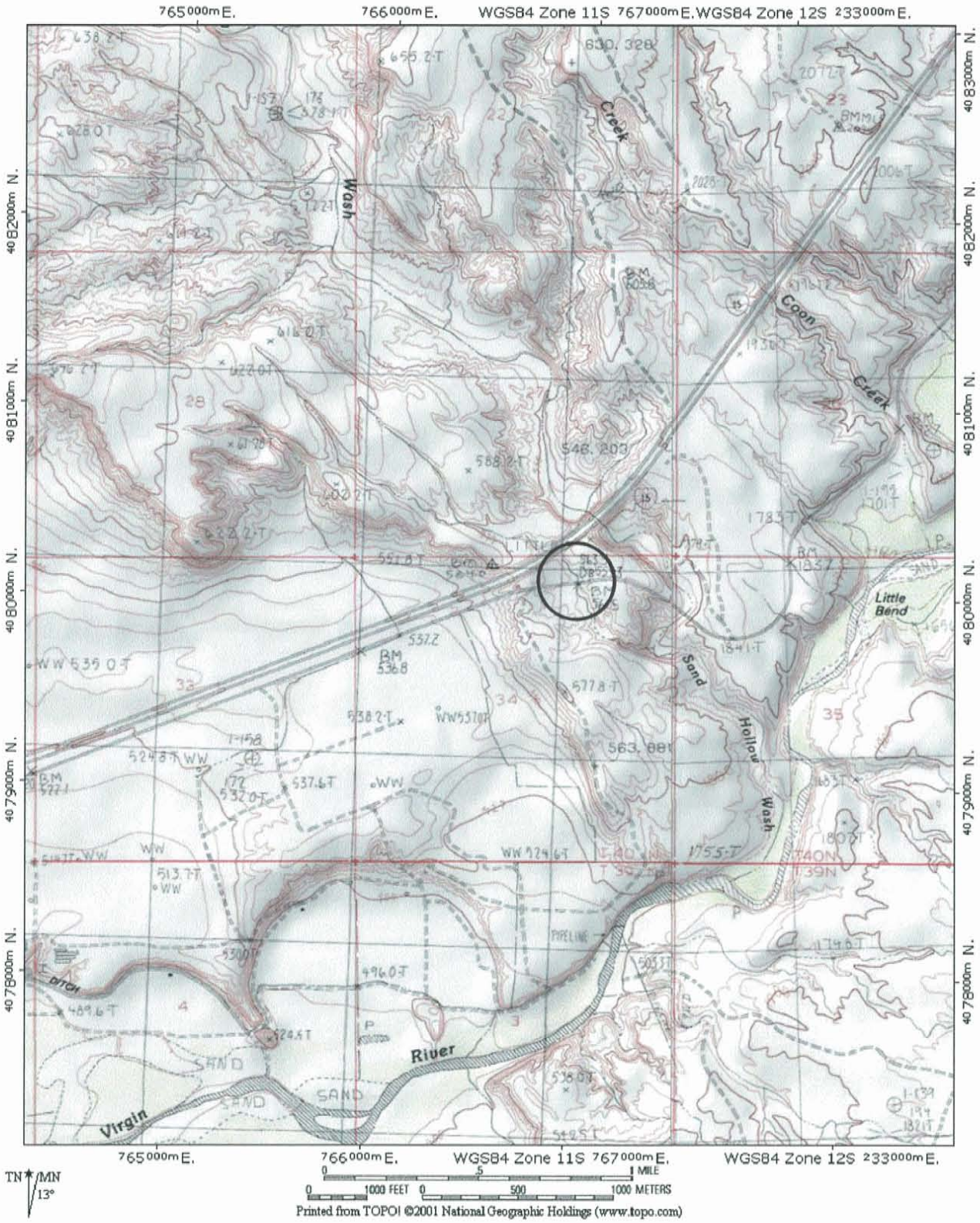
TECHNOLOGICAL SIGNIFICANCE
___ represents the work of a master
___ possesses high artistic values
_x_ represents a type, period or method of construction

HISTORICAL SIGNIFICANCE
___ associated with significant persons
_x_ associated with significant events or patterns
___ contributes to historical district

NATIONAL REGISTER CRITERIA
_x_ Criterion A
___ Criterion B
_x_ Criterion C

NATIONAL REGISTER ELIGIBILITY
individually eligible _x_ yes ___ no
contributes to district ___ yes _x_ no

AREA OF SIGNIFICANCE: Transportation; Engineering
PERIOD OF SIGNIFICANCE: 1930-1964
THEME(S): Transportation: Highways



Location Map

HISTORIC BRIDGE INVENTORY

Old Trails Bridge

PROPERTY IDENTIFICATION

county	Mohave	inventory number	private
milepost	0.00	inventory route	Natural Gas Pipeline
location	at Topock	feature intersected	Colorado River
city/vicinity	Topock	USGS quadrangle	Topock
district	86	UTM reference	11.730340.3844340

STRUCTURAL INFORMATION

main span number	1	main span type	312
appr. span number	0	appr. span type	
degree of skew	0	guardrail type	0
main span length	592.0	superstructure	steel three-hinge spandrel-braced through arch
structure length	832.0	substructure	concrete abutments, wingwalls and arch pedestals
roadway width	17.0	floor/decking	steel grid walkways
structure width	20.0	other features	upper arch chord: 2 channels w/ cover plate and double lacing; lower arch chord: 4 channels w/ double lacing; diagonal: 4 angles w/ lacing; arch post: 2 angles w/ lacing; suspender: round rod; lateral bracing: 2 angles; floor beam: plate girder

HISTORICAL INFORMATION

construction date	1916	designer/engineer	San Bernardino County Engr.
project number		builder/contractor	Kansas City Structural Steel Co., Kansas City MO
information source	ADOT bridge records	structure owner	El Paso Natural Gas Company
alteration date(s)	1948	alterations	deck removed and gas pipeline installed

NATIONAL REGISTER EVALUATION

For additional information, see "Vehicular Bridges in Arizona 1880-1964" National Register Multiple Property Documentation Form

inventory score	94	NRHP eligibility	listed
		NRHP criteria	A x B ____ C x
		signif. statement	outstanding early large-scale bridge, located at major interstate crossing

FORM COMPLETED BY

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31 October 2004

OLD TRAILS BRIDGE

Structure No.: private

PHOTO INFORMATION

date of photo.: November 2002 view direction: west southwest photo no.: 02.11.212 02.11.209

CONSTRUCTION HISTORY

As the Ocean-to-Ocean Bridge [**8533**] was under construction in Yuma in 1914, the states of Arizona and California and the U.S. Bureau of Indian Affairs sought to erect another substantial span over the Colorado River to carry the Old Trails Highway further north. Topock, Arizona—halfway between Yuma and the Utah border—was chosen as the crossing site. The new structure would be situated just south of the existing Red Rock Bridge, J.A.L. Waddell's famous cantilevered truss that was built in 1890 to carry the Santa Fe Railroad over the Colorado. Each government entity contributed $25,000 to construction of the Topock Bridge, and San Bernadino County agreed to design the bridge and pay for any cost overruns. County Surveyor S.A. Sourwine engineered this long-span steel arch. Whether he received consulting help or not, his design for the Topock Bridge bore more than a passing resemblance to the Bellows Falls (Vermont) Arch Bridge, completed in 1905.

On June 30, 1915, the contract for fabrication and erection of the bridge was let to the Kansas City Structural Steel Company of Missouri. Under the direction of company construction superintendent Thomas McCurnin and county construction engineer J.P. Kimmerer, a Kansas City Steel crew poured the concrete footings for the arch pedestals and erected the sinnewy arch using a unique cantilever technique in 1915. The Old Trails Bridge was completed on February 20, 1916. It carried interstate traffic for U.S. Highway 66 until 1947, when traffic was transferred to the Red Rock Bridge. Two years later the bridge was sold to El Paso Natural Gas Company, and the deck of the 1916 arch was removed to accommodate a natural gas pipeline, which it still carries. Other than this, the Old Trails Bridge stands in essentially unaltered condition.

SIGNIFICANCE STATEMENT

The Old Trails Bridge is historically significant in the Southwest as a pivotal crossing on the transcontinental National Old Trails Highway. Technologically, the structure is nationally important as an outstanding example of steel arch construction. Upon its completion, it was praised by *Engineering Record* as "exceptionally daring and successful for work of such magnitude." Taking a cue from the difficulties experienced erecting the Ocean-to-Ocean Bridge [**8533**] at Yuma, engineers for Kansas City Steel erected this bridge using a novel cantilever system, in which the bridge halves were assembled on their sides on either side of the river and hoisted into place using a unique ball-and-socket center hinge. At its completion the longest arch bridge in America, the 360-ton Old Trails Bridge was also distinguished as the country's lightest and longest three-hinged arch. The removal of the deck has done little to compromise the structure's integrity, and it remains a landmark in American civil engineering.

NATIONAL REGISTER EVALUATION

TECHNOLOGICAL SIGNIFICANCE
- ___ represents the work of a master
- ___ possesses high artistic values
- _x_ represents a type, period or method of construction

HISTORICAL SIGNIFICANCE
- ___ associated with significant persons
- _x_ associated with significant events or patterns
- ___ contributes to historical district

NATIONAL REGISTER CRITERIA
- _x_ Criterion A
- ___ Criterion B
- _x_ Criterion C

NATIONAL REGISTER ELIGIBILITY

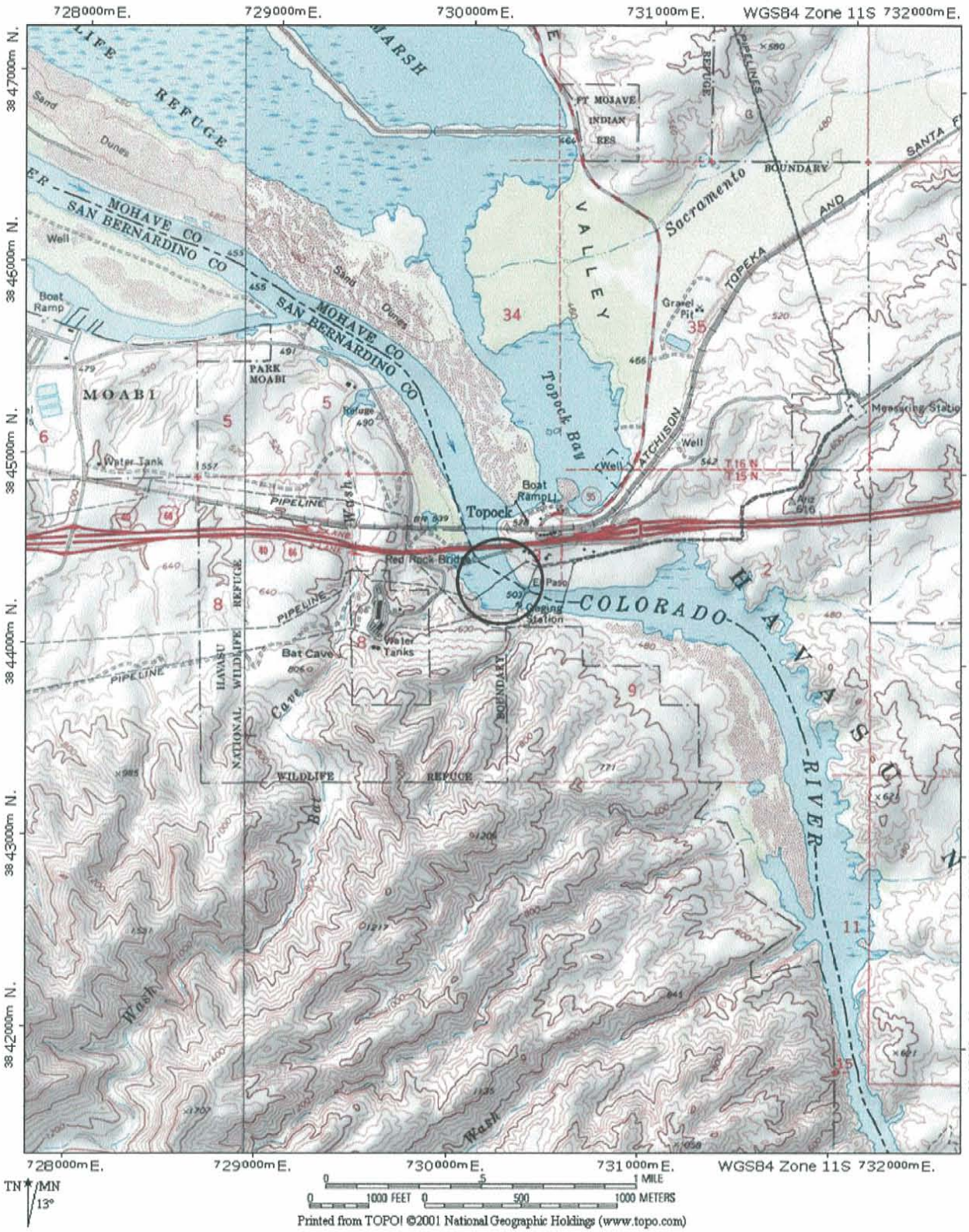
individually eligible _x_ yes ___ no

contributes to district ___ yes _x_ no

AREA OF SIGNIFICANCE: Transportation; Engineering

PERIOD OF SIGNIFICANCE: 1916-1964

THEME(S): Transportation: Highways



Location Map