1. NAME OF PROPERTY

Historic Name: Knight's Ferry Bridge

Other Name/Site Number:

Designated a National Historic Landmark by the Secretary of the Interior October 16, 2012

2. LOCATION

Street & Number: Spanning Stanislaus River at bypassed section of Sonora Road, approximately .75 mile north of SR 108/120 Not for publication: __

City/Town: Knight's Ferry Vicinity: __

State: California County: Stanislaus Code: 099 Zip Code: 95361

3. CLASSIFICATION

Ownership of Property	Category of Property
Private:	Building(s):
Public-Local:	District:
Public-State:	Site:
Public-Federal: X	Structure: X
	Object:

Number of Resources within Property

Contributing		Noncontributing	
buildings	0	buildings	0
sites	0	sites	0
structures	1	structures	0
objects	0	objects	0
Total	1	Total	0

Number of Contributing Resources Previously Listed in the National Register: 1

Name of Related Multiple Property Listing: "Covered Bridges NHL Context Study"

4. STATE/FEDERAL AGENCY CERTIFICATION

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ____ nomination ____ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ____ meets ____ does not meet the National Register Criteria.

Signature of Certifying Official Date

State or Federal Agency and Bureau

In my opinion, the property ____ meets ____ does not meet the National Register criteria.

Signature of Commenting or Other Official Date

State or Federal Agency and Bureau

5. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is:

___ Entered in the National Register
___ Determined eligible for the National Register
___ Determined not eligible for the National Register
___ Removed from the National Register
___ Other (explain): _____

Signature of Keeper Date of Action

6. FUNCTION OR USE

Historic: Transportation Sub: road-related (vehicular)

Current: Transportation Sub: road-related (pedestrian)

7. DESCRIPTION

ARCHITECTURAL CLASSIFICATION: Other: Howe through truss

MATERIALS:
Foundation: stone
Walls: wood
Roof: metal
Other:

Describe Present and Historic Physical Appearance.

Summary

Knight's Ferry Bridge is an exceptionally fine example of nineteenth-century covered bridge construction, and an outstanding example of a timber Howe truss, one of the most significant American timber truss types, of which approximately 110 historic (pre-1955) examples survive. It is nationally significant under NHL Criterion 4, as a property that embodies the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of construction and NHL Theme VI, Expanding Science and Technology, under the area of Technological Applications. Patented by William Howe (1803-1852) in 1840, the Howe truss was a ground-breaking design that used adjustable wrought iron rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient pre-stressing of the members. The bridge has been well-maintained and retains an uncommonly high degree of historic integrity. Knight's Ferry Bridge was recorded by the Historic American Buildings Survey (HABS) in 1934 and by the Historic American Engineering Record (HAER) in 2002. It is a contributing structure to the Knight's Ferry Historic District, which was listed in the National Register of Historic Places in 1975. Of the approximately 690 historic (pre-1955) covered bridges surviving in the United States, Knight's Ferry Bridge is the longest extant covered bridge west of the Mississippi River and stands out as a very fine example of covered bridge construction and preservation.[1]

General Setting

The Knight's Ferry Bridge spans the Stanislaus River in a picturesque natural and historical setting at the interface of the rolling Sierra Nevada foothills and the fertile farmlands of California's Central Valley. It is an arid landscape of rolling hills and prairie, sparsely covered with groves of oak trees and sagebrush. The Stanislaus River, one of ten rivers that drain the Sierra Nevada, travels 96 miles in a westerly direction from the foothills north of Sonora to the confluence of the San Joaquin River near Ripon. At Knight's Ferry, the river exits the confines of a narrow canyon and begins a slower, meandering course through the valley. This proved to be an ideal site for a ferry—and later, a bridge—as the topography here allowed travelers to be safely conveyed across the river. This crossing was essential to the Sonora Road, one of the principal overland routes used by miners traveling between the Central Valley and the southern mines during the California gold rush. The volume of traffic generated by miners traveling the Sonora Road enabled Knight's Ferry to quickly develop into a thriving industrial village, which also served as the seat of Stanislaus County from 1862 to 1871.

Description

Knight's Ferry Bridge is an impressive and well-maintained four-span timber Howe through truss covered bridge on mortared stone abutments and piers. It spans the Stanislaus River and a former millrace at a bypassed section of Sonora Road about a half mile southeast of the historic village of Knight's Ferry. The bridge is 378′ 11 ¾″-long overall, with clear span lengths (from north to south) of 43′-10″, 96′-5 3/8″, 80′-8 1/2″, and 135′-10 5/8″. The superstructure (including housing) is approximately 23 feet-deep and 25 feet-wide overall. The trusses are approximately 18 feet-deep and the roadway is 15 feet-wide. Each truss panel is approximately 9′-5″-wide, except the panels at the piers and abutments which are approximately 4′-wide. The housing extends 16′ 8″ beyond the trusses at the southerly end.

The top chords are four 3″x14″ planks laid on the flat and bolted together. The bottom chords are five 3″x14″ planks laid on the flat and bolted together. This type of laminated chord is not typical of Howe truss covered

[1] Approximately half of the 690 extant historic (pre-1955) covered bridges in the United States have been significantly altered, with much loss of historic fabric and character.

bridges, but was occasionally found in California covered bridge construction, and rarely elsewhere.[2] The top and bottom chords are connected by paired tension rods that vary in dimensions from 7/8″ to 1 ¼″ paired 4″x 8″ wood braces and single 5″x9″ wood counterbraces. The end panels of each span have single 5″x8″ braces. Connections at each panel point incorporate triangular cast iron bearing block assemblies, with seats for the diagonal timbers and openings for the iron rods to pass through. Each pair of rods passes through the bearing blocks and the chords; they are fastened on the far side with a plate and nuts. There are 1 1/8″ diagonal tension rods parallel to the counterbraces in the end panels of the trusses. Whether these rods are original, or a later modification is not known, but the fact that they are consistent throughout the structure suggests that they may be original.[3]

Transverse timber floor beams are suspended from iron rods at each panel point. Lower lateral bracing consists of metal tie rods crossing between the floor beams. There are 11 lines of 3″x12″ stringers laid longitudinally on top of the floor beams. The stringers carry 2″x4″ transverse joists spaced at 1′-6″. The decking is 3″x8″ plank flooring laid longitudinally on the joists. The deck is surfaced with bituminous paving.

The upper lateral system is composed of 7″x9″ transverse tie beams seated on the top chord at each panel point and 4″x8″ braces crossing diagonally between the tie beams. There are wood sway braces at the ends of each truss between the end posts and tie beams. Wood rafters frame onto longitudinal timbers supported on the outer ends of the tie beams at the eaves. The gable roof with extended eaves was originally covered with wood shingles; the shingles were replaced with standing-seam metal roofing in 1885. That roof was replaced during the 1988-1991 restoration.

The exterior of the bridge is covered with 2″x12″ unpainted, vertical board sheathing to about 18″ below the top chord. The sheathing is fastened to three 2″x4″ wood nailers on the exterior faces of the trusses. The portals are painted red with white trim. They are plumb with arched openings flanked by engaged pilasters. The gables are ornamented with reverse curve eaves and a small modillion centered above the portal opening. There are four openings with wire screens and wood shutters on each side of the bridge. The approaches to the bridge are covered with worn bituminous pavement and flanked by whitewashed board fences.

The abutments and piers are mortared rubble stone on natural rock ledge foundations. The piers are wedge-shaped on the upstream side, designed to divide the current and deflect floes of ice or debris heading downstream. The bottom chords of each span rest on bedding timbers at the abutments and bolster beams at the piers. 12″x14″ timber posts support the bolster beams at the southern pier; these were added sometime between 1934 and 1972.[4]

Integrity

The structure clearly illustrates the character-defining features of the resource type. It has undergone few significant alterations or modifications during its lifetime, and retains an uncommonly high level of integrity, in location, setting, design, materials, workmanship, feeling and association.

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[2] The usual form of Howe truss had chords consisting of three or four timbers set on their edges, spaced apart with shear blocks and bolted together. The type of laminated chord found at Knight's Ferry Bridge was also used for Bridgeport Bridge (1862) in Nevada County, the former O'Byrnes (Byrnes) Ferry Bridge (1862-1957) between Calaveras and Tuolumne counties, and Glen Canyon Bridge (1892) in Santa Cruz County. According to historian Joseph Conwill, the popularity of plank chords in California covered bridges may have been due to a scarcity of labor to hew the chord sticks and the use of rural sawmills, which were ill-equipped to handle the larger timbers that are more typically seen in bridge chords. [Joseph D. Conwill, "Why Those Plank Chords in California Covered Bridges?" *Covered Bridge Topics*, Vol. 69, No. 1 (Winter 2011), 12.]

[3] The diagonal tension rods were in place when historian Joseph d. Cornwill visited Knight's Ferry in 1978.

[4] Measurements were taken in 2011 by the HAER field team, using the Leica ScanStation 2 laser scanner.

Knight's Ferry Bridge is one of the best surviving examples of a timber Howe through truss, one of the most successful and widely-used 19th-century bridge truss designs. It exhibits the distinctive features of this truss type: diagonal wood compression members, vertical iron tension rods grouped at each panel point, and cast-iron angle blocks at the joints. All the essential load-bearing components of the structure are still intact. The bridge is uniquely suited to its site. In particular, the length of each span was dictated by the site's topography, with the longest span over the river, and shorter spans over a rock ledge and a former millrace. The height of the bridge above the water was determined after an 1862 flood that washed out the previous structure. The bridge has been minimally altered since construction. The original wood shingle roof was replaced with metal in 1885, and the deck was rebuilt in 1918. Sometime between 1934 and 1972, timber posts were added to support the bolster beams at the southern pier. The bridge was restored in 1988-1991 by renowned covered bridge specialist Milton S. Graton, who used traditional materials and construction techniques to repair the trusses and piers, remove non-historic elements, and restore the exterior of the bridge to its 19th-century appearance.

Knight's Ferry Bridge was built on-site using local materials and traditional 19th-century construction methods. Locally-quarried stone was used for the piers and locally-milled lumber was used in the trusses. The latter may have been the reason for the unusual plank chords, a feature sometimes found in California covered bridges.[5] In keeping with the Howe truss design, the primary structural members are wood compression members and iron tension rods. The wrought iron rods and cast-iron angle blocks reflect a mid-19th century trend toward replacing traditional joinery with prefabricated parts. These elements were presumably fabricated in a factory and shipped to the site, a procedure that was later used for metal truss bridges of all types. The masonry piers and abutments were clearly built by a skilled craftsman. They are carefully tapered to maximize support without impeding the flow of the river, with cutwaters on the upstream side. All of the siding, roof covering and flooring have been replaced over the years, most recently during the 1988-1991 restoration, but this is part of routine maintenance, and—as long as materials are replaced in-kind—does not diminish the integrity of the structure. The fact that this structure has retained its historic appearance over time is a testament to the high level of care and maintenance it has received.

Knight's Ferry Bridge retains the feeling of a 19th-century covered bridge built for pedestrians and horse-drawn wagons. Although it was bypassed in 1981, the bridge remains at its original site and is maintained as a pedestrian bridge, historic landmark and tourist attraction. The bridge's picturesque "Old West" setting possesses a high level of aesthetic and historic integrity. Numerous remnants of the gold rush era survive near the structure, in particular the 19th-century ruins of the Stanislaus Flour Mill (Tulloch Mill) that stand just northwest of the bridge, and a water-diversion ditch (San Joaquin Ditch) near the top of the hill north of the bridge.[6] The bridge is a contributing structure to the Knight's Ferry Historic District, which was listed in the National Register of Historic Places in 1975.

[5] See fn. 3.

[6] Knight's Ferry once had extensive water-diversion ditches and flumes for placer mining, mill power, and domestic use.

8. STATEMENT OF SIGNIFICANCE

Certifying official has considered the significance of this property in relation to other properties:

Nationally: X Statewide:__ Locally:__

Applicable National Register Criteria:	A X B__ C X D__
Criteria Considerations (Exceptions):	A__ B__ C__ D__ E__ F__ G__
NHL Criteria:	4
NHL Theme(s):	V. Developing the American Economy 3. Transportation and Communications VI. Expanding Science and Technology 2. Technological Applications
Areas of Significance:	Transportation Engineering
Period(s) of Significance:	1863
Significant Dates:	1863
Significant Person(s):	N/A
Cultural Affiliation:	N/A
Architect/Builder:	Divoll & Bray, Designers[7] Schuylkill Construction Company, Contractor[8]; Thomas Vinson, Stonemason[9]
Historic Contexts:	"Covered Bridges NHL Context Study" XVIII. Technology (Engineering and Innovation) B. Transportation

[7] Donna M. Stanio, "Knight's Ferry Covered Bridge," *Covered Bridge Topics* (Summer 1988), 9. "Divoll & Bray" *may* be a reference to James Divoll (1831-1904) and Joseph Bray (b.1834), who owned the Bonanza Gold Mine at Sonora and would have had a vested interest in the Sonora Road and the bridge at Knight's Ferry, https://sonoraca.com/downtown-sonora/sonora-california-history/short-history/, retrieved 5/25/2011.

[8] S. Griswold Morley, *The Covered Bridges of California* (Berkeley: University of California Press, 1938), 70. No additional information has been found concerning the Schuylkill Construction Company.

[9] George Henry Tinkham, *History of Stanislaus County, California* (Los Angeles: Historic Record Company, 1921), 74.

State Significance of Property, and Justify Criteria, Criteria Considerations, and Areas and Periods of Significance Noted Above.

Summary

Knight's Ferry Bridge is nationally significant under NHL Criterion 4, as a property that embodies the distinguishing characteristics of an architectural type specimen exceptionally valuable for a study of a period, style, or method of construction and NHL Theme VI, Expanding Science and Technology, under the area of Technological Applications. Constructed in 1862-1863, it is an exceptionally fine example of nineteenth-century covered bridge construction, and an outstanding example of a timber Howe truss, one of the most significant American timber truss types, of which approximately 110 historic (pre-1955) examples survive. Patented by William Howe (1803-1852) in 1840, the Howe truss was a ground-breaking design that used adjustable wrought iron rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient pre-stressing of the members. The bridge has been well-maintained and retains an uncommonly high degree of historic integrity. Knight's Ferry Bridge was recorded by the Historic American Buildings Survey (HABS) in 1934 and by the Historic American Engineering Record (HAER) in 2002. It is a contributing structure to the Knight's Ferry Historic District, which was listed in the National Register of Historic Places in 1975.

A full discussion of the national significance of Knight's Ferry Bridge is provided in the associated document, "Covered Bridges NHL Context Study." The study establishes the history and evolution of the property type, and provides a preliminary assessment of the National Historic Landmark (NHL) eligibility of 20 covered bridges that are considered by experts in the field to be the best representative examples of the surviving 690 historic (pre-1955) covered timber bridges in the United States. These properties were selected from the National Covered Bridges Recording Project (NCBRP), undertaken in 2002-2005 by the Historic American Engineering Record (HAER), which is administered by the Heritage Documentation Programs Division of the National Park Service, United States Department of the Interior. The project was funded by the Federal Highway Administration's (FHWA) National Historic Covered Bridge Preservation Program (NHCBPP), established in 2000 by Section 1224 of the Transportation Equity Act for the 21st Century (TEA21). Over the course of a multi-year project, HAER recorded 75 covered bridges throughout the United States. In 2010, each of these bridges was individually evaluated against National Historic Landmark criteria and a list compiled of 20 covered bridges that have high integrity and are significant as outstanding representative examples of their type, period, and method of construction. Secondary considerations for inclusion in this list were: historical significance, significance of the designer or builder, and aesthetics of the bridge and site.

Covered Bridges in the United States

Covered bridges are pre-eminently an American phenomenon. Nowhere else in the world were such impressive timber structures attempted, and nowhere else were they built in such vast numbers.[10] Over the course of two centuries, covered bridges have played a significant role in American life, by facilitating settlement, transportation and commerce. They also represent a period of remarkable achievement in civil engineering,

[10] According to the 7th edition of the *World Guide to Covered Bridges* (2009), there are approximately 1,500 extant historic (pre-1955) covered bridges in the world. More than half of these structures are located in North America. American scholars have recently become aware of large numbers of ancient covered bridges in China, but most were built for pedestrian traffic, and their construction techniques and reason for covering differ from the Western tradition.

during which bridge building evolved from an empirical craft to a science. At the height of covered bridge building, around 1870, there were well over 10,000 covered bridges in the United States.[11]

Timber bridges have been built in forested regions of the world for centuries.[12] Wood is an excellent material for building; it is strong, relatively lightweight, and easy to work with. Since most species of wood suitable for structural applications deteriorate rapidly when exposed to the weather, European bridge builders quickly learned the value of covering wood bridges with roofs and siding to protect the underlying framework.[13]

Bridges were rare in Colonial America. Small streams were spanned with simple wood beams or stone slabs, and occasionally with stone arches, but with few exceptions, larger waterways had to be crossed by ford or ferry. Travel was hazardous and uncertain; delays and accidents were common. A few ambitious crossings were made with pontoons or a series of simple beam spans supported on timber piles, but long-span bridges were generally not built in America until the volume of transportation justified the expenditure of material and labor.[14] Following the American Revolutionary War, the demand for roads and bridges, coupled with access to abundant forests, spurred the development of timber bridge design in the United States.

Internal improvements were a priority of the new nation. Roads, canals and bridges were desperately needed to expand commerce and unite the country. The Louisiana Purchase of 1803 doubled the land area of the United States and over the next half-century, settlement expanded west to the Pacific Ocean. Timber bridges were an ideal solution to America's many transportation hurdles and settlers built hundreds of them as they moved westward across the continent. They provided for safe, efficient and economical overland transportation that was essential to the new nation's growth.

In 1804-05, Timothy Palmer (1751-1821) built America's first covered bridge across the Schuylkill River at Philadelphia. By 1810, covered bridges were common in southern New England, southeastern New York, Pennsylvania and New Jersey. From this core area, covered bridges spread northward, southward and westward. In the 1820s, town and county governments began to specify covered bridges for construction on local roads. By 1830, covered bridges were commonplace at major river crossings in the eastern United States. The builders of timber bridges utilized readily available materials and common hand tools. Making use of patented truss designs, carpenters with basic woodworking ability could erect an average-sized covered bridge in a short time, usually within a few weeks.

Covered bridges were adapted to the needs of every type of transportation corridor, including turnpikes, canals and railroads and they facilitated the settlement of the United States for over a century. The rapid growth of the railroads in the mid-1800s—in particular, the increasing weight of locomotives and rolling stock—encouraged innovations and technical advancements in the design of timber truss bridges and was an important factor in the rise of civil engineering as a profession. All the major technological improvements in American truss bridge design occurred when wood was the building material of choice.

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[11] This is only a rough estimate of known covered bridges that existed c.1870. Initial data compiled by the "Covered Spans of Yesteryear Project," https://www.lostbridges.org/, suggests that this figure may be too low.

[12] In 55 BC, Julius Caesar (100 BC-44 BC) built the earliest known timber bridge across the Rhine River.

[13] Several European covered bridges have survived for more than three centuries, while a few in the United States are nearing the two-century mark.

[14] The Great Bridge (1660) across the Charles River at Boston and the York River Bridge (1761) at York, Maine, were notable exceptions. The Great Bridge consisted of "*cribs of logs filled with stone and sunk in the river—hewn timber being laid across it.*" The York River Bridge was a timber pile bridge, which uses tree trunks or piles driven vertically into the river bed to provide a foundation for a series of simple beam spans.

By 1850, there were covered bridges in most settled regions of the United States.[15] Thereafter, the number of covered bridges continued to multiply until about 1870, by which time there were well over 10,000 covered bridges in the United States.[16] The golden era of covered bridge building lasted for about a century in most areas of the United States, and even longer in areas where timber was plentiful.[17]

History of Knight's Ferry Bridge

Knight's Ferry Bridge was erected during the mid-nineteenth-century, a period when covered bridges were being built in extensive numbers throughout the United States, particularly in newly-settled areas west of the Mississippi River. Within a year of the discovery of gold at Coloma, California in 1848, the territory's population tripled, and there was an urgent demand for goods, services, and infrastructure improvements. Early infrastructure improvements like roads and bridges were financed by private capital, so they were generally not built until the volume of transportation justified the expenditure of material and labor.[18] In 1850, only a few rustic timber trestle structures or floating log bridges existed in California. One stage coach passenger reported that he and the other passengers were required to disembark and walk across each bridge they encountered, adding that the structures were so flimsy, "*they trembled and swayed as the empty coach was being drawn over*."[19] In the summer of 1850, John T. Little (1820-1891) of Castine, Maine built California's first covered bridge across the South Fork American River at Salmon Falls (near present-day Folsom).[20] This successful enterprise inspired the construction of dozens of other toll bridges in the region, many of which were covered bridges.[21]

In 1848, shortly after veins of gold were discovered in the southern Sierra Nevada, Indiana native Capt. William Knight (d.1849) and his partner Capt. James Vantine (b.1827) established a trading post and ferry near this site on the Stanislaus River.[22] This crossing was located halfway between present-day Stockton and the Sonora mining area, and was considered an ideal spot for teams to rest before heading into the Sierra foothills. Within a short time, the crossing was known as Knight's Ferry.[23] After Captain Knight was killed in a gun fight in November 1849, Captain Vantine partnered with Lewis (1824-1874) and John Dent (b.1831) in operating the ferry. An advertisement published in the *Stockton Times* in 1850 described Knight's Ferry as follows:

> The boat is one of the best in the country, well railed in, and is in every way well adapted to the purposes of a ferry. The roads leading to and from this ferry are excellent during both the winter and summer months. There is always a good supply of water and wood through the whole route. At the Ferry House a restaurant and boarding house, has just been opened, where the traveler will always find the best accommodation, and the most attentive consideration to his wants.
>
> —Dent, Vantine & Co.[24]

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[15] Fred Kniffen, "The American Covered Bridge," *The Geographic Review*, Vol. 41 (1951), 119.

[16] Covered bridges once existed in 41 of the 50 states. No records have been found concerning covered bridges in Colorado, Florida, Idaho, Louisiana, New Mexico, North Dakota, Oklahoma, South Dakota and Utah. The reasons for this presumably vary from region to region, but probably include: absence of readily-available timber, absence of major river crossings, topography more suited to other types of bridges, late-period settlements and low population density.

[17] Covered bridge building ended in New England and the Midwest around 1925, and in the South around 1935. Covered bridges continued to be built in Oregon into the 1950s.

[18] By the 1870s, state and local governments throughout the country had largely taken over the building and maintenance of public bridges, and toll bridges were rare by the end of the century.

[19] Robert O'Brien, "Bridges of the Pioneers," *San Francisco Chronicle*, 30 October 1950.

[20] Kramer Adams, Covered Bridges of the West: A History and Illustrated Guide (Berkeley: Howell-North, 1963), 13.

[21] Ibid., 22.

[22] Captain Knight served as a guide for John C. Fremont's (1813-1890) expedition that camped near this site in 1844.

[23] This crossing, labeled "Knights," appears on William A. Jackson's 1851 "Map of the Mining District of California."

[24] Advertisement published in the *Stockton Times*, 1850; republished in *Stanislaus Stepping Stones*, Vol. 2, No. 2 (April 1978), 76.

Knight's Ferry quickly became a major river crossing, with as many as one hundred wagons crossing daily.[25] According to David Tulloch's history of the community, "*one could follow the trail from Stockton to Sonora at night and the entire road would be illuminated by the campfires of the travelers*."[26] As early as 1850, there was discussion of building a bridge at, or near, the ferry crossing, but it did not happen for several years.

In 1849, New England machinist David M. Locke (b.1825) was passing through Knight's Ferry and noticed an ideal location for a mill just upstream from the ferry crossing. Locke returned to Knight's Ferry in 1853 to construct a dam, a sawmill and a grist mill. In 1855, gold was discovered along the banks of the Stanislaus River, and the Dent brothers platted the town of Knight's Ferry (originally, "Dentsville") on the hillside just north of the river. Within a year, the thriving industrial village was home to 800 inhabitants, leading a local newspaper correspondent to write:

> During the last year a large town or village has sprung into existence here, and improvements still increase. There is one thing, however, which has retarded the growth somewhat—the high price of lots. …Another reason is, we have only a ferry boat, whereas we want a bridge. The traveling community demanded the latter, and for want of it, much of the travel which has formerly passed through here now goes to Six Mile Bar. This can be prevented. All we want is a few enterprising men with capital to come in here and in less than one year we can boast of as large and enterprising a city as Columbia or Sonora. Our facilities are greater, we have the never-failing Stanislaus taking its course through our village, and as there are miles of good pay dirt with the rich placers at Keeler's Ferry, why should not we boast of our future prospect.[27]

On November 1, 1856, David Locke purchased the Dents' ferry franchises at Knight's Ferry and Keeler's Ferry, along with timber "for the bridge intended to be built" at Knight's Ferry, for $26,000.[28] Soon thereafter, work began on a bridge adjacent to Locke's Mills, about a half-mile above the original river crossing at Knight's Ferry. That bridge, originally known as "Locke's Bridge," was a non-housed timber truss structure, with timber trestle approaches.[29] It was completed by January 7, 1857, when Stanislaus County issued David Locke a toll bridge license.[30] One month later, a new road connecting this crossing with the Sonora Road was declared a public highway.[31]

In the spring of 1858, a group of local ferrymen and bridge owners, led by David Locke, organized the Stanislaus Bridge & Ferry Company to operate toll bridges at Two Mile Bar and Knight's Ferry, along with the ferry boat at Keeler's Ferry, thereby creating a local monopoly of Stanislaus river crossings for a distance of about four miles.[32] On July 26, 1858, David Locke sold the Knight's Ferry Bridge and Keeler's Ferry to the Stanislaus Bridge & Ferry Company for $27,000, but maintained a controlling interest in the company.[33]

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[25] John F. Criswell, *Knight's Ferry's Golden Past* (Knight's Ferry, California: John F. Criswell, 1972), 11.

[26] David W. Tulloch, "Tulloch Grandson Tells Town History," *The Oakdale Leader*, May 25, 1939.

[27] San Francisco Bulletin, 7 May 1856.

[28] I. N. "Jack" Brotherton, "A Brief History of Knight's Ferry and Buena Vista," unpublished manuscript, May 1977, 9.

[29] Some modern sources suggest that the first bridge at this site was designed by the Dent's brother-in-law, Gen. Ulysses S. Grant (1822-1885). Grant visited Knight's Ferry several times in the early 1850s, but there is no written evidence that he designed the bridge.

[30] Even though Knight's Ferry was still located in San Joaquin County at this date, the river formed the northern boundary of Stanislaus County, and Stanislaus County had authority to issue licenses for ferries and bridges on the river.

[31] Stanislaus County Board of Supervisors, *Records*, Book 1, 157.

[32] The Stanislaus Bridge & Ferry Company was formed by: G.J. Slocum, William H. Qualls and Thomas E. Bell of Two Mile Bar; D.M. Locke of Knight's Ferry; A.N. Bell of Angel's Camp; and J.F. Grover of San Pablo Creek. [Brotherton, "A Brief History of Knight's Ferry and Buena Vista," 10.]

[33] Stanislaus County, *Deeds*, Book 1, 324.

In December 1861, a period of heavy snowfall followed by a period of warm rain in the Sierra Nevada resulted in massive flooding throughout the San Joaquin Valley. On January 11, 1862, the Stanislaus River rose three to four feet per hour, until it peaked at 35 feet above low water level. The town of Knight's Ferry was nearly destroyed and the bridge at Two Mile Bar was swept down the river, where it took out the Knight's Ferry Bridge. Damages were estimated at $115,300, with the biggest losses incurred by the Stanislaus Flour Mill ($30,000) and the Stanislaus Bridge & Ferry Company ($20,000).[34]

Within a month, the Stanislaus Bridge & Ferry Company obtained permission from the California State Legislature to rebuild the bridges at Two Mile Bar and Knight's Ferry.[35] During construction, the ferry boats were pressed back into service. Construction began on the Knight's Ferry Bridge in March 1862 and the new bridge was opened to traffic on May 30, 1863. The new Knight's Ferry Bridge was more substantially built than its predecessor, and was placed eight feet higher above the river, to protect it from flood waters.

For the next few years, the bridge was a profitable enterprise, but traffic gradually lessened as mining in the area declined. As time went on, there was increasing public outcry for a toll-free crossing. On August 5, 1872, citizens of Knight's Ferry petitioned the county for the establishment of a public ford, as a means of avoiding the toll bridge, but the petition was dismissed.[36] Two years later, the Stanislaus County Board of Supervisors appointed a commission to investigate the possible purchase of the Knight's Ferry Bridge. The commission assessed the value of the bridge at $14,000, but the bridge company refused to sell.[37] Another decade would elapse before the county revisited the issue. On June 10, 1884, another commission was appointed to look into the matter. They appraised the bridge at $7,000, and over the next several months, an agreement was reached with the Stanislaus Bridge & Ferry Company. On November 12, 1884, Stanislaus County formally purchased the Knight's Ferry Bridge for $7,000.[38] After 36 years, Knight's Ferry had a free river crossing.

Knight's Ferry's heyday lasted two decades. As the gold rush drew to a close, the railroad bypassed the community in 1871, and the county seat moved from Knight's Ferry to Modesto. Individuals and businesses moved to Oakdale, Modesto, San Francisco, and other growing urban centers, and the once-thriving village shifted its focus to supplying goods and services to surrounding farms and ranches. In 1890, Charles Tulloch (dates unknown) moved the operations of the Stanislaus Flour Mill from Knight's Ferry to Oakdale. The former mill was converted for use as a hydro-electric power plant, which provided power for Knight's Ferry and surrounding communities until 1927. In the mid-twentieth century, the hamlet of Knight's Ferry experienced a revival as an artist's colony and tourist attraction.

Knight's Ferry Bridge continued to carry traffic as a county bridge, but by the mid-20th century, heavier and faster vehicles were beginning to take a toll on the aging span. In 1955, *Mother Lode Magazine* reported: "[The bridge] *is still in a good state of repair and is in constant use by area residents and sightseeing tourists*."[39] Within two decades, the county found it necessary to install traffic signals at each end of the bridge. In 1981, county engineers discovered cracked timbers in the bridge deck and decided to close the structure.[40] Traffic was redirected over a temporary bridge until a new concrete and steel bridge was completed about a quarter mile upstream in 1987. On April 18, 1985, Stanislaus County transferred ownership of the covered bridge to the U.S. Army Corps of Engineers, Sacramento District. Today, the bridge serves as a pedestrian bridge and focal point

[34] A Memorial and Biographical History of the Counties of Merced, Stanislaus, Calaveras, Tuolumne and Mariposa, California (Chicago: Lewis Publishing Company, 1892), 135.
[35] *Statutes of the State of California*, Chapter 26, 1862 (Sacramento, 1863.)
[36] Stanislaus County Board of Supervisors, *Records*, Book 3, 295.
[37] Ibid., Book 3, 634.
[38] Ibid., Book 6, 102-103.
[39] "Knight's Ferry's Big Bridge," *Mother Lode Magazine*, September 1955.
[40] Sandy Wood, "Knight's Ferry Covered Bridge," *Covered Bridge Topics*, Vol. 41, No. 3 (Summer 1983), 5.

for the Knight's Ferry Recreation Area, one of several parcels of land along the river developed in the 1970s and 80s as part of the New Melones Dam flood-control project.[41]

The bridge was restored in 1988-1991 by renowned covered bridge specialist Milton S. Graton (1908-1994), at a cost of $492,000. Over the course of a career that spanned four decades, Milton Graton and his sons built seven new covered bridges, and repaired many more, like Knight's Ferry Bridge, using traditional materials and framing techniques. The restoration of Knight's Ferry Bridge involved repairs to both the superstructure and substructure, along with replacement of the roof, siding, and deck.[42] In addition, previous alterations, including pedestrian walkways (1918) and chain-link fences (1970) were removed.[43] Today, the bridge is well-maintained as a local landmark and tourist attraction.

Development of Timber Truss Bridges in America: The Howe Truss

The first half of the 19th century saw a great technological advancement in the design and construction of timber bridges in America. Between 1790 and 1840, timber bridge forms evolved from rudimentary pile-and-beam spans to scientifically designed, long-span trusses capable of carrying railroad loadings. The demand for roads and bridges, which grew rapidly after the American Revolutionary War, coupled with access to abundant forests, spurred the development of timber bridge design.[44] These advancements were evolutionary in nature, each responding to a particular aspect of the challenge confronting bridge builders: to create economical and efficient structures that could span long distances, that were easy to erect and maintain, and that were strong enough to carry heavy moving loads. Broadly speaking, the major advancements made in American timber bridge building can be credited to the truss designs patented by five individuals: Timothy Palmer (1751-1821), Theodore Burr (1771-1822), Ithiel Town (1784-1844), Col. Stephen H. Long (1784-1864), and William Howe (1803-1852).

Creating spans greater than the length of a single log or beam was one of the initial challenges facing timber bridge builders and this required construction of a frame structure known as a truss. The truss, which utilizes the stable geometry of the triangle to carry a load, has been used for centuries for centering masonry arches and for roof construction. A truss is an assemblage of members joined together to form a series of interconnected triangles that carry loads by alternately pushing and pulling the individual members; it is the most efficient way to build long spans of wood.[45]

The Knight's Ferry Bridge employed one of the most popular designs, the Howe Truss. The Howe truss was a highly successful patented design that was the culmination of nearly a half-century of timber bridge evolution in America. In the 1830s, demand increased for standardized bridges that could be rapidly erected to keep pace with the growth of the nation's railroad network. In 1840, Massachusetts millwright William Howe (1803-1852) patented a timber truss with parallel chords connected by diagonal wood compression members and vertical iron tension members.[46] The Howe truss improved on the 1830 Long truss by using adjustable wrought iron

[41] Located 12 miles upstream, the New Melones Dam replaced an earlier dam constructed by the U.S. Bureau of Reclamation in 1926.

[42] Limited documentation has been found concerning the restoration as Milton Graton typically worked without plans or specifications. He also typically used traditional construction techniques and in-kind materials to replace historic components, so any repairs are not immediately obvious. This is reflected in the fact that no repairs are noted in the 2011 HAER drawings.

[43] Joseph D. Conwill, "Knight's Ferry Revisited." *Covered Bridge Topics*, Vol. 50 No. 4 (Fall 1992), 3-4.

[44] Between 1791 and 1860, more than 50 bridge patents were granted, but only a few bridge designs gained widespread acceptance.

[45] Only six extant covered bridges are not truss bridges: three tied arch bridges in Vermont and three polygonal arch bridges in Virginia.

[46] William Howe, United States Letters Patent No. 1,711, 3 August 1840. Howe received another patent in 1846 and a reissue in 1850, but the design of most Howe truss bridges was simpler than that shown in the patent drawings.

rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient pre-stressing of the members. Railroads favored the Howe truss design because it had standardized framing connections and could be quickly erected and easily adjusted. The American Society of Civil Engineers termed the Howe truss, "the most perfect wooden bridge ever built; others have been designed of greater theoretical economy; but for simplicity of construction, rapidity of erection, and general utility it stands without rival."[47] Used extensively for railroad bridges during the mid-nineteenth-century, the wood-iron Howe truss was gradually superseded by iron and later steel structures, but the type remained one of the most important timber truss types throughout the 19th century, and it saw a revival in Oregon after World War I, when steel shortages, coupled with readily available timber, led to a new era of covered bridge building. Hundreds, perhaps thousands, of timber Howe truss covered bridges once existed in the United States; about 110 historic (pre-1955) examples survive (primarily in the Midwest and Pacific Northwest), with dates ranging from 1854 to 1954. Knight's Ferry Bridge is an outstanding example of this truss type, but also reflects regional variations. As was occasionally found in covered bridges in the west, the chords consist of a series of planks stacked on the flat and laminated, rather than several planks set on edge and bolted together. Also, the floor beams are suspended from the lower chords rather than seated on top of the chords.

Conclusion

Knight's Ferry Bridge is an outstanding example of a timber Howe truss, one of the most successful and widely-used American timber truss types. Patented by William Howe (1803-1852) in 1840, the Howe truss was a ground-breaking design that used adjustable wrought iron rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient pre-stressing of the members. It is one of the most visually impressive and structurally intact of approximately 110 historic (pre-1955) Howe truss covered bridges surviving in the United States.

Although gold mining ceased long ago, and the bridge was bypassed in 1981, Knight's Ferry Bridge and its picturesque setting possess a high level of aesthetic and historic integrity that conveys a sense of the nineteenth-century Old West.[48] The original transportation corridor is still used by pedestrians and equestrians, and the bridge is maintained as an historic landmark and tourist attraction. The bridge is a contributing structure to the Knight's Ferry Historic District, which was listed in the National Register of Historic Places in 1975.

[47] "Bridge Superstructure," Transactions of the American Society of Civil Engineers, 1878, 340.

[48] Located two miles south of Knight's Ferry, Willms Ranch (1852) was a location used for filming *Bonanza* and *Little House on the Prairie* in the 1970s, which is indicative of the area's picturesque landscape.

Chronology

1805 America's first covered bridge completed at Philadelphia

1806 Spanish army officer Lt. Gabriel Moraga (1765-1832) discovers the Stanislaus River

1840 William Howe (1803-1852) patents the Howe truss

1844 John C. Fremont's (1813-1890) expedition camps near this site on the Stanislaus River

1848 James W. Marshall (1810-1885) discovers gold at Sutter's Mill near Coloma, California

1849 California gold rush begins
Capt. William Knight (d.1849) and Capt. James Vantine (b.1827) establish a ferry near this site
Capt. William Knight killed in a gun fight at Knight's Ferry
Captain Vantine partners with Lewis Dent (1824-1874) and John Dent (b.1831) in ferry franchise

1850 John T. Little (1820-1891) builds California's first covered bridge at Salmon Falls
California enters the Union

1852 Captain Vantine sells his interests at Knight's Ferry to Lewis and John Dent
California gold country covers an estimated 20,000 square miles

1853 David M. Locke (b.1825) erects a sawmill and grist mill near this site

1854 David Locke's mills begin operation
Stanislaus County formed from part of Tuloumne County

1855 Placer gold mining operations commence at Knight's Ferry
John Dent plats the village of Knight's Ferry

1856 David Locke purchases the Dent's ferry franchise for $26,000, including timber for a proposed bridge
Knight's Ferry population 800

1857 David Locke receives license to operate a toll bridge at Knight's Ferry
David Locke sells flour mill to Hestries & Magendie of Stockton

1858 Stanislaus River bridge and ferry owners organize the Stanislaus Bridge & Ferry Company
David Locke sells bridges at Knight's Ferry and Two Mile Bar to Stanislaus Bridge & Ferry Company

1859 David W. Tulloch (d.1886) invests in Stanislaus Flour Mill with Hestries & Magendie

1861 Knight's Ferry annexed to Stanislaus County
David Locke's sawmill ceases operation

1862 January flood destroys much of Knight's Ferry, including flour mill and Knight's Ferry Bridge
Construction begins on present Knight's Ferry Bridge
Stanislaus County seat moves from LaGrange to Knight's Ferry

1863 Knight's Ferry Bridge opened to traffic May 30
David Tulloch rebuilds flour mill at Knight's Ferry

1866 Lawrence & Houseworth of San Francisco publish photographs of Knight's Ferry

1869 Thomas Roberts (b.1823) purchases a controlling interest in the Knight's Ferry Bridge

1871 Stockton-Visalia Railroad bypasses Knight's Ferry; Oakdale founded

Stanislaus County seat moves from Knight's Ferry to Modesto

1875 Knight's Ferry Bridge appraised at $14,000

1880 Knight's Ferry population 200

1884 Stanislaus County buys Knight's Ferry Bridge for $7,000 and makes it a free bridge

David Tulloch turns operation of flour mill over to his son, Charles Tulloch

1885 Knight's Ferry Bridge wood shingle roof replaced with metal

1890 Charles Tulloch moves flour mill operations from Knight's Ferry to Oakdale

1895 Charles Tulloch converts Stanislaus Flour Mill at Knight's Ferry to hydro-electric power plant

1918 Knight's Ferry Bridge deck rebuilt

1927 Knight's Ferry hydro-electric power plant ceases operation

1931 Knight's Ferry Bridge pictured in Rosalie Wells' (b.1876) book, *Covered Bridges in America*

1934 Knight's Ferry Bridge recorded by the Historic American Buildings Survey (HABS)

1956 Stanislaus Flour Mill (Tulloch Mill) burns

1975 Knight's Ferry Historic District listed in the National Register of Historic Places

1981 Knight's Ferry Bridge bypassed and closed to traffic; temporary bridge erected nearby

1982 Stanislaus Flour Mill (Tulloch Mill) ruins stabilized

1985 Knight's Ferry Bridge transferred from Stanislaus County to U.S. Army Corps of Engineers

1987 New Stanislaus River Bridge completed at Knight's Ferry

1988 U.S. Army Corps of Engineers facilities completed at Knight's Ferry

Milton S. Graton (1908-1994) begins restoration of Knight's Ferry Bridge

1991 Restoration of Knight's Ferry Bridge completed

2002 Knight's Ferry Bridge recorded as part of HAER's National Covered Bridges Recording Project

2011 Knight's Ferry Bridge proposed for consideration as a National Historic Landmark

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Previous documentation on file (NPS):

__ Preliminary Determination of Individual Listing (36 CFR 67) has been requested.
_X_ Previously Listed in the National Register: Knight's Ferry Historic District [NRIS #CA-75000490, 1975]
__ Previously Determined Eligible by the National Register.
__ Designated a National Historic Landmark.
_X_ Recorded by Historic American Buildings Survey: HABS No. CA-158
_X_ Recorded by Historic American Engineering Record: HAER No. CA-314

Primary Location of Additional Data:

_X_ State Historic Preservation Office
__ Other State Agency
_X_ Federal Agency: U.S. Army Corps of Engineers Sacramento District, Knight's Ferry Visitor's Center
_X_ Local Government: Stanislaus County Courthouse, Modesto, California
__ University
_X_ Other (Specify Repository): McHenry Museum & Historical Society, Modesto, California

10. GEOGRAPHICAL DATA

Acreage of Property: Less than an acre

UTM References:	**Zone**	**Easting**	**Northing**
	10	705750	4188160

Verbal Boundary Description:

The property consists of the superstructure, housing, substructure and approaches of the Knight's Ferry Bridge spanning the Stanislaus River at Knight's Ferry, California. Overall, the superstructure is approximately 379 feet long, 22 feet deep (from the peak of the roof to the bottom of the floor beams) and 25 feet wide (including the overhanging eaves). The piers and abutments vary in height from approximately 16 feet to approximately 29 feet above the level of the river. A short, curved approach at the bridge's northern end and a long, straight approach at the southern end are flanked by whitewashed board fences along the roadway. The structure sits on a NW-SE axis approximately a half mile southeast of the historic village of Knight's Ferry.

Boundary Justification:

The property boundary includes the essential components of the bridge: the superstructure, including the trusses, floor system, and bracing systems; the housing, including the siding and roof; the substructure, including abutments, piers and foundations; and the roadway approaches to the structure.

11. FORM PREPARED BY

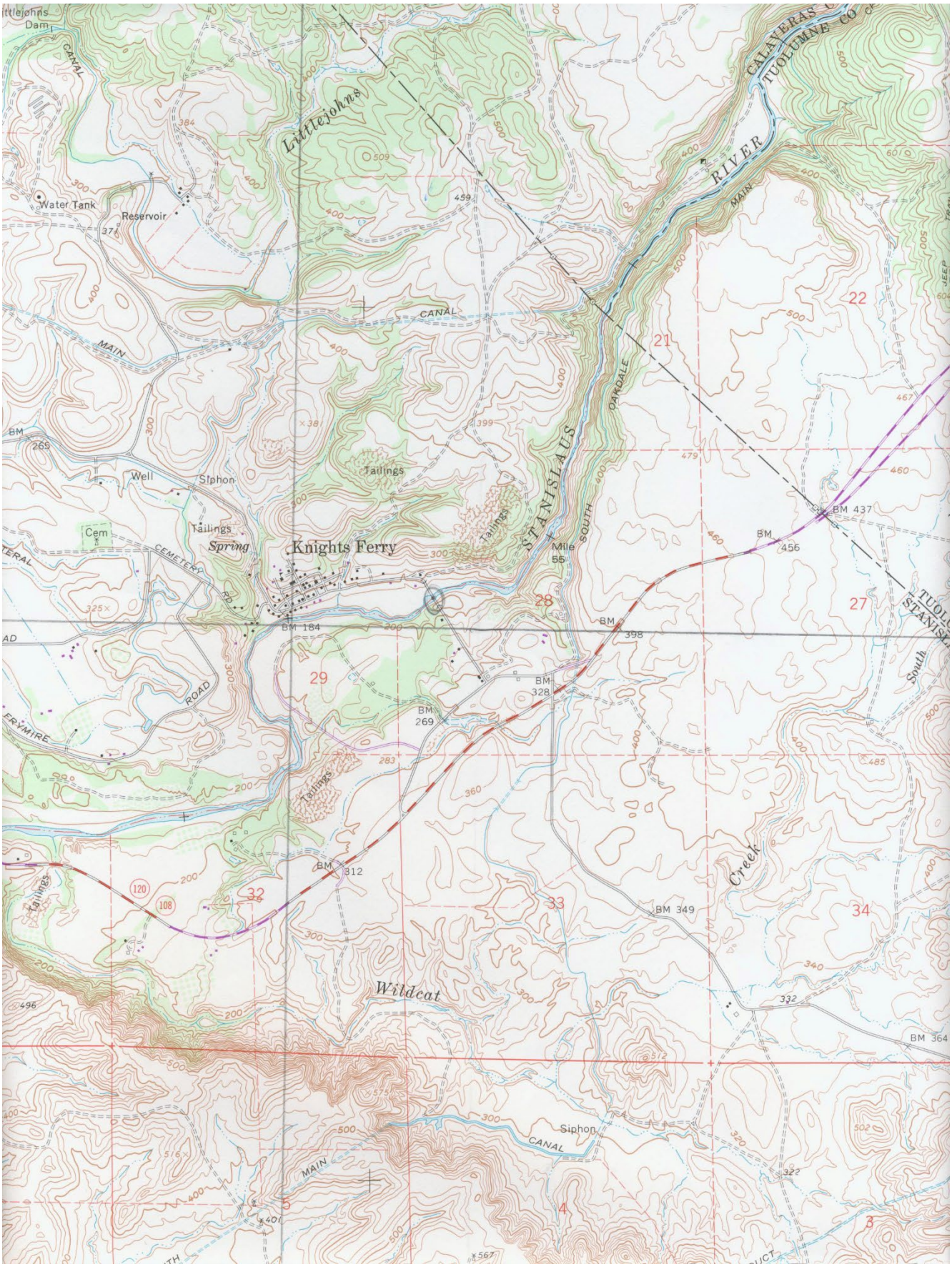
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NATIONAL HISTORIC LANDMARKS PROGRAM



USGS Map Showing Location of Knight's Ferry Bridge



KNIGHT'S FERRY BRIDGE. General view to west.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-17]



KNIGHT'S FERRY BRIDGE. Oblique perspective from southeast portal.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-3]



KNIGHT'S FERRY BRIDGE. Southeast portal elevation.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-2]



KNIGHT'S FERRY BRIDGE. Perspective view to southeast from midstream pier.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-13]



KNIGHT'S FERRY BRIDGE. Floor system detail at northwest abutment.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-11]



KNIGHT'S FERRY BRIDGE. Interior from southeast portal.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-9]



KNIGHT'S FERRY BRIDGE. Truss detail.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-4]



KNIGHT'S FERRY BRIDGE. Top chord connection detail.
Photograph by Jet Lowe, 2004
[HAER No. CA-314-6]



"Knights Ferry and the Stanislaus River from the West," showing present Knight's Ferry Bridge (background).
A flume carries water across the Stanislaus River at Knight's Ferry (foreground).
Lawrence & Houseworth, Publisher, 1866.
Courtesy of the Library of Congress, LC-USZ62-27457



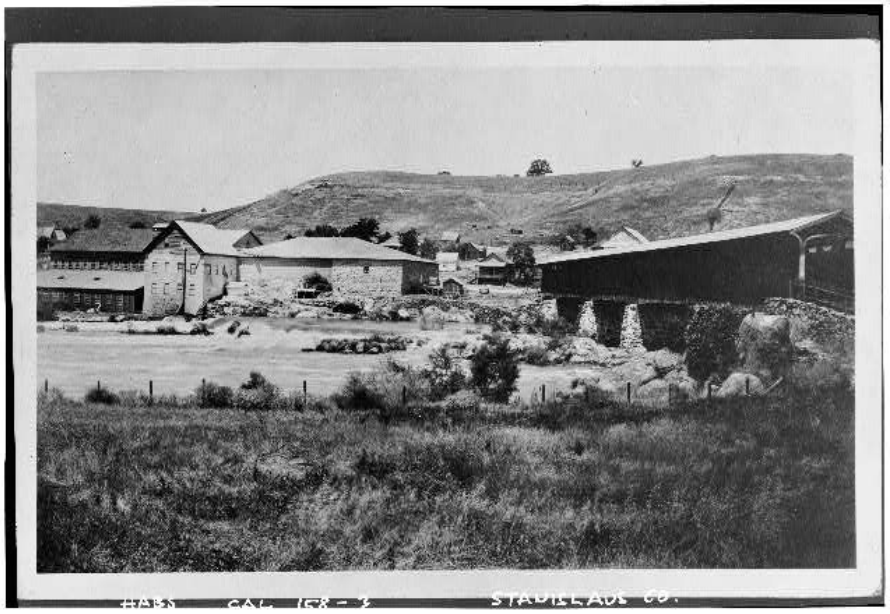
Knight's Ferry, Stanislaus River, General View from the East, Stanislaus County.
Lawrence & Houseworth, Publisher, 1866.
Courtesy of the Library of Congress, LC-USZ-62-27119



Stanislaus Flour Mill from the Bridge over the River at Knight's Ferry, Stanislaus County.
Lawrence & Houseworth, Publisher, 1866
Courtesy of the Library of Congress, LC-USZ-6-529



Stanislaus Flour Mill and Bridge at Knight's Ferry, Stanislaus County, California.
Lawrence & Houseworth, Publisher, 1866
Courtesy of the Library of Congress, LC-USZ-6-528



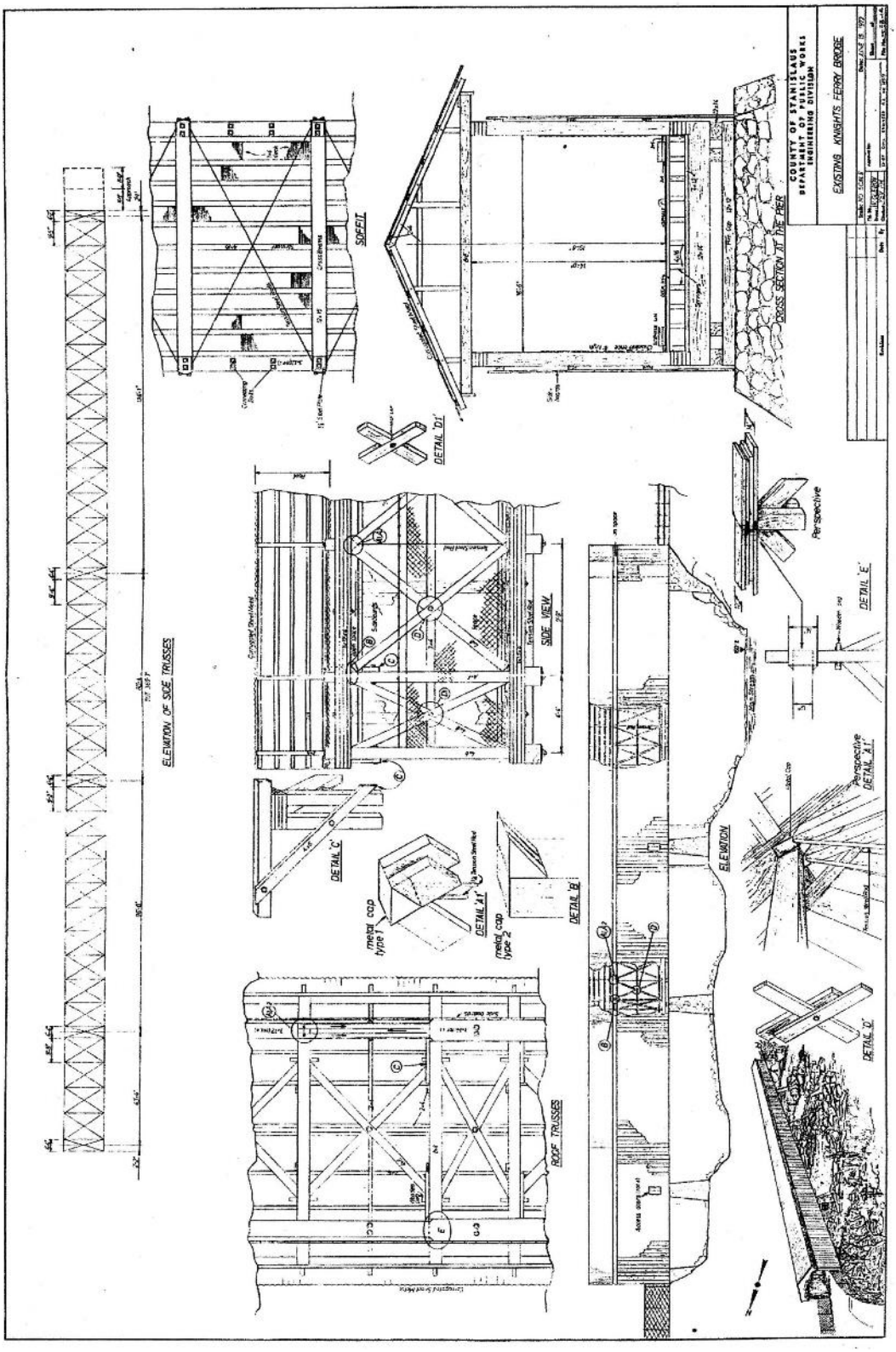
Tulloch Mill and Knight's Ferry Bridge.
Tulloch Collection reproduction, date unknown.
[HABS No. CA-158-1]



KNIGHT'S FERRY BRIDGE. General view from northwest.
Photograph by Roger Sturtevant, 1934
[HABS No. CA-158-2]



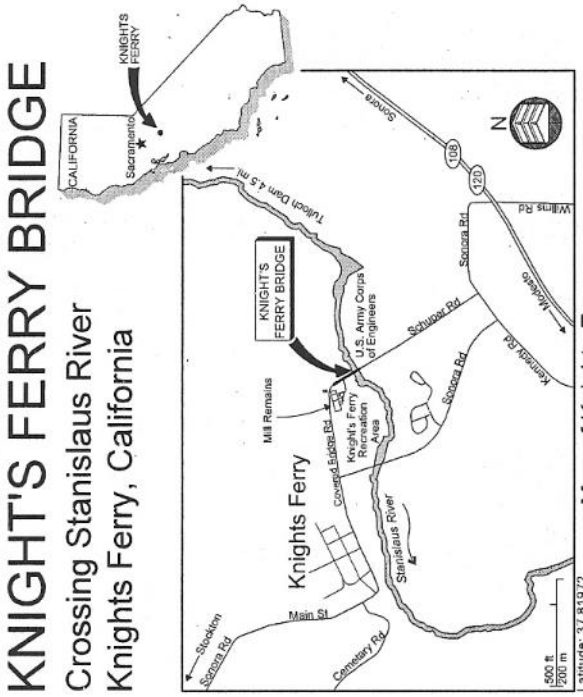
KNIGHT'S FERRY BRIDGE. General view from southeast.
Photograph by Roger Sturtevant, 1934
[HABS No. CA-158-3]



Stanislaus County Department of Public Works, "Existing Knight's Ferry Bridge," 1972.

KNIGHT'S FERRY BRIDGE

Crossing Stanislaus River
Knights Ferry, California



Latitude: 37.819/2
Longitude: -120.67111

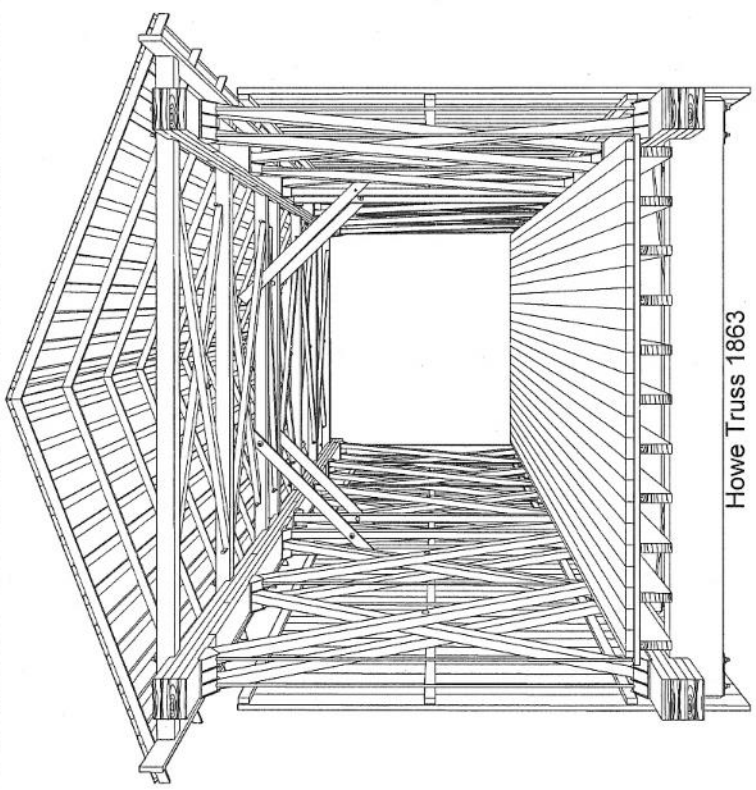
Map of Knights Ferry

The Knight's Ferry Bridge spans the Stanislaus River in a picturesque natural and historical setting at the interface of the rolling Sierra Nevada foothills and the fertile farmlands of California's Central Valley. The town was established in 1848 as a ferry crossing on the Sonora Road, one of the principal overland routes used by miners traveling between the Central Valley and the southern mines during the California gold rush. The high volume of traffic combined with the establishment of a substantial flour mill enabled Knight's Ferry to quickly develop into a thriving industrial village, which also served as the seat of Stanislaus County from 1862 to 1871.

Knight's Ferry Bridge is an outstanding example of the Howe truss, one of the most successful and widely-used American timber bridge truss types. Patented by William Howe (1803-1852) in 1840, the Howe truss was a ground-breaking design that used adjustable wrought iron rods to overcome the inherent difficulty of creating tension connections in wood structures and allow for easier and more efficient pre-stressing of the members. At 379' long, the four-span bridge is the longest east of the Mississippi and one of the most visually impressive and structurally intact of over 100 historic Howe truss covered bridges surviving in the United States.

Knight's Ferry's Howe trusses reflect construction variations occasionally found in covered bridges on the West Coast. The chords consist of a series of planks laid on the flat and laminated, rather than multiple timbers set on edge and bolted together and the floor beams are suspended from the lower chords, rather than resting on them.

The present bridge was completed in 1863 to replace an 1857 non-housed timber truss bridge that was destroyed by a flood in 1862. Knight's Ferry Bridge served traffic for nearly 120 years, closing to traffic in 1981, and was restored in 1988-1991 by renowned covered bridge specialist Milton S. Graton.



Howe Truss 1863

Today, the bridge serves as a pedestrian bridge and focal point for the U.S. Army Corps of Engineers' Knight's Ferry Recreation Area, developed as part of the 1980s New Melones Dam flood-control project.

The National Covered Bridges Recording Project was undertaken by the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Heritage Documentation Programs Division (Richard O'Connor, Chief), a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration's National Historic Covered Bridge Preservation Program funded the project.

The 2011 HAER field team consisted of project leader Christopher H. Marston, HAER Architect, Jeremy T. Mauro, field supervisor, and Pavel Gorokhov, Catholic University. The drawings support earlier HAER documentation by historian Lola Bennett, and HAER photographer Jet Lowe, completed in 2004. The Knight's Ferry Bridge was documented using high definition surveying (HDS) technology. The data was collected with a Leica ScanStation 2 and Cyclone v7.3 software. The drawings were rendered using CloudWorx, an HDS plug-in for AutoCAD 2012.

DELINEATED BY: PAVEL GOROKHOV, 2011

NATIONAL COVERED BRIDGES RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

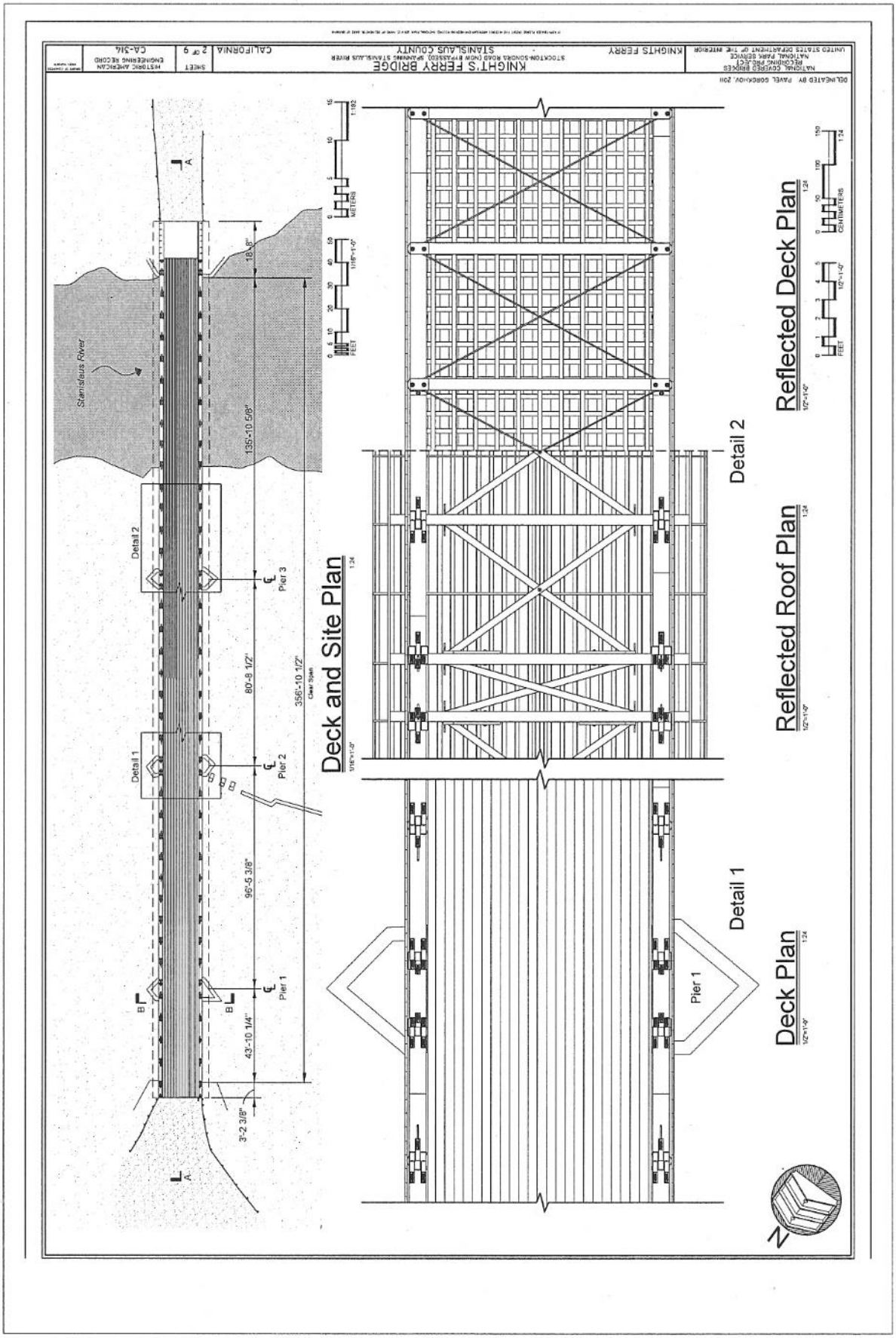
KNIGHTS FERRY

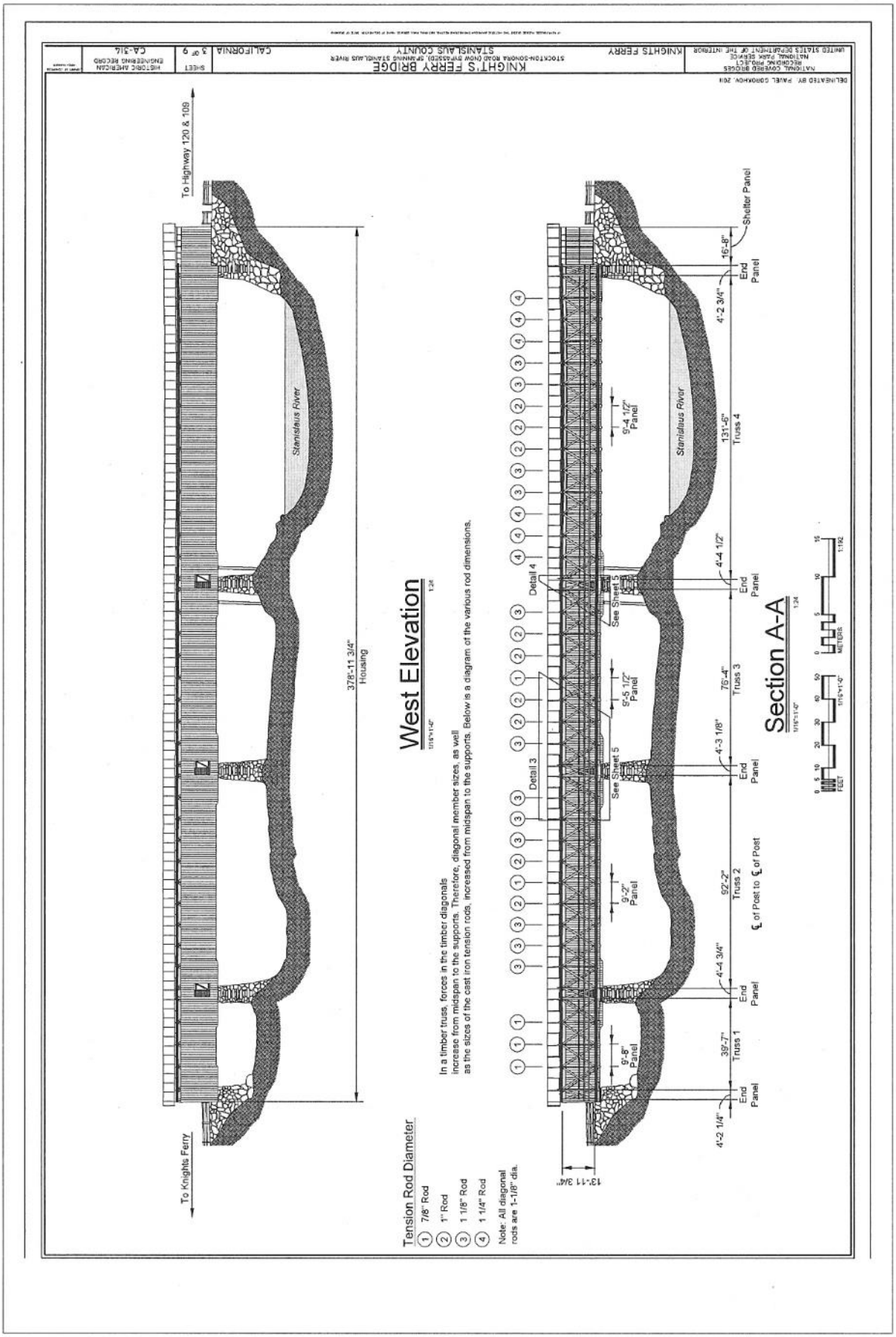
KNIGHT'S FERRY BRIDGE
STOCKTON-SONORA ROAD (NOW BYPASSED) SPANNING STANISLAUS RIVER
STANISLAUS COUNTY

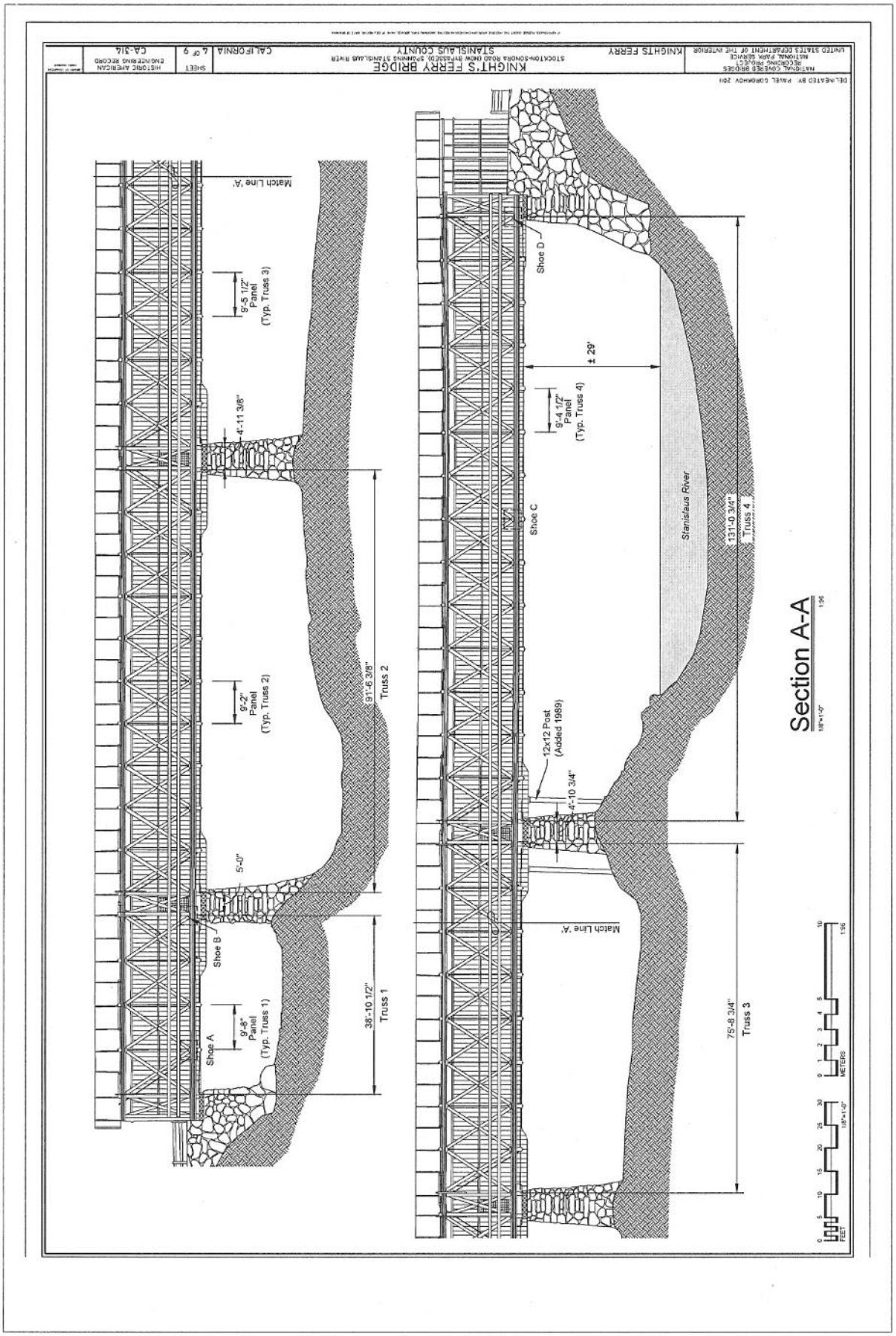
CALIFORNIA

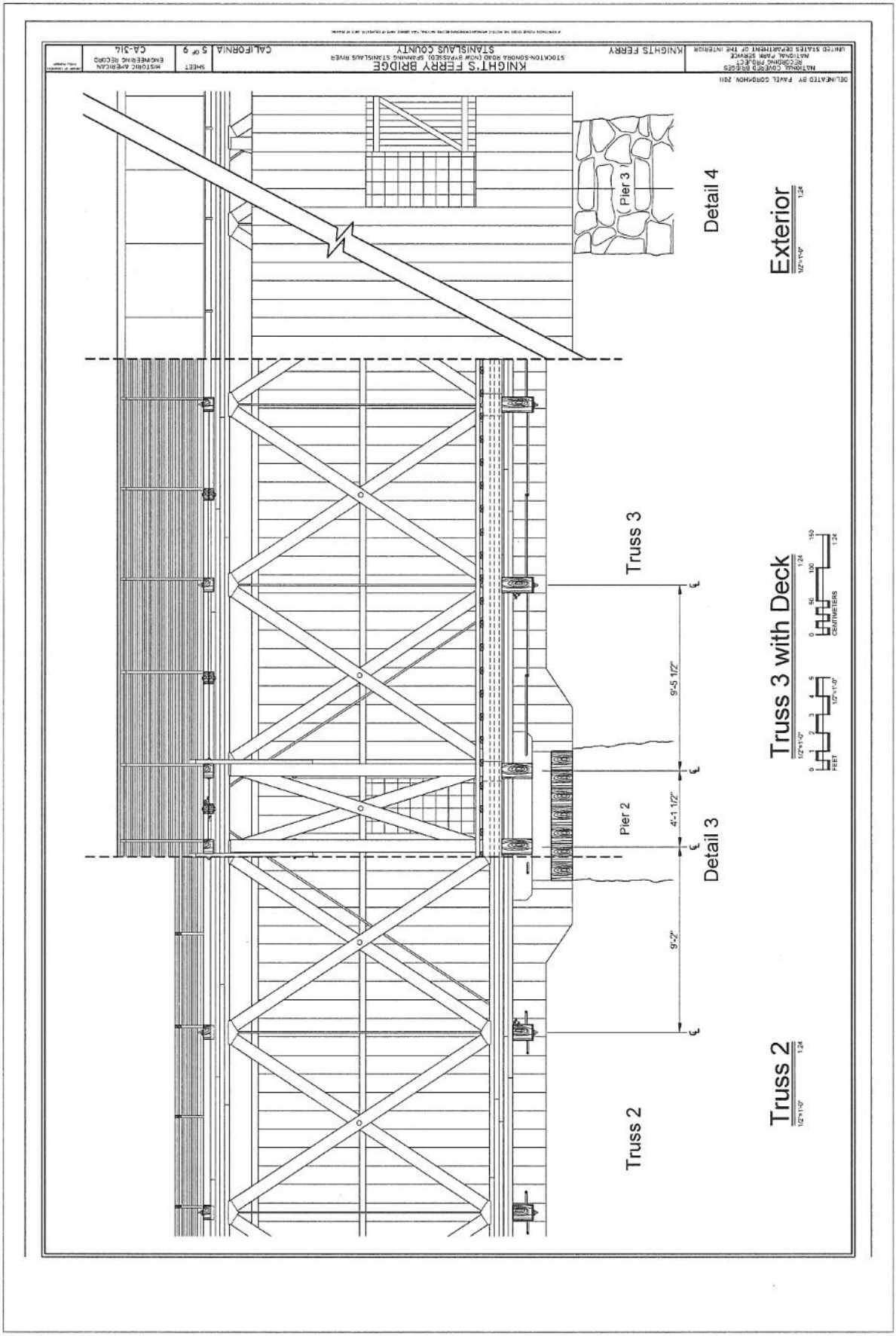
SHEET 1 OF 9

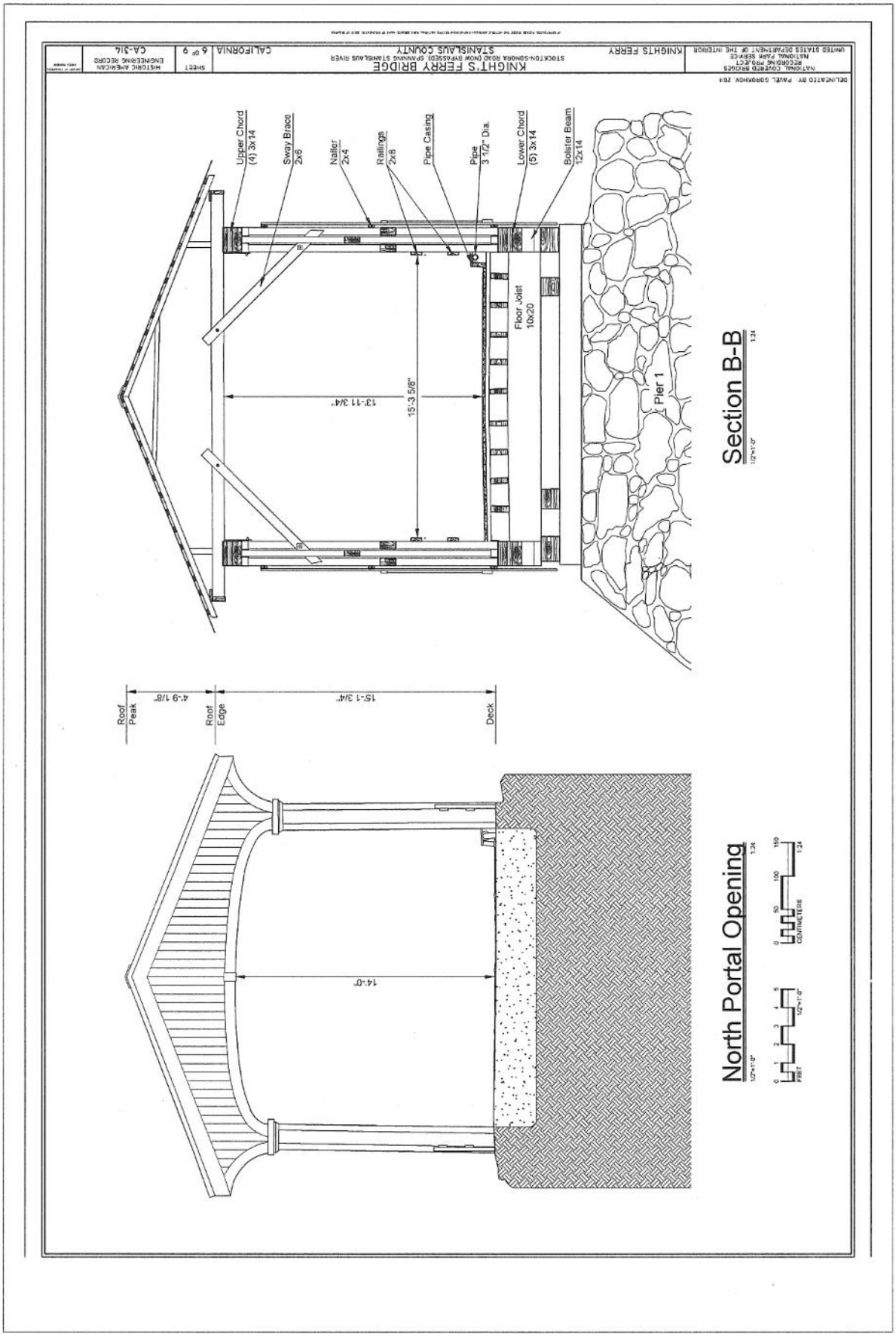
HISTORIC AMERICAN ENGINEERING RECORD
CA-314

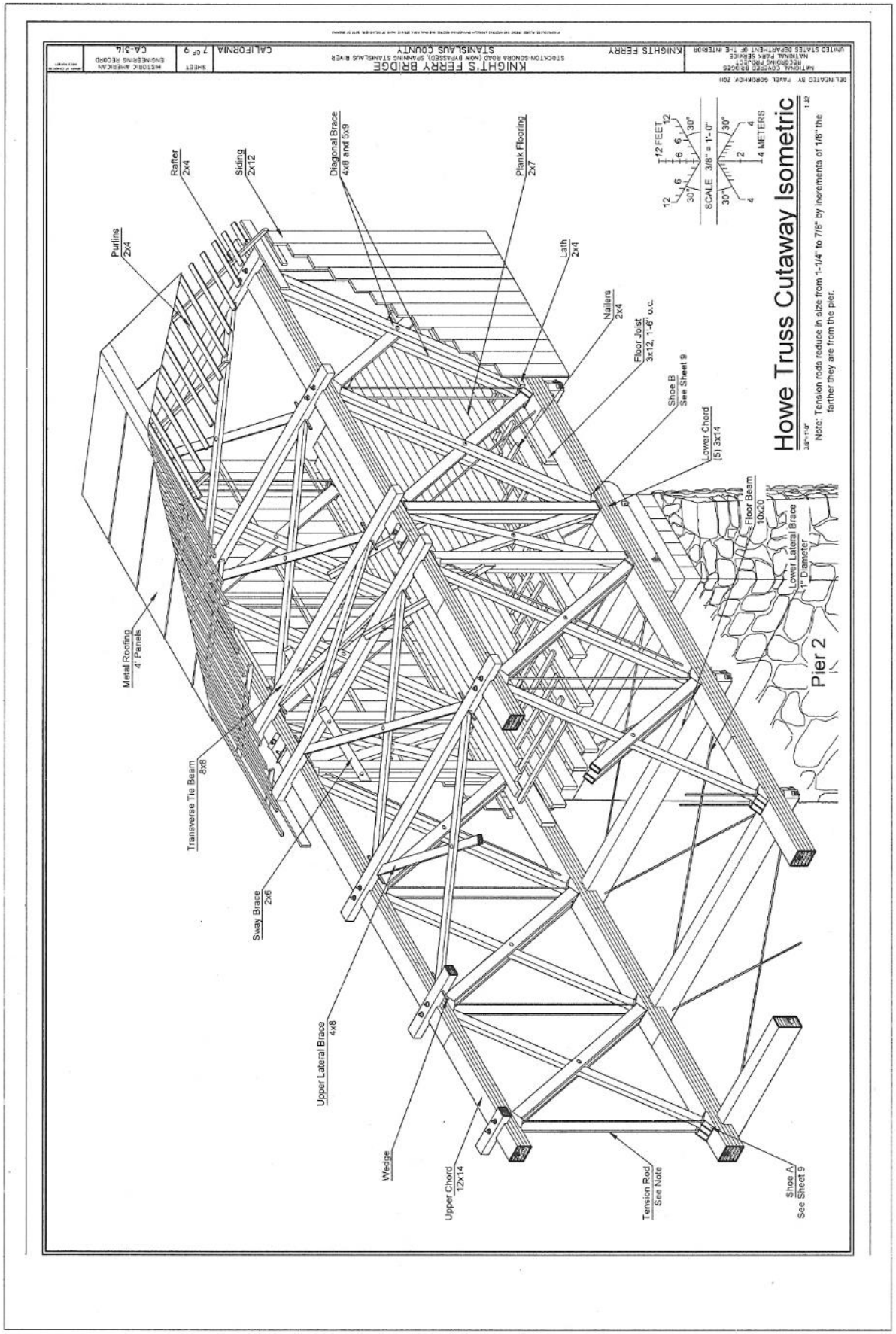

KNIGHT'S FERRY BRIDGE
KNIGHTS FERRY
STANISLAUS COUNTY
CALIFORNIA
Deck and Site Plan
Reflected Deck Plan
Reflected Roof Plan
Deck Plan
Detail 1
Detail 2
Pier 1
Pier 2
Pier 3
Stanislaus River
135'-10 5/8"
80'-8 1/2"
96'-5 3/8"
43'-10 1/4"
3'-2 3/8"
356'-10 1/2"
Clear Span
18'-8"

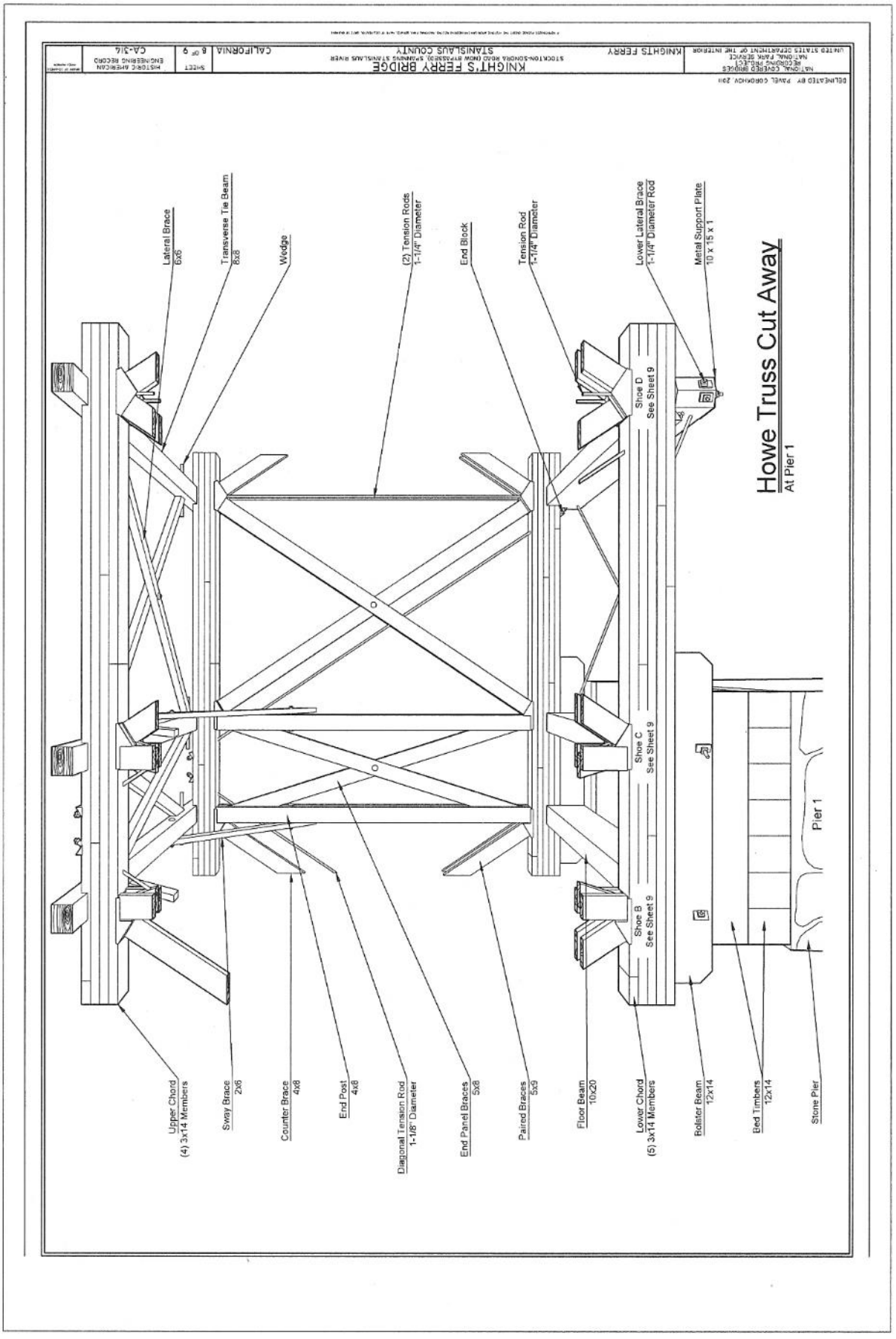

KNIGHT'S FERRY BRIDGE
STANISLAUS COUNTY
CALIFORNIA
KNIGHTS FERRY
CA-314
To Highway 120 & 109
To Knights Ferry
Stanislaus River
378'-11 3/4"
Housing
West Elevation
Section A-A
Shelter Panel
End Panel
Truss 1
Truss 2
Truss 3
Truss 4
Detail 3
Detail 4
See Sheet 5
See Sheet 6
9'-2" Panel
9'-5 1/2" Panel
9'-4 1/2" Panel
9'-6" Panel
of Post to of Post
In a timber truss, forces in the timber diagonals increase from midspan to the supports. Therefore, diagonal member sizes, as well as the sizes of the cast iron tension rods, increased from midspan to the supports. Below is a diagram of the various rod dimensions.
Tension Rod Diameter
1 7/8" Rod
2 1" Rod
3 1 1/8" Rod
4 1 1/4" Rod
Note: All diagonal rods are 1-1/8" dia.
FEET
METERS

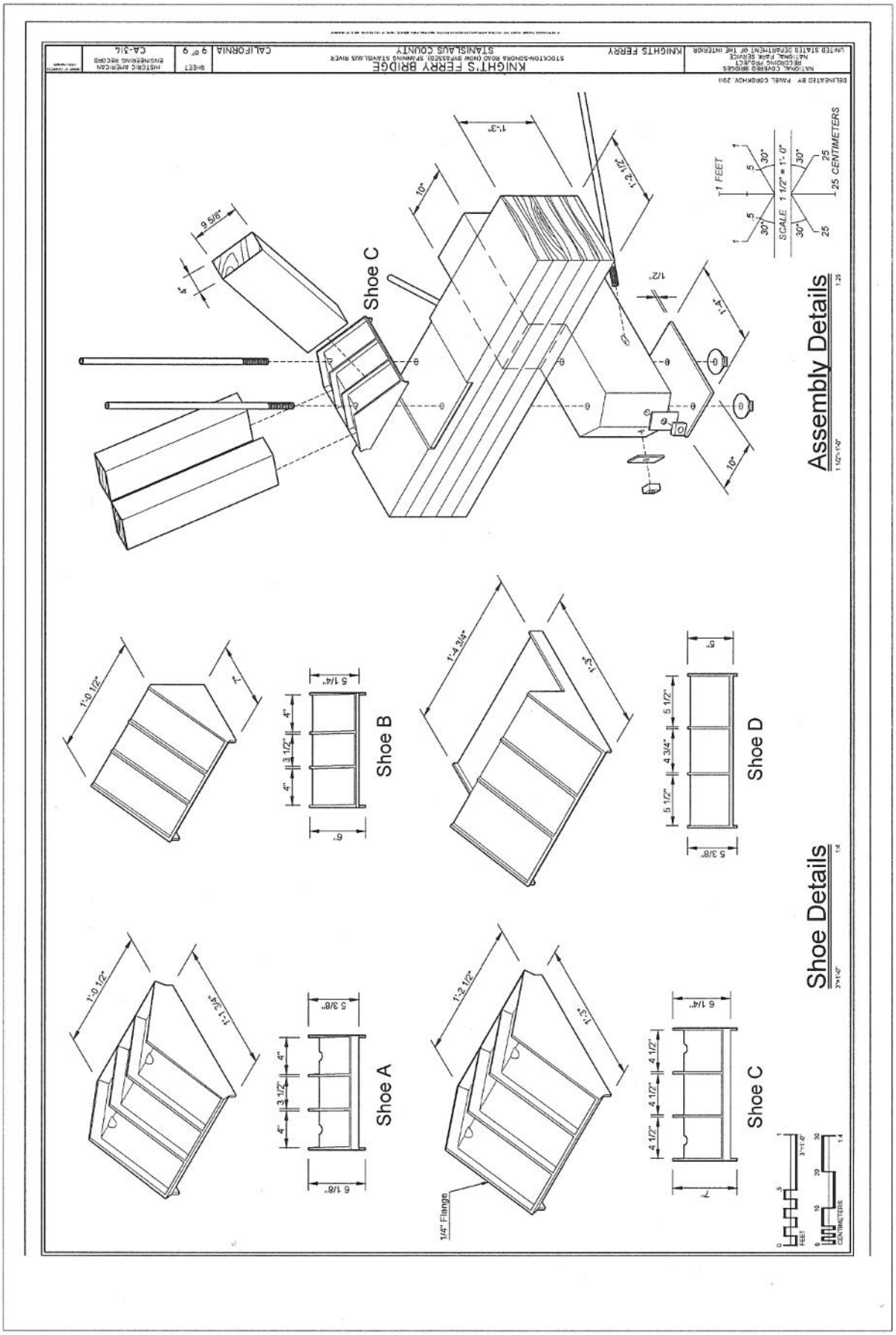

KNIGHT'S FERRY BRIDGE
KNIGHTS FERRY
STANISLAUS COUNTY
CALIFORNIA
Section A-A
Match Line 'A'
Shoe A
Shoe B
Shoe C
Shoe D
9'-8" Panel (Typ. Truss 1)
9'-2" Panel (Typ. Truss 2)
9'-5 1/2" Panel (Typ. Truss 3)
9'-4 1/2" Panel (Typ. Truss 4)
38'-10 1/2" Truss 1
97'-6 3/8" Truss 2
75'-8 3/4" Truss 3
131'-0 3/4" Truss 4
± 29'
5'-0"
4'-11 3/8"
4'-10 3/4"
12x12 Post (Added 1989)
Stanislaus River
FEET
METERS


KNIGHT'S FERRY BRIDGE
STANISLAUS COUNTY
CALIFORNIA
KNIGHTS FERRY
Pier 3
Detail 4
Exterior
Truss 3
Truss 3 with Deck
9'-5 1/2"
Pier 2
4'-1 1/2"
Detail 3
9'-2"
Truss 2
Truss 2
FEET
CENTIMETERS


KNIGHT'S FERRY BRIDGE
STANISLAUS COUNTY
CALIFORNIA
Upper Chord (4) 3x14
Sway Brace 2x6
Nailer 2x4
Railings 2x8
Pipe Casing
Pipe 3 1/2" Dia.
Lower Chord (5) 3x14
Bolster Beam 12x14
Floor Joist 10x20
Pier 1
13'-11 3/4"
15'-3 5/8"
Section B-B
Roof Peak
Roof Edge
Deck
4'-9 1/8"
15'-1 3/4"
14'-0"
North Portal Opening


KNIGHT'S FERRY BRIDGE
STANISLAUS COUNTY
CALIFORNIA
KNIGHTS FERRY
Howe Truss Cutaway Isometric
Note: Tension rods reduce in size from 1-1/4" to 7/8" by increments of 1/8" the farther they are from the pier.
SCALE 3/8" = 1'-0"
12 FEET
4 METERS
Rafter 2x4
Siding 2x12
Diagonal Brace 4x8 and 5x9
Plank Flooring 2x7
Purlins 2x4
Lath 2x4
Nailers 2x4
Floor Joist 3x12, 1'-6" o.c.
Shoe B See Sheet 9
Lower Chord (5) 3x14
Floor Beam 10x20
Lower Lateral Brace 1" Diameter
Pier 2
Metal Roofing 4' Panels
Transverse Tie Beam 8x8
Sway Brace 2x6
Upper Lateral Brace 4x8
Wedge
Upper Chord 12x14
Tension Rod See Note
Shoe A See Sheet 9


KNIGHT'S FERRY BRIDGE
STANISLAUS COUNTY
CALIFORNIA
KNIGHTS FERRY
Howe Truss Cut Away
At Pier 1
Lateral Brace 6x6
Transverse Tie Beam 8x8
Wedge
(2) Tension Rods 1-1/4" Diameter
End Block
Tension Rod 1-1/4" Diameter
Lower Lateral Brace 1-1/4" Diameter Rod
Metal Support Plate 10 x 15 x 1
Shoe D See Sheet 9
Shoe C See Sheet 9
Shoe B See Sheet 9
Pier 1
Upper Chord (4) 3x14 Members
Sway Brace 2x6
Counter Brace 4x8
End Post 4x8
Diagonal Tension Rod 1-1/8" Diameter
End Panel Braces 5x8
Paired Braces 5x9
Floor Beam 10x20
Lower Chord (5) 3x14 Members
Rolster Beam 12x14
Bed Timbers 12x14
Stone Pier


KNIGHT'S FERRY BRIDGE
STANISLAUS COUNTY
CALIFORNIA
KNIGHTS FERRY
STOCKTON-SONORA ROAD OVER STANISLAUS RIVER
CA-316
Assembly Details
Shoe Details
Shoe A
Shoe B
Shoe C
Shoe D
1/4" Flange