KALIALINUI BRIDGE
(Hansen Road Bridge)
Hansen Road and Kalialinui Stream
Kahului vicinity
Maui County
Hawaii

HAER HI-121
HAER HI-121

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD
PACIFIC WEST REGIONAL OFFICE
National Park Service
U.S. Department of the Interior
1111 Jackson Street, Suite 700
Oakland, CA 94607

HISTORIC AMERICAN ENGINEERING RECORD

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HAER No. HI-121

Location: Hansen Road and Kalialinui Stream
Kahului vicinity
Maui County, Hawaii

U.S.G.S. Paia, HI quadrangle 1997
7.5 Minute Series (Topographic) (Scale – 1:24,000) NAD83 datum.
Universal Transverse Mercator Coordinates: 04.767150.2310790

Lat./Long. Coordinates:
20° 52' 41.08" N
156° 25' 56.05" W

Date of Construction: Uncertain, probably 1920s-1930s

Owner: Maui County

Present Use: Vehicular bridge

Significance: Kalialinui Bridge is significant for its association with the Hawaiian Commercial & Sugar (HC&S) Company, a major sugar plantation and mill on Maui. The bridge facilitated transportation of cut cane along Hansen Road from HC&S' eastern fields to the mill at Puunene.

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Date of Report: April 2014

DESCRIPTION:

Kalialinui Bridge is a reinforced concrete, flat slab bridge that carries the two traffic lanes of Hansen Road over the Kalialinui Stream. It is located about 700' southwest of the intersection of Hansen Road and the Hana Highway, about two miles southeast of Kahului, Maui. The setting around the bridge is rural, with nearby agricultural fields to the west, north and east. The dry streambed has a profusion of trees, shrubs and grass.

The bridge is about 33' long and has a width of 23'-10" that includes the 18'-6" wide, asphalt-surfaced two-lane roadway and shoulders measuring approximately 2'-8" on each side. The outboard edges of the bridge deck have low concrete curbs, 5" high and 8" wide. The curb on the southeast edge is 26'-7" long and the curb on the northwest edge is 32'-9" in length. In the top surface of each curb are vertically imbedded sections of 2" diameter metal pipe as posts, on a spacing of about 5'-2" to about 5'-5". The southeast curb has six posts and the northwest curb has seven posts. Vehicle impact has bent most of these pipe posts to a near horizontal position and shorn two posts off entirely at the top of the curb. One pipe post at the end of the northwest curb measures about 2'-6" and retains a 2" pipe elbow at its top end. This indicates that the historic bridge railing was 2" pipe posts with a 2" pipe rail (on tees and elbows) at a height about 2'-6" above the curb. The outer vertical surfaces of the bridge, below the curbs, are each about 2'-3" high (measured from the top of the curb to the bottom of the bridge deck slab) and show the impressions of the horizontal boards used in forming.

At the east end of the southeast (upstream) curb is a concrete wing wall, measuring 8" thick, extending out 9'-6" in length at an approximate right angle to the curb. This wing wall has bi-level top surface; the 2'-4" long portion nearest the curb has an overall height of 2'-10" above grade on the outboard side and the remaining 7'-3" long portion has a height of 1'-6" above the outboard grade. Both sections of wing wall have a 1'-1" wide, coping with flat top but hipped edges creating approximate 2" overhangs. The sides of the wing wall show the impressions of the horizontal boards used in forming it. At the west end of the southeast (upstream) curb, a section of steel railroad track, measuring a little over 2" both across the base and from base to top of head. It is imbedded vertically in the earth, projecting up about 1'-6" above grade.

Another concrete wing wall with horizontal board impressions and a typical coping, as described above, extends from the west end of the northwest (downstream) curb. This wing wall is 6'-6" long; its single-level top surface is only about 3" higher than the curb, and it forms an approximately 60-degree angle with the curb.

The central part of the flat underside of the concrete slab (or deck) of the bridge shows the transverse impressions of the boards used in forming. At the upstream and downstream edges, the underside of the deck has added concrete sections along its length that show the impression of longitudinal forming boards. The added concrete strips are about 3' in width, at both edges of the deck. They could have been added either to cover repairs of spalling or to widen the bridge.

Viewed in plan, the vertical abutments are angled, which results in a varying span. The span is about 19' at the downstream side, but only about 14' at the upstream side. The concrete on the north abutment, especially on the downstream end, has large exposed lava rock aggregate. Rather than aggregate, board forms are visible on the south abutment's concrete.

The Kalialinui Stream is described as non-perennial or ephemeral.[1] When visited in February 2014, the stream bed under the bridge largely consisted of mud and stones, with some standing water. Kalialinui Gulch has a total channel length of 43.6 miles, starting high on Haleakala. The stream and its tributaries "have become deeply incised through the Pukalani area of upcountry Maui," but the banks of the stream near this bridge only range from 3' to 6' in height.[2] In contrast to the relatively flat land near this Kalialinui Bridge, there is a bridge with a similar name on the upper slopes of Haleakala: the 1911 Kalialinui Gulch Bridge #2, which carries the Lower Kula Road.[3]

HISTORIC CONTEXT

The construction year of Kalialinui Bridge is uncertain, but several sources suggest it dates from the 1920s–1930s. Consultation letters regarding this bridge from the State of Hawaii, Department of Land and Natural Resources, Historic Preservation Division (SHPD) mention examples of 1920s period designs and a probable construction date in the 1930s.[4] The Sugar Museum in Puunene believes that HC&S built the road and culvert/bridge in the early 1920s.[5]

Map research confirms that Hansen Road was built sometime between 1915 and 1921. It began near the HC&S mill, creating a T-intersection with Puunene Road. It extended east about one mile to a small cluster of homes, then called [HC&S] Camp 4, before turning northeast and extending about 1¾ mile to [HC&S] Camp 3. (on the 1921 map the camp numbers are spelled out, but on most other maps digits are used). It ended at a junction with Sunny Side Road, then called Lower Makawao Road. The Kalialinui Bridge is located less than ¼ mile east of the site of Camp 4 (no longer extant). When constructed, Hansen Road was not a portion of the roads to either Hana or to Haleakala from Kahului. The portion of Hansen Road carried by the Kalialinui Bridge was never a part of the Maui Belt Road from Kahului to Hana. Although the official completion date of the Hana Belt Road is 1926, when an eastern section beyond Keanae was built, the western section of that road, from Kahului to Paia and beyond, was open since at least 1915.[6] "The [Hana Belt Road] and its predecessor, the footpath built by the ancient Hawaiians, served as the principal link between Kahului, the island's principal town, and the isolated communities along the east Maui coast."[7] For a complete discussion of the Hana Belt Road, see HAER No. HI-75.

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[1] County of Maui, Department of Public Works. Application for the Department of the Army Permit, POH-2012-0041, Kalialinui Bridge Replacement. January 2014. pp. 2-3.
[2] Ibid.
[3] Hawaii Heritage Center, Historic Bridge Inventory and Evaluation, Islands of Maui and Molokai (Prepared for State of Hawaii, Department of Transportation, Highways Division) September 1990. p. 189.
[4] Hawaii SHPD, Angie Westfall, letter dated May 2, 2013 [log: 2013.2657 doc: 1305RS10] "Hansen Road Kalialinui Gulch bridge." Hawaii SHPD, Angie Westfall, letter dated June 28, 2013 [log: 2013.4034 doc: 1306RS63] "Hansen Road near Kahului Airport." Hawaii SHPD, Mike Gushard, letter dated January 31, 2014 [log: 2014.00379 doc: 1401AB75] "Hansen Road near Kahului Airport."
[5] Roslyn Lightfoot, Museum Director, Alexander and Baldwin Sugar Museum, e-mail dated April 17, 2014 to Ann Yoklavich of Mason Architects, Inc.
[6] Hawaii Promotional Committee, Hugh Howell, "Island of Maui, Territory of Hawaii" [map], 1:190,000. 1915.
[7] The Heritage Center, School of Architecture, University of Hawaii at Manoa, State of Hawaii Historic Bridge Inventory and Evaluation, Final Draft (Prepared for State of Hawaii, Department of Transportation) May 2008. p. IV-56.

Starting in 1942, the creation of Naval Air Station Kahului, which became Kahului Airport, caused the alteration of many roads in its vicinity. A roadway project in the 1940s created the current section of the Hana Highway (Belt Road) that exists northeast of the Kalialinui Bridge (Hansen Road Bridge), and a 1944 bridge carries the Highway over Kalialinui stream.[8] This 1940s project incorporated a part of the earlier alignment of Hansen Road to the northeast of the Kalialinui Bridge (Hansen Road Bridge).

The construction of original Hansen Road, extending between the HC&S mill at Puunene and Camp 3, would have facilitated passage for residents of Camp 3 and Camp 4 to the mill. It also would have provided a good route for HC&S trucks to access the plantation fields east of the mill. The Maui News reported at the death of Johan Conrad Hansen:

> The Hansen road in Puunene, which was named after Mr. Hansen, was built under his supervision as were many other of the early improvements in the district.[9]

Johan Conrad Edwin Hansen (or Johan Konrad Edvin Hansen[10]), "affectionately known throughout the Territory as 'Pop' Hansen" came to Hawaii in 1881 at about age 19. After a few other jobs in the islands, he settled on Maui in1891 and worked for HC&S for 43 years, rising "up the sugar ladder to the position of steam plow engineer."[11] In the mid 1890s he was "made foreman in charge of the plows", and his job "increased in importance and scope with the number of plows that were in use."[12]

The HC&S Company was significant both on Maui and in the entire island chain. Claus Spreckels, who had a sugar-refining monopoly in California, decided to enter the sugar planting business in Hawaii after the 1876 Reciprocity Treaty was signed. That treaty allowed sugar grown in the Kingdom of Hawaii to enter the United States free of duty. Spreckels became friends with King Kalakaua and leased a large acreage of crown lands in central Maui, as well as making purchase agreements for adjacent private lands. He started the Hawaiian Commercial Company in 1878, which became the HC&S Company, a California corporation, in 1882. By 1889 its plantation was producing the largest amount of sugar in the island chain.[13] The Puunene Mill is the only remaining operational sugar factory in Hawaii.[14]

The original mill for HC&S was in Spreckelsville. The monarchy-aligned Spreckels lost control of the plantation about 1899 to Hawaii investors who were supporters of the governments succeeding the monarchy. In 1900-1901 the new owners built a new mill in Puunene.

HC&S primarily used its own rail transport for moving cane from fields to the mill for most of the early decades of the twentieth century. A 1931 report noted that "all cane is delivered to the factory via the Plantation railroad, which runs 77 miles of 36" gauge, with which is used 11

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[8] National Bridge Inventory Database, Hana Hwy/Kalialinui Strm, on website www.nationalbridges.com, accessed April 17, 2014.

[9] "Johan Conrad Hansen Dies After Brief Illness," *Maui News,* July 290, 1946, p. 1, c. 6.

[10] "Hansen Observes 60th Anniversary in Isles," *Maui News,* February 19, 1941, p. 1, c. 3.

[11] "Johan Conrad Hansen Dies After Brief Illness," *Maui News,* July 29, 1946, p. 1, c. 6.

[12] "Hansen Observes 60th Anniversary in Isles," *Maui News,* February 19, 1941, p. 1, c. 3.

[13] William Dorrance and Francis S. Morgan, *Sugar Islands, the 165-Year Story of Sugar in Hawai'i* (Honolulu: Mutual Publishing) 2000. pp. 68-9.

[14] Alexander & Baldwin Sugar Museum, homepage on website www.sugarmuseum.com, accessed April 17, 2014.

miles of portable track."[15] In 1915 the first truck arrived on the planation and the number steadily increased "to gradually squeeze the railroad out of business."[16] As trucks took over cane hauling duties, the importance of the Kalialinui Bridge increased, because it enabled Hansen Road to provide an efficient route from eastern fields to the mill. In October 1950, HC&S abandoned its rail operations to haul cane exclusively with trucks.[17]

A Maui resident recalls that the earlier railings of this bridge were concrete. Those concrete railings were extant until at least the mid 1970s.[18] Damage by collision and/or the need to widen the bridge led to replacement with metal pipe posts and rails. Due to vehicular impacts, there are only remnants of that later railing.

Some have described Kalialinui Bridge as a large concrete box culvert.[19] It does not appear to be a continuous box structure, unless there is bottom concrete section connecting the abutments, now covered with mud and rocks. This structure seems to be an example of a single-span, reinforced-concrete flat slab bridge,[20] a type commonly constructed in Hawaii from about 1908 to 1937. Typical spans for this type of bridge are twelve to sixteen feet, but a few Hawaii bridges were built with maximum spans of twenty-eight or thirty-three feet.[21] Concrete flat slab bridges "became the preferred choice for spans of modest length" during the early twentieth century.[22]

SOURCES

A. Architectural Drawings:

No historic drawings were located for this report. The County of Maui Department of Public Works has no drawings or other records of this bridge's construction or of any alterations.

B. Early Views:

No early views were located for this report.

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[15] Jesse C. Condé & Gerald M. Best, *Sugar Trains: Narrow Gauge Rails of Hawaii* (Felton, California: Glenwood Publisher) 1973. p. 212.
[16] Ibid., p. 213.
[17] Gale E. Trieber, *Hawaiian Railway Album WWII Photographs* (Hanover PA: The Railroad Press), 2008. p. 249.
[18] Michael Ishikawa, e-mails dated April 22 & 23, 2014 from Structural Engineer, Sato & Associates, Inc. to Ann Yoklavich, Architectural Historian, Mason Architects, Inc.
[19] Hawaii SHPD, Angie Westfall, letter dated May 2, 2013 [log: 2013.2657 doc: 1305RS10] "Hansen Road Kalialinui Gulch bridge." Roslyn Lightfoot, e-mail dated April 17, 2014 from Museum Director, Alexander and Baldwin Sugar Museum to Ann Yoklavich, Architectural Historian, Mason Architects, Inc.
[20] County of Maui, Department of Public Works, Application for the Department of the Army Permit, POH-2012-0041, Kalialinui Bridge Replacement, January 2014. p. 1.
[21] The Heritage Center, School of Architecture, University of Hawaii at Manoa, State of Hawaii Historic Bridge Inventory and Evaluation, Final Draft (Prepared for State of Hawaii, Department of Transportation, Highways Division) May 2008. p. I-71.
[22] Parsons Brinckerhoff and Engineering and Industrial Heritage, A Context for Common Historic Bridge Types (Prepared for the National Cooperative Highway Research Program et al.) October 2005. p. 3-84.

C. Maps:

Hawaii Promotional Committee, Hugh Howell. "Island of Maui, Territory of Hawaii." 1:190,000. 1915. Call # G4382.M3 1915 .H6 half, in collection of Hawaii State Archives.

United States Geological Survey. "Paia Quadrangle." 1:31,680. 1921. Call # G4382.M3:3P5 1921 .U54.G4 half, in collection of Hawaii State Archives.

United States Geological Survey. "Kahului Quadrangle." 1:62,500. 1922. Call # G4382.M3:3K3 1922 .U54.G4 half, in collection of Hawaii State Archives.

United States Geological Survey. "Island of Maui." 1:62,500. 1922-1925, Edition of 1930. Call # G4382.M3 1925 .U54.G4 full, in collection of Hawaii State Archives.

Hawaii Tourist Bureau. "Island of Maui." 1:211,200. 1937. Call # G4382.M3 1937 .H38.T6 half, in collection of Hawaii State Archives.

United States Army, Hawaiian Department. "Island of Maui." 1:125,000. 1942. Call # G4382.M3 1942 .U54.A7 full, in collection of Hawaii State Archives.

United States Geological Survey. "Paia Quadrangle." 1:24,000. 1954. Call # G4382.M3:3P5 1954 .U54.G4 full, in collection of Hawaii State Archives.

United States Geological Survey. "Wailuku Quadrangle." 1:24,000. 1955. Call # G4382.M3:3W5 1955 .U54.G4 full, in collection of Hawaii State Archives.

D. Bibliography:

Alexander & Baldwin Sugar Museum, homepage on website www.sugarmuseum.com, accessed April 17, 2014.

Condé, Jesse C. & Gerald M. Best. *Sugar Trains: Narrow Gauge Rails of Hawaii* (Felton, California: Glenwood Publisher) 1973:

County of Maui, Department of Public Works. Application for the Department of the Army Permit, POH-2012-0041, Kalialinui Bridge Replacement. January 2014.

Dorrance, William and Francis S. Morgan. *Sugar Islands, the 165-Year Story of Sugar in Hawai'i.* Honolulu: Mutual Publishing. 2000.

Duensing, Dawn. "Hana Belt Road." HAER No. HI-75. Historic American Engineering Record, National Park Service, Department of the Interior. 2005.

"Hansen Observes 60th Anniversary in Isles," *Maui News,* February 19, 1941, p. 1, c. 3.

Hawaii Heritage Center. Historic Bridge Inventory and Evaluation, Islands of Maui and Molokai. Prepared for State of Hawaii, Department of Transportation, Highways Division. September 1990.

"Johan Conrad Hansen Dies After Brief Illness," *Maui News,* July 29, 1946, p. 1, c. 6.

National Bridge Inventory Database. Hana Hwy/Kalialinui Strm, on website www.nationalbridges.com, accessed April 17, 2014.

Parsons Brinckerhoff and Engineering and Industrial Heritage. A Context for Common Historic Bridge Types. Prepared for the National Cooperative Highway Research Program. Transportation Research Council, and National Research Council. October 2005.

The Heritage Center, School of Architecture, University of Hawaii at Manoa. State of Hawaii Historic Bridge Inventory and Evaluation, Final Draft. Prepared for State of Hawaii, Department of Transportation, Highways Division. May 2008.

Trieber, Gale E. *Hawaiian Railway Album WWII Photographs.* Hanover, PA: The Railroad Press. 2008.

PROJECT INFORMATION

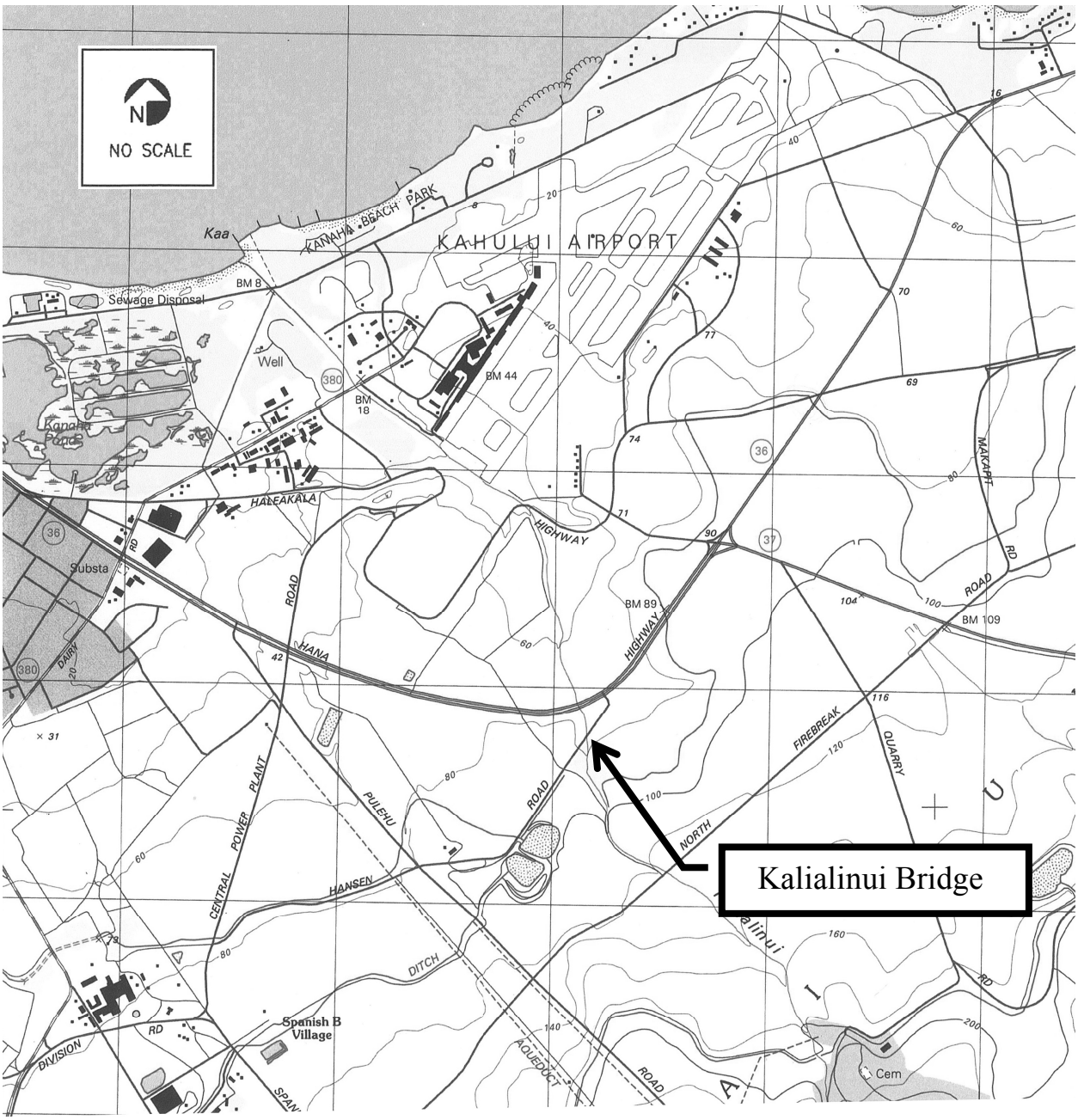
This HAER documentation was produced in advance of a County of Maui, Department of Public Works project to replace the existing Kalialinui Bridge, which is part of a larger overall effort to rehabilitate Hansen Road. Hawaii State Historic Preservation Division (SHPD) determined that the bridge is eligible for the National Register under Criterion A and C in the following letters:

Letter May 2, 2013	Log: 2013.2657	Doc: 1305RS10
Letter June 28, 2013	Log: 2013.4034	Doc: 1306RS63
Letter Jan. 31, 2014	Log: 2014.00379	Doc: 1401AB75

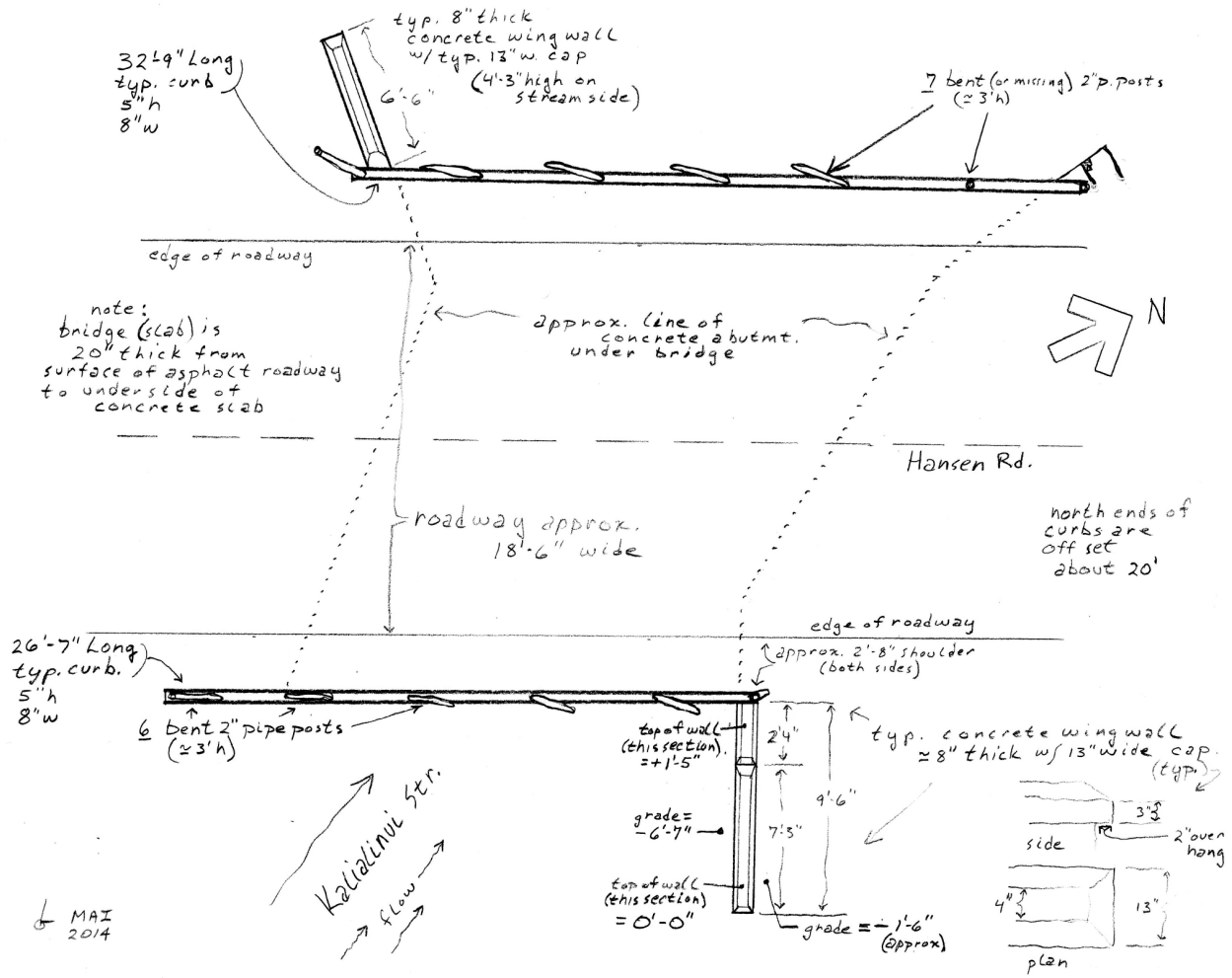
The first two letters responded to a proposed widening of the bridge, before the complete reconstruction with in-kind replacement was deemed necessary. In their letter of Jan.31, 2014 SHPD asked for HABS [HAER] documentation, Level III with large format photographs, as mitigation for this project.

Federal involvement in this project stems from a fall 2013 application by Maui County to the US Army Corps of Engineers for a Department of the Army permit for bridge reconstruction work in Kalialinui Stream, which involves filling 1,163 square feet of wetland.

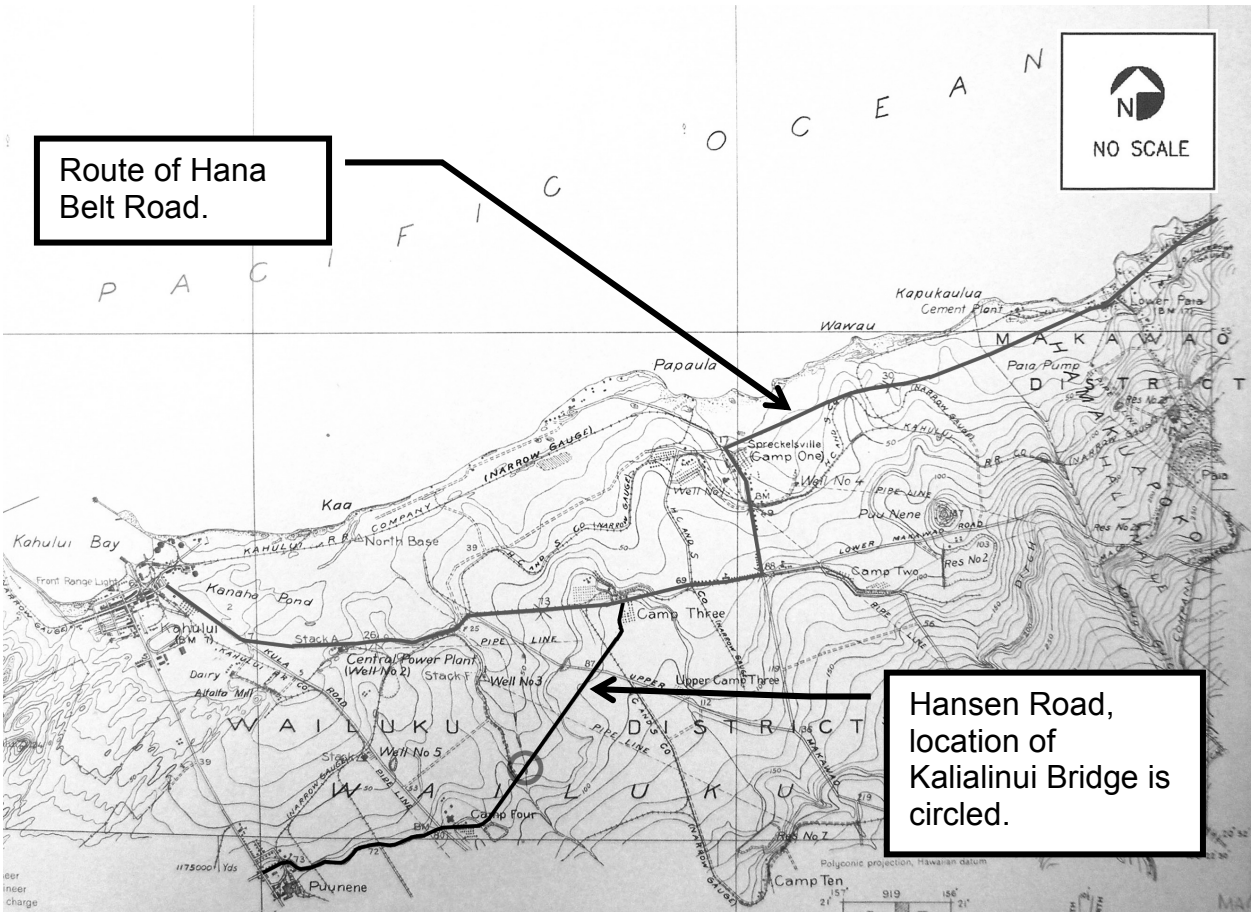
Location map.



Sketch plan of Kalialinui Bridge. February 2014. No scale.



Portion of map dated 1921 showing Hansen Road (added highlight in black) running between Puunene and Camp Three, and the route of the Hana Belt Road (added highlight in gray) from Kahului on the left to beyond Paia on the right. The location of Kalialinui Bridge is shown by the added circle on Hansen Road. [Note: Hana Belt Road was not officially competed until 1926, when an eastern section beyond Keanae was built.]
Source: United States Geological Survey. "Paia Quadrangle." 1:31,680. 1921. This map was produced by a Federal agency and is considered in the public domain.



Portion of map dated 1942 showing the Hana Belt Road, Hansen Road (with added circle at location of Kalialinui Bridge), and other roads between Kahului and Pauwela.
Source: United States Army, Hawaiian Department. "Island of Maui." 1:125,000. 1942. This map was produced by a Federal agency and is considered in the public domain.

Portion of map dated 1954 showing the re-routed section of the Hana (Haleakala) Highway, between Kahului and Spreckelsville, that was built to bypass the airport. Kalialinui Bridge is highlighted with added circle.

Source: United States Geological Survey. "Paia Quadrangle." 1:24,000. 1954. This map was produced by a Federal agency and is considered in the public domain.