Appendix A
Agency Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
2015-SL-0081

DEC 22 2014

J. Michael Will
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 380
Lakewood, CO 80228

Subject: Species List for Hawaii Bridges Program, Hawaii, Kauai, and Oahu

Dear Mr. J. Michael Will:

The U.S. Fish and Wildlife Service (Service) received your letter, dated November 21, 2014, requesting a list of federally threatened and endangered species, candidate species, plants and animals of special concern, and critical habitats in the vicinity of the proposed bridge projects. The Federal Highways Administration (FHWA), Central Federal Lands Highway Division (CFLHD), in cooperation with the State of Hawaii Department of Transportation (HDOT), is planning to conduct environmental studies for the proposed rehabilitation or replacement of 12 bridges at 10 locations on the islands of Hawaii, Kauai, and Oahu to improve the safety and reliability of the bridges.

On the island of Hawaii, the Ninole Bridge located along Mamalahoa Highway (Route 11) at mile post 56.7 would be rehabilitated or replaced, addressing bridge width, load capacity, railing, transitions, and approaches. The Hilea Bridge located on Mamalahoa Highway (Route 11) at mile post 57.7 would be rehabilitated or replaced, addressing bridge width, load capacity, railing, and transitions.

On the island of Kauai, Bridge 7E located along Kaumualii Highway (Route 50), approximately 800 feet west of Maluhia Road intersection, would be rehabilitated or replaced, addressing bridge width, load capacity, railing, and transitions. Hanapepe Bridge located on Kaumualii Highway (Route 50) in Hanapepe town would be rehabilitated or replaced, addressing bridge width, load capacity, railing, transitions, approaches, and effects of scour. Kapaa Stream Bridge located on Kuhio Highway (Route 56) near mile post 10 would be rehabilitated or replaced, addressing bridge width, load capacity, railing, transitions, and approaches. This project would also involve improvements to the highway intersection at Mailihuna Road, including roadway widening, lighting, signing, pavement markings, drainage, and other improvements such as installation of traffic signals. The three Wainiha Stream bridges located on Kuhio Highway (Route 560) at mile post 6.4 and 6.7 would be replaced. Additionally, three load-restricted bridges which cross Waioli, Waipa, and Waikoko streams, located at mile posts 3.4, 3.9, and 4.2, will be studied to determine loads and alternatives such as temporary bridges or supports necessary to provide construction access to the Wainiha Stream bridges.

On the island of Oahu, the Halona Bridge located on Halona Street, which crosses Kapalama Canal, would be rehabilitated or replaced, addressing bridge width, load capacity, railing, transitions, approaches, and pedestrian traffic. The Kawela Bridge located on Kamehameha Highway (Route 83) at mile post 11.4 would be replaced, addressing bridge width, load capacity, railing, transitions, and approaches. The Nanahu Bridge located on Kamehameha Highway (Route 83) at mile post 13.4 would be rehabilitated or replaced, addressing bridge width, load capacity, railing, transitions, and approaches. The Roosevelt Bridge located on Kamehameha Highway (Route 99) at mile post 14.4 would be rehabilitated, addressing bridge load capacity, railing, and transitions.

The Service offers the following comments to assist you in your planning process so that impacts to trust resources can be avoided through site preparation, construction, and operation. Our comments are provided under the authorities of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C 1531 *et seq.*).

Our databases, including data compiled by the Hawaii Biodiversity and Mapping Program (HBMP), indicate the following species are known to occur or transit through the vicinity of the proposed project areas at Ninole Bridge and Hilea Bridge on the island of Hawaii: the federally endangered Blackburn's sphinx moth (Manduca blackburni, BSM), Hawaiian goose (*Branta sandvicensis*), Hawaiian hawk (*Buteo solitarius*), Hawaiian hoary bat (*Lasiurus cinereus semotus)*, and Hawaiian petrel (*Pterodroma sandwichensis*); and the threatened Newell's shearwater (*Puffinus auricularis newelli*). There is no designated critical habitat in the vicinity of the proposed project areas on the island of Hawaii.

Our databases, including data compiled by the HBMP, indicate the following species are known to occur or transit through the proposed project areas at Bridge 7E, Hanapepe Bridge, Kapaa Stream Bridge, and the Wainiha Stream bridges on the island of Kauai: the endangered Hawaiian black-necked stilt (*Himantopus mexicanus knudseni)*, Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian coot (*Fulica alai*), Hawaiian duck (*Anas wyvilliana)*, Hawaiian goose, Hawaiian hoary bat, and Hawaiian petrel; the threatened Newell's shearwater; and a candidate for listing band-rumped storm-petrel (*Oceanodroma castro*). Additionally, our databases indicate the threatened green sea turtle (*Chelonia mydas*) is known to occur in the vicinity of the proposed project areas at the Kapaa Stream Bridge and the Wainiha Stream bridges. There is no designated critical habitat in the vicinity of the proposed project areas on the island of Kauai.

The endangered Hawaiian monk seal (*Monachus schauinslandi*) may use beach habitat in the vicinity of the proposed project at the Kapaa Stream Bridge and the Wainiha Stream bridges. The National Marine Fisheries Service (NMFS) is the Federal agency that consults on potential impacts to monk seals, both in their on-shore and ocean habitats. Therefore, we did not review the proposed project for potential project impacts to monk seals. We recommend that you contact NMFS regarding the presence of monk seals in the area and potential impacts to the species from the project.

Our databases, including data compiled by the HBMP, indicate the following species are known to occur or transit through the proposed project areas at Kawela Bridge, Nanahu Bridge, and Roosevelt Bridge on the island of Oahu: the endangered Hawaiian black-necked stilt, Hawaiian moorhen, Hawaiian coot, Hawaiian duck, Hawaiian goose, Hawaiian hoary bat, and Hawaiian petrel; and the threatened Newell's shearwater. Hawaiian geese recently arrived on Oahu. A pair was first observed in early January 2014 at the First Wind Kawailoa wind farm facility. They have successfully nested, fledging two goslings at the James Campbell National Wildlife Refuge (NWR) near the town of Kahuku. The pair, originally from Kauai, was translocated to Hilo, Hawaii in February 2012, by the State of Hawaii Division of Forestry and Wildlife, and were apparently attempting to return to Kauai when they arrived on Oahu. As of December 2014 the four birds have been seen at the Mililani Agricultural Park, Mililani golf course, and James Campbell NWR.

Additionally, our databases indicate the endangered Hawaiian hoary bat is known to occur or transit through the proposed project area at Halona Bridge on the island of Oahu. There is no designated critical habitat in the vicinity of the proposed project areas on the island of Oahu.

The Service recommends the following measures to avoid and minimize project impacts to the above listed species.

Island of Hawaii

Blackburn's sphinx moth
Adult Blackburn's sphinx moths feed on nectar from native plants including beach morning glory (*Ipomoea pescaprae*), iliee (*Plumbago zeylanica*), and maiapilo (*Capparis sandwichiana*). BSM larvae feed upon native tree tobacco (*Nicotiana glauca*), which occupies disturbed areas such as open fields and roadway margins, and the native aiea (*Nothocestrum sp.*), which is found in dry to moist forests at elevations ranging from 1,500 to 5,000 feet. We recommend that a qualified biologist survey the project area for the presence of larval host plants. If larval host plants are detected and will be affected during project construction or operation, we recommend that the biologist document 1) general larval plant density; 2) proximity of larval plants to project sites; 3) average height of the larval plants; 4) signs of larval feeding damage on leaves; and 5) presence of BSM larvae on leaves. We recommend that surveys be conducted for BSM and potential host plants approximately four to eight weeks following significant rainfall and during the wettest portion of the year (usually November-April).

Hawaiian Goose
In order to avoid impacts to Hawaiian geese, we recommend a biologist familiar with the nesting behavior of the Hawaiian goose survey the area prior to the initiation of any work, or after any subsequent delay in work of three or more days (during which birds may attempt nesting). If a nest is discovered, work should cease immediately and our office should be contacted for further guidance. Furthermore, all on-site project personnel should be apprised that Hawaiian geese

may be in the vicinity of the project at any time during the year. If a Hawaiian goose (or geese) appears within 100 feet of ongoing work, all activity should be temporarily suspended until the Hawaiian goose (or geese) leaves the area of its own accord.

Hawaiian Hawk

Loud, irregular and unpredictable activities, such as using heavy equipment or building a structure, near an endangered Hawaiian hawk nest may cause nest failure. Harassment of Hawaiian hawk nesting sites can alter feeding and breeding patterns or result in nest or chick abandonment. Nest disturbance can also increase exposure of chicks and juveniles to inclement weather or predators. To avoid impacts to Hawaiian hawks, we recommend avoiding brush and tree clearing during their breeding season (March through September). If you must clear the property during the Hawaiian hawk breeding season, we recommend a nest search of the proposed construction site and surrounding area be conducted by a qualified ornithologist immediately prior to start of construction activities. Surveys should ensure that construction activity will not occur within 1,600 feet of any Hawaiian hawk nest.

Hawaiian Hoary Bat

The Hawaiian hoary bat roosts in both exotic and native woody vegetation and, while foraging, will leave young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed. To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Site clearing should be timed to avoid disturbance to Hawaiian hoary bats in the project area.

Seabirds

Seabirds, including the Newell's shearwater, Hawaiian petrel and band-rumped storm petrel, fly at night and are attracted to artificially-lighted areas resulting in disorientation and subsequent fallout due to exhaustion. Seabirds are also susceptible to collision with objects that protrude above the vegetation layer, such as utility lines, guy-wires, and communication towers. Additionally, once grounded, they are vulnerable to predators and are often struck by vehicles along roadways. To reduce potential impacts to seabirds, we recommend the following minimization measures be incorporated into your project description:

- Construction activities should only occur during daylight hours. Any increase in the use of nighttime lighting, particularly during peak fallout period (September 15 through December 15), could result in additional seabird injury or mortality.

- If lights cannot be eliminated due to safety or security concerns, then they should be positioned low to the ground, be motion-triggered, and be shielded and/or full cut-off. Effective light shields should be completely opaque, sufficiently large, and positioned so that the bulb is only visible from below.

Island of Kauai

Please refer to "Hawaiian goose", "Hawaiian hoary bat", and "Seabirds" under the Island of Hawaii (above) for recommended measures to avoid and minimize impacts to the Hawaiian goose, Hawaiian hoary bat, and Hawaiian petrel, Newell's shearwater, and band-rumped storm petrel.

Hawaiian Waterbirds

The Hawaiian stilt, moorhen, coot, and duck are hereafter collectively referred to as "Hawaiian waterbirds." Our records indicate there is a high probability that Hawaiian waterbirds may occur in the vicinity of the proposed project. We recommend you incorporate the following measures into your project description to avoid and minimize impacts to Hawaiian waterbirds:

- A biological monitor should conduct Hawaiian waterbird and nest surveys at the proposed project site prior to project initiation.
- Any documented nests or broods within the project vicinity should be reported to the Service within 48 hours.
- A 100-foot buffer should be established and maintained around all active nests and/or broods until the chicks/ducklings have fledged. No potentially disruptive activities or habitat alteration should occur within this buffer.
- The Service should be notified immediately prior to project initiation and provided with the results of pre-construction Hawaiian waterbird surveys.
- A biological monitor(s) should be present on the project site during all construction or earth moving activities to ensure that Hawaiian waterbirds and nests are not adversely impacted.
- If a listed Hawaiian waterbird is observed within the project site, or flies into the site while activities are occurring, the biological monitor should halt all activities within 100 feet of the individual(s). Work should not resume until the Hawaiian waterbird(s) leave the area on their own accord.
- A post-construction report should be submitted to the Service with 30 days of the completion of the project. The report should include the results of Hawaiian waterbird surveys, the location and outcome of documented nests, and any other relevant information.

Sea Turtles

Artificial lighting can disorient adult sea turtles and hatchlings by affecting their ability to find the ocean. To minimize potential impacts to sea turtles that may utilize beaches in the project vicinity, no light from the proposed project should be visible from the beach. We recommend installation of shielded lighting at construction sites near beaches and around shoreline developments. Shielded lights reduce the direct and ambient lighting of beach habitats within and adjacent to the project site. Effective light shields should be completely opaque, sufficiently large, and positioned so that light from the shielded source does not reach the beach. Projects should also be designed to minimize adverse impacts to basking or nesting sea turtles from off-leash pets, mammalian predators, and human disturbance.

Island of Oahu

Please refer to "Hawaiian goose", "Hawaiian hoary bat", "Seabirds", and "Hawaiian waterbirds" (above) for recommended measures to avoid and minimize impacts to the Hawaiian goose, Hawaiian hoary bat, Hawaiian petrel, Newell's shearwater, Hawaiian black-necked stilt, Hawaiian moorhen, Hawaiian coot, and Hawaiian duck.

Because the proposed activities may cause soil erosion and sedimentation in sensitive aquatic habitats, we are attaching the Service's recommended Best Management Practices regarding sedimentation and erosion in aquatic environments. We encourage you to incorporate the relevant practices into your project design. In addition to the guidance provided in this letter, the Service anticipates responding to the U.S. Army Corps of Engineers inter-agency notification process and providing further recommendations pursuant to the Fish and Wildlife Coordination Act of 1934 (FWCA), as amended (16 U.S.C. 661 *et seq.*; 48 Stat. 401); and the Clean Water Act (CWA), as amended (33 U.S.C. 1251 *et seq.*; 62 Stat. 1155).

If additional information becomes available, or it is determined that the proposed project may affect federally listed species, we recommend you coordinate with our office early in the planning process so that we may further assist you with Endangered Species Act compliance. We appreciate your efforts to conserve endangered species. Please contact Adam Griesemer, Endangered Species Biologist (phone: 808-285-8261, email: adam_griesemer@fws.gov) should you have any questions pertaining to this response.

Sincerely,

Joy Browning, Acting

Aaron Nadig
Assistant Field Supervisor:
Oahu, Kauai, NWHI, Am.Samoa

Cc: Paul Luersen, CH2M HILL

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Suite 380
Lakewood, CO 80228
Office: 720-963-3647
Fax: 720-963-3596
Michael.Will@dot.gov

October 21, 2015

In Reply Refer To:
HFPM-16

[INSERT ADDRESSEE HERE]

Subject: National Historic Preservation Act, Section 106 and Hawaii Revised Statutes, Chapter 6e Consultation for the Project to Replace Temporary Wainiha Bridges

Haleleʻa District, Kauaʻi Island, Waiʻoli, Waikoko, Waipā, Lumahaʻi, and Wainiha Ahupuaʻa

Tax Map Key: Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por./ Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por./ Waioli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por./ Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por./ Waikoko Bridge: [4] 5-6-003:002, 999 por./ Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.

Dear [INSERT ADDRESSEE HERE]:

The Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD), in partnership with the State of Hawaii Department of Transportation (HDOT), is proposing to replace the three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) in Wainiha Valley on the north side of the island of Kauaʻi. The bridges are located between mile post 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge #2 suffered permanent damage and Bridges #1 (the southern-most bridge) and #3 (the northern-most bridge) were determined to be structurally deficient). The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by HDOT. The location of the bridges is depicted in the enclosed Figure 1: Project Location Figure.

The proposed project is considered a federal action and undertaking, and will comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006), as well as Hawaii Revised Statutes (HRS) Chapter 6E. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the *Code of Federal Regulations*, Section 800.3, by providing information and/or by requesting to be a consulting party. This letter also initiates consultations in accordance with HRS Chapter 6E.

Overview of the Undertaking and Area of Potential Effects

FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. The width of the new bridges would be close to the existing bridge widths to maintain the existing roadway character. Also included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway located at Waiʻoli, Waipā, and Waikoko Streams that access the Wainiha Bridges project site. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges. The existing temporary ACROW bridges at the Wainiha project site would be shifted *makai* to accommodate traffic during construction of the new bridges. All temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumahaʻi Ahupuaʻa are also included in the Area of Potential Effects (APE). Staging also may occur at each bridge location and is included in the APE. The APE for this project is shown on the enclosed Figures 2 through 7.

The archaeological and historic architectural APE illustrated in the enclosed map set includes both temporary and permanent impact areas. Tax Map Keys (TMK) and corresponding acreage included in the APE are listed below:

- Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por.; 0.669 acres
- Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por.; 2.272 acres
- Waiʻoli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por.; 0.913 acres
- Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.; 0.916 acres
- Waikoko Bridge: [4] 5-6-003:002, 999 por.; 0.715 acres
- Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; 0.517 acres

One previously identified historic property is known to exist within the APE. Kauaʻi Belt Road, North Shore Section (also referred to as Kūhiō Highway and State Route 560) is listed in the National Register of Historic Places (NRHP). An Archaeological Inventory Survey (AIS) is currently being prepared to identify if any other historic properties occur within the APE. Database searches and field efforts conducted to this point have identified no new properties within the APE.

Your knowledge of the area is of great value. We seek your assistance in FHWA and HDOT's efforts to identify historic properties and evaluate the project's potential to affect properties. We would appreciate any information or concerns you may wish to share and, in particular, if there are any resources or places of traditional cultural or religious importance that might be affected by this undertaking. In addition, if you are acquainted with any person or organization that is knowledgeable about the proposed project area, or any descendants with ancestral, lineal, or cultural ties to or cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area, we would appreciate receiving their names and contact information. A response within 30 days would be appreciated, should you have concerns about this project and/or wish to be a consulting party. Please provide written response to me by email at Michael.will@dot.gov or by US Postal Service to 12300 West Dakota Avenue, Suite 380, Lakewood, CO 80228.

Please also feel free to contact Nicole Winterton, Environmental Protection Specialist, by telephone at (720) 963-3689, or email Nicole.Winterton@dot.gov, if you have any questions.

Sincerely yours,

J. Michael Will, P.E.
Project Manager

Enclosures:

- Figure 1: Project Location Figure with Area of Potential Effects
- Figures 2-7: Area of Potential Effects

cc (via electronic mail):

Christine Yamasaki, HDOT
Donald Smith, HDOT
Todd Nishioka, HDOT
Jessica Puff, SHPD
Dr. Susan Lebo, SHPD
Mary Jane Naone, SHPD

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Suite 380
Lakewood, CO 80228
Office: 720-963-3647
Fax: 720-963-3596
Michael.Will@dot.gov

December 21, 2015

In Reply Refer To:
HFPM-16

Historic Hawaii Foundation
Ms. Kiersten Faulkner, Executive Director
680 Iwilei Road, Ste. 690
Honolulu, HI 96817

Subject: National Historic Preservation Act, Section 106 and Hawaii Revised Statutes, Chapter 6e Consultation for the Project to Replace Temporary Wainiha Bridges

Haleleʻa District, Kauaʻi Island, Waiʻoli, Waikoko, Waipā, Lumahaʻi, and Wainiha Ahupuaʻa

Tax Map Key: Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por./ Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por./ Waioli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por./ Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por./ Waikoko Bridge: [4] 5-6-003:002, 999 por./ Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.

Dear Ms. Faulkner:

The Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD), in partnership with the State of Hawaii Department of Transportation (HDOT), is proposing to replace the three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) in Wainiha Valley on the north side of the island of Kauaʻi. The bridges are located between mile post 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge #2 suffered permanent damage and Bridges #1 (the southern-most bridge) and #3 (the northern-most bridge) were determined to be structurally deficient). The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by HDOT. The location of the bridges is depicted in the enclosed Figure 1: Project Location Figure.

The proposed project is considered a federal action and undertaking, and will comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended (2006), as well as Hawaii Revised Statutes (HRS) Chapter 6E. We would like to invite you to participate in the Section 106 consultation for the proposed project in accordance with Title 36 of the *Code of*

Federal Regulations, Section 800.3, by providing information and/or by requesting to be a consulting party. This letter also initiates consultations in accordance with HRS Chapter 6E.

Overview of the Undertaking and Area of Potential Effects

FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. The width of the new bridges would be close to the existing bridge widths to maintain the existing roadway character. The proposed typical section of the one-lane bridge would accommodate a total 14-foot roadway section from rail to rail, with an additional 1 to 1.5 feet on each side to support the bridge rails and for hanging utilities. It is anticipated that structural steel tube rails that are crash-tested would be installed. A rail type has been identified that offers visual similarities to the historic pre-ACROW bridges that existed prior to their emergency replacement. Attached to this letter is a visual rendering of the proposed bridges.

Also included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway located at Waiʻoli, Waipā, and Waikoko Streams that access the Wainiha Bridges project site. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges. The existing temporary ACROW bridges at the Wainiha project site would be shifted *makai* to accommodate traffic during construction of the new bridges. All temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumahaʻi Ahupuaʻa are also included in the Area of Potential Effects (APE). Staging also may occur at each bridge location and is included in the APE. The APE for this project is shown on the enclosed Figures 2 through 7.

The archaeological and historic architectural APE illustrated in the enclosed map set includes both temporary and permanent impact areas. Tax Map Keys (TMK) and corresponding acreage included in the APE are listed below:

- Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por.; 0.669 acres
- Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por.; 2.272 acres
- Waiʻoli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por.; 0.913 acres
- Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.; 0.916 acres
- Waikoko Bridge: [4] 5-6-003:002, 999 por.; 0.715 acres
- Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; 0.517 acres

One previously identified historic property is known to exist within the APE. Kauaʻi Belt Road, North Shore Section (also referred to as Kūhiō Highway and State Route 560) is listed in the National Register of Historic Places (NRHP). Wainiha Bridges 1, 2, and 3 are modern elements and as such are identified as non-contributing to the NRHP-listed Kauaʻi Belt Road in the State

Historic Bridge Inventory prepared by MKE Associates, LLC and Fung Associates, Inc. Waiʻoli, Waipā, and Waikoko bridges are identified as contributing elements to the historic roadway. An Archaeological Inventory Survey (AIS) is currently being prepared to identify if any other historic properties occur within the APE. Database searches and field efforts conducted to this point have identified no new properties within the APE.

Your knowledge of the area and of the resources is of great value. We seek your assistance in FHWA and HDOT's efforts to identify historic properties and evaluate the project's potential to affect properties. We would appreciate any information or concerns you may wish to share and, in particular, if there are any resources or places of traditional cultural or religious importance that might be affected by this undertaking. In addition, if you are acquainted with any person or organization that is knowledgeable about the proposed project area, or any descendants with ancestral, lineal, or cultural ties to or cultural knowledge or concerns for, and cultural or religious attachment to the proposed project area, we would appreciate receiving their names and contact information.

A response within 30 days would be appreciated, should you have concerns about this project and/or wish to be a consulting party. Please provide written response to me by email at Michael.will@dot.gov or by US Postal Service to 12300 West Dakota Avenue, Suite 380, Lakewood, CO 80228.

Please also feel free to contact Nicole Winterton, Environmental Protection Specialist, by telephone at (720) 963-3689, or email Nicole.Winterton@dot.gov, if you have any questions.

Sincerely yours,

J. Michael Will, P.E.
Project Manager

Enclosures:

- Figure 1: Project Location Figure with Area of Potential Effects
- Figures 2-7: Area of Potential Effects
- Photograph of Existing Bridges 2 and 3 and Visual Rendering of Proposed New Bridges

cc (via electronic mail):

Christine Yamasaki, HDOT
Donald Smith, HDOT
Todd Nishioka, HDOT
Jessica Puff, SHPD
Dr. Susan Lebo, SHPD
Mary Jane Naone, SHPD

PHONE (808) 594-1888

FAX (808) 594-1938

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD15-7644B

November 5, 2015

J. Michael Will, P.E.
Project Manager
U.S. Department of Transportation – Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 380
Lakewood, CO 80228

Re: National Historic Preservation Act Section 106 Consultation
Project to Replace Temporary Wainiha Bridges
Wai'oli, Waikoko, Waipā, Lumaha'i, and Wainiha Ahupua'a; Halele'a Moku;
Kaua'i Mokupuni
Tax Map Key: Various

Aloha e J. Michael Will:

The Office of Hawaiian Affairs (OHA) is in receipt of your October 22, 2015 letter, initiating consultation pursuant to the National Historic Preservation Act for a proposed work project located in Wainiha, Kaua'i. The proposed project will replace the three temporary pre-fabricated bridges on Kūhiō Highway in Wainiha Valley, between mile posts 6.4 and 6.7, and cross over Wainiha Stream. The scope of work includes replacing three temporary ACROW bridges with new, one-lane bridges and installing three temporary one-lane bridges crossing over Wai'oli, Waipā, and Waikoko Streams.

At the Wainiha project site, the project plan includes shifting the existing temporary ACROW bridges makai to accommodate traffic and heavy construction loads. Upon completion of the project, all temporary bridges will be removed. Your letter mentions that staging may take place at two potential staging areas in the Lumaha'i ahupua'a or that staging may take place at each bridge location. The Area of Potential Effect includes all of the bridges, the area around the bridges, and the staging areas. It is our understanding that federal funding via the U.S. Department of Transportation, Federal Highways Administration will support the completion of this undertaking. The federal nexus serves as the "trigger" for the applicable requirements of the NHPA.

As mentioned in the cultural impact assessment (CIA) consultation letter for this project dated October 29, 2015, our records confirm that one of the staging parcels contains a historic site, Ka'iliopaia Heiau (State Site 50-30-03-00147) located shoreward of Kūhiō Highway. The use of this parcel for staging should be carefully considered and impacts to the heiau should be avoided. In a previously issued letter, OHA provided consultation recommendations of knowledgeable individuals and community organizations for this project's CIA. Given other projects occurring in the Lumaha'i and Hā'ena areas, we suggest coordinating outreach with Auli'i Mitchell of Cultural Survey Hawai'i, Inc. to seek out community input, so as to minimize the burden on consulting parties from having duplicative consultations for the same project.

OHA does request assurances that should iwi kūpuna or Native Hawaiian cultural deposits be identified during ground altering activities, all work will immediately cease and the appropriate agencies, including OHA, will be contacted pursuant to applicable law.

OHA looks forward to reviewing the archaeological inventory survey that is being prepared for this project. Thank you for initiating consultation at this early stage. Should you have any questions, please contact Kathryn Keala at (808) 594-0272 or kathyk@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono Crabbe

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:kk

C: Kaliko Santos – Kaua'i Community Outreach Coordinator (*via email*)

**Please address replies and similar, future correspondence to our agency:*

Dr. Kamana'opono Crabbe
Attn: OHA Compliance Enforcement
560 N. Nimitz Hwy, Ste. 200
Honolulu, HI 96817

COUNTY OF KAUAI
PLANNING DEPARTMENT
4444 RICE STREET, SUITE A473
LIHUE, KAUAI, HAWAII 96766-1326

MEMORANDUM

DATE: October 28, 2015

TO: J. Michael Will, P.E.
Program Engineering Manager
Federal Highway Administration
Central Federal Lands Highways Div.
12300 West Dakota Avenue, Suite 380
Lakewood, CO 80228

FROM: FOR Kauai Historic Preservation Review Commission

SUBJECT: Letter (8/25/15) from J. Michael Will, P.E., Program Engineering Manager, US Department of Transportation, Federal Highway Administration requesting to be placed on the Kaua'i Historic Preservation Review Commission agenda to discuss and review the Wainiha Bridges No. 1, 2, 3; Bridge 7 E; Kapa'a Stream Bridge; and Hanapēpē River Bridge.

This is to inform you that the Kauai Historic Preservation Review Commission (KHPRC) met on October 1, 2015 to discuss and review the proposed bridge projects submitted in accordance with the Section 106 Consultation.

The KHPRC appreciated the opportunity to comment on the project and received the documentation on the subject bridges. The comments offered by the KHPRC are contained in the attached minutes of the KHPRC meeting of October 1. 2015.
Please feel free to contact us should you have any questions regarding this matter.

Mahalo.

cc: State Historic Preservation Division

attachment

KAUA'I COUNTY HISTORIC PRESERVATION REVIEW COMMISSION
Līhu'e Civic Center, Mo'ikeha Building, Meeting Room 2A/2B

MINUTES

A regular meeting of the Kaua'i County Historic Preservation Commission (KHPRC) was held on October 1, 2015 in the Līhu'e Civic Center, Mo'ikeha Building, Meeting Room 2A/2B.

The following Commissioners were present: Chairperson Pat Griffin, Anne Schneider, Stephen Long, Charlotte Hoomanawanui, Victoria Wichman, and Larry Chaffin Jr.

The following Commissioners were absent: Althea Arinaga, David Helder, and Kuuleialoha Santos.

The following staff members were present: Planning Department – Kaaina Hull, Shanlee Jimenez; Deputy County Attorney Jodi Higuchi-Sayegusa; Office of Boards and Commissions – Administrator Jay Furfaro, Support Clerk Darcie Agaran.

CALL TO ORDER

The meeting was called to order at 3:00 p.m.

APPROVAL OF THE AGENDA

Ms. Griffin: If there are no objections as we move to approve the agenda, I would like to place Items C.2., C.3., and C.4. at the end of the business today, rather than where they appear now. With that, may I have a motion to approve the agenda?

Ms. Schneider: I make a motion that we approve the agenda.

Mr. Chaffin Jr.: Second.

Ms. Griffin: Thank you. Ms. Schneider moved and Mr. Chaffin seconded the motion. All in favor? (Unanimous voice vote) Opposed? Hearing none, the motion carries 6:0.

APPROVAL OF THE AUGUST 6, 2015 MEETING MINUTES

Ms. Griffin: The Approval of the August 6, 2015 Meeting Minutes. Are there any corrections?

Hearing none. May I have a motion to approve?

Ms. Wichman: Move to approve.

FHWA-CFLHD Note: Wainiha Bridges Discussion Included Below for EA Purposes. All other non-project items from KHPRC meeting minutes excluded for brevity.

Mr. Chaffin Jr.: I think you have to consider that.

Ms. Griffin: Thank you. Other discussion? Hearing none.

Mr. Hull: If I could clarify for Commissioner Chaffin, too. Ultimately what goes on with review at the Historic Preservation Commission is the KHPRC serves in an advisory capacity, and would serve in an advisory capacity to either the Planning Director if we're reviewing a Class I or over-the-counter permit, or to the Planning Commission if we're reviewing a Use Permit or Class IV Zoning Permit. That analysis does get taken into place particularly with some reviews at the Planning Commission level where they do take into discretion, as long as it's not a variance that you're talking about, but as far as exactions or requirements made upon applicants and the potential over-exacting, if you will, on a particular application. So that type of review is done, but I'll also defer to what Chair Griffin pointed out is that the purview of this Commission is really to look at the historic qualities and the historical resources and whether or not things like preservation or adaptation can be utilized. So I wouldn't worry too much about the financial side of it being that there will be another review of it, be it at the Planning Commission level or be it at the Planning Director's level, that you don't necessary have to worry about at this point. Just to, somewhat, unlay that concern.

Ms. Griffin: Thank you for that explanation. Is there other discussion? Hearing none. All in favor? (Unanimous voice vote) Opposed? (None) The motion carries 6:0. Thank you, and we'll look forward to your report next month.

Re: Letter (8/25/15) from J. Michael Will, P.E., Program Engineering Manager, US Department of Transportation, Federal Highway Administration requesting to be placed on the Kaua'i Historic Preservation Review Commission agenda to discuss and review the Wainiha Bridges No. 1, 2, 3; Bridge 7 E; Kapa'a Stream Bridge; and Hanapēpē River Bridge.

Ms. Griffin: Okay. Item D.3., New Business, letter from Michael Will, P.E., Program Engineering Manager, US Department of Transportation, to discuss and review Wainiha Bridges No. 1, 2, and 3; Bridge 7 E; Kapa'a Stream Bridge; and Hanapēpē River Bridge.

Staff, is there any…?

Mr. Hull: We don't have a report on these particular ones. I think they are not actually coming for any zoning permits. This is disclosure before you for their 6E Review Process.

Ms. Griffin: Thank you. Applicants?

Nicole Winterton: Hi. I'm Nicole Winterton. I'm the Environmental Manager from Federal Highway Administration, Central Federal Lands. We planned to come before you last month, so we have had some updated project planning, so we did update some presentations for you. We figured you would appreciate the latest and greatest information, so we'll pass that out.

Ms. Griffin: Terrific.

Ms. Winterton: I'll just go ahead and get started, if that's okay, while he's handing that out.

Ms. Griffin: Please.

Ms. Winterton: Like I said, I'm with the Federal Highway Administration, Central Federal Lands. We are a division of Federal Highways that does planning, environmental compliance, design, engineering, and construction management oversight of transportation projects. We typically work in the Federal lands, within or access to Federal lands, such as National Parks and National Fish and Wildlife Service Refuges. We've developed a partnership with the Hawai'i Department of Transportation. Over several years, we've partnered up on some infrastructure jobs here in Hawai'i, and have worked closely and developed a good relationship with HDOT; I'll abbreviate. We've developed into a five-year Memorandum of Agreement to deliver a program of projects with HDOT to help them deliver some critical infrastructure jobs, and also enter in a Peer-to-Peer Partnership with both agencies learning from one another the delivery, programming of jobs, and construction management of jobs. We have several projects on several different islands, but what we are here to talk about are the projects that we have here on this island.

So the project that I thought that I'd start with, if it's okay with you all, is the Wainiha Bridges Project. As part of this partnership, we have four (4) projects on this island. We've also partnered with an A&E, Architectural and Engineering firm, to support us on delivery on a lot of the projects. The Wainiha Bridges Project is a little bit unique, so I'll primarily talk about that project. CH2M Hill is helping support the engineering and compliance for the other bridges on the island, so I'll hand it over to Kathleen Chu, with CH2M Hill, after we talk about the Wainiha Bridges. We also have representatives from Mason Architects and Cultural Surveys Hawai'i, who are providing support from the historic architecture side of things and the archaeological side of things, so if questions come up, they are here to help (inaudible) their purview.

Ms. Griffin: Before you start, just so I'll know whether we can go through or not, is there anybody that's in the public that's going to want to testify on any of these bridges?

Okay, then we'll just go through one to the other. Thank you.

Ms. Winterton: Okay, great. So I think going through the Wainiha Bridges Project, if you want to just kind of run through the slides with me, I think I pretty much covered the role of FHWA in this project. I really wanted to talk about that because I think you probably seen or heard from projects that are federally funded and worked with the division where in those roles, traditionally, HDOT is more the delivery agent for that project and FHWA acts as a Federal agency for the 106. In this project, we are doing the actual design engineering, so we are the lead agency for Federal. These are federally funded jobs, so they are subject to Federal compliance, so Section 106. They are also State projects on the State route, so they're also, you know, with compliance for the State laws as well.

A little bit of project background for the Wainiha Bridges. They have a pretty long background; these are the bridges. We've actually been on this part of the island talking about it here tonight, so Wainiha Bridges 1, 2, and 3, which are the last one-lane bridges on your way to Hā'ena on

Kūhiō Highway, the north shore section. The original Bridges 1 and 3 were constructed in 1904. The stream channel kind of carved a new path, and in 1931 we had a new bridge added. Tidal storms damaged the bridges in '46 and '47, so then we had a new period of significance with new bridges added in this timeframe between the 50's. Bridges 1 and 2 were replaced, and then we had...oh, I'm sorry, we had all of the bridges replaced, and then in '66 we had the east span of Bridge 3 replaced. So just a little bit of background. We have, kind of, two (2) periods of significance with these bridges that were in this location. In 2004, the Bridge 2...so they go in order, Bridge 1 is the eastern most bridge, and then 2 and 3 are two (2) bridges that operate essentially as one (1) single-lane bridge, so just a little bit of background on that. These bridges suffered damage from storms in 2004, and Bridge 2 was replaced. Under inspection in 2007, they were in a pretty bad state of disrepair, so there was an emergency proclamation for the Governor to replace the bridges. HABS (Historic American Buildings Survey)/HAER (Historic American Engineering Record) was done at that time, and new prefabricated modular steel structures that we refer to as Acrow bridges are in there now. That was placed as a temporary measure to secure funding for the permanent replacement, and also to get through the compliance and engineering of that.

If we go to the next slide, just a little bit of reference, this is Bridge 3. In the lower right-hand corner, that's the existing bridge that's there now; that's the Acrow Bridge that we refer to. In the upper left-hand corner, that's the 1950's structure, the historic bridge that was present before that removal in the 2000's.

Central Federal Lands came into this project and there was a lot of background on it. What we really tried to do is seek to understand. There's very strong interest in this project. We have a significant road; the north shore section of Kūhiō Highway is listed on the National Register, and also on the State Register. Also, we knew coming into this that it was important to come up with a context sensitive design, so Central Federal Lands really spent time meeting with the community on the north shore, as well as the Hanalei Roads Committee to really understand what was important, as far as the aesthetic, the natural, the cultural features, so that we could try and develop the goals for the project. Through that process, and I think in the old presentation from last month, I really kind of went through the issues that we've heard from the public. If you're interested, I'd be happy to expand. But we heard a lot of different feedback on how the bridges are operating, and developed a purpose and need for the project. The primary purpose is essentially to provide permanent replacement bridges for the temporary Acrow bridges that are out there. We also identified opportunities to improve operations, manage the maintenance requirements, and also to balance project improvements with the character of the historic roadway corridor. There are issues with sight distance and visibility crossing the bridges. We heard that the rail spacing of the steel bridges is difficult, and I've experienced it, too. It's difficult to see through and across. There are maintenance concerns with vegetation overgrowth affecting site distance. When they had to put those temporary bridges in, they also had to raise the grade of the road a little bit. So all different factors that we identified. We identified a lot of opportunities. One (1) other important thing that we also identified was the significance of the roadway, so it became a balancing act of evaluating what our project transportation goals were, with also the context of the roadway, but also just the aesthetic and natural values that are really important to the community. In kind of reviewing the historic significance and some of those project goals and improvements, we really tried to step forward a process, and this is where we really would like the Commission's feedback, and this is what we presented. We had our most recent public meeting on September 15th. We've stepped through an alternative evaluation process, and we're preparing an environmental assessment for the project, and identified alternatives based on what we heard. We don't think that we are going to carry forward for analysis and we'd like the Commission's feedback on that. And also on the flip side, alternatives that we'd like to really move forward with analysis, so preliminary design feedback as we move forward with that process.

Moving forward, we identified a lot of opportunities for developing of the alternatives based really on the feedback that we heard and some of the engineering evaluation, which was the sight distance, traffic calming considerations. We heard interest in narrow bridges to help slow the traffic, accommodation of vehicle loads and navigation of emergency vehicles across and between the bridges; we heard feedback on that. Maintenance requirements, the aesthetics compared to historic roadway, historic alignment of the roadway, and then other design criteria and guidelines. Whenever we build new infrastructure or work on infrastructure, we have to document anything that we're doing that deviates from standards and guidelines.

Some of the opportunities, and this is through past coordination with HDOT before we were involved with the Hanalei Roads Committee, was replacement of those Acrow bridges, lowering of the roadway and bridge profiles to improve the sight distance to get it back to a little bit more like it was before, incorporating bridge rails that are shorter and more open than those on the temporary Acrow bridges to address some of that sight distance problem, and then a very minor alignment improvement between Bridges 2 and 3.

On the flip side, moving forward to the next slide, we did hear feedback on the challenges crossing those one-lane bridges, so there were recommendations on replacing the Acrow bridges with two-lane bridges so that you don't have that stop controlled traffic situation. We also looked at this because this is the standard design recommendation that if you were coming at a project today somewhere else in the world, this would be the recommended alternative for the type of roadway we have and the traffic number. However, considering the historic context and the current roadway operating and safety conditions, we're able to apply design exception to eliminate having to create two-lane bridges. Currently, that's being evaluated as an alternative to dismiss from further analysis, so we would certainly like feedback on that.

Ms. Schneider left the meeting at 4:37 p.m.

Ms. Winterton: Another option considered, which is always a consideration on a bridge project because you're crossing a stream is to replace the bridges with one-lane bridges on a new alignment. So that allows you the opportunity to build your new bridge, maintain traffic on your existing bridge, and then switch the traffic and take out the bridge. Basically, it shortens your construction period. We looked at that and it might provide some cost savings and time savings, but it didn't really outweigh some of the other disadvantages from the alignment change, and it didn't really offer design advantages. It's not like it was the ultimate improvement to make everyone see across and between the bridges. At this point, we anticipate dismissing that alternative from further evaluation.

So really where we're left is replacing the Acrow bridges with new one-lane bridges on a similar alignment, so that's closely matching the historic alignment with just a slight minor improvement on the tweak and curve between Bridges 2 and 3. As I mentioned before, we will have to have a design exception because typically one-lane bridges are usually only considered on very low-volume roads, but based on the conditions, the engineering team felt that could be justified. And as I mentioned before, lowering the profile of the road and the bridges to get it back more to the historic conditions. Then, as part of the National Environmental Policy Act process, we do need to carry forward the no action and no build alternative.

A lot of the feedback from the community was interest in width and design considerations, so we looked at a lot of different factors, such as the Design Controlling Criteria; what recommendations are for lane width, shoulder width. We considered functionality; how vehicles can get across the bridges and between the bridges. Potential maintenance considerations for whichever bridges are out there. Pedestrian and bicycle safety; we heard was important. Driver perception and expectation; how they are able to operate on the roadway. And also the historic alignment considerations. They were all kind of factors, and advantages and disadvantages of different varying widths.

Ms. Schneider returned to the meeting at 4:39 p.m.

Ms. Winterton: What you see before you, and what I provided ahead of time with some of the layouts provided for each of the three (3) bridges is, where our team is looking at, as far as reviewing of DOT and Federal standards, what some of the conditions are out there, and that is essentially a 14-foot clear width. It's a precast concrete girder bridge. On the slide, I have some of the lengths. So essentially you have, similar to the historic conditions, a single-span bridge for Bridge 1, approximately 50 feet, single-span for Bridge 2, and then three-span approximately 178 feet for Bridge 3. There are the historic piers in the water, but they are not actually functioning right now. The Acrow Bridge actually spans them, so for permanent replacement bridges, we would need piers to support that length of bridge.

Ms. Griffin: So you'd leave the old pier, but construct new ones? Is that what you're…?

Ms. Winterton: Actually, the recommendation is to…because what we need to do is match the hydraulics and the hydraulic opening with lowering the bridge, so the recommendation is to have a three-span structure with two (2) piers in the water similar to how the historic bridges were, but to put the new piers in and to remove the historic piers. So where exactly they would line up is still being evaluated because obviously they can't put it right where the old ones are.

Ms. Schneider: What is the timeline for this? When would you be doing this?

Ms. Winterton: We aim to get through the environmental compliance process winter/early spring, and then move towards completion of the design and securing the permits. It depends a lot on funding priorities with the State, but we find that as soon as we get everything done and ready to go, the money tends to appear.

Ms. Schneider: What's the duration for doing this?

Ms. Winterton: Okay, so I include that a little bit later, but I should add that…and I didn't include…our memorandum agreement with all of these projects with HDOT is essentially to do the full delivery and construction, and turn the facility back over to HDOT by 2018. So our goal is to get all of the projects that we are working with completed in 2018. The construction approach is a challenge on these projects, and I'll talk a little bit about that later, but the anticipated timeframe, to be conservative, was two (2) years.

Ms. Schneider: And you're going to improve the sight lines for entry and exit of the bridge? Because that's really the problem now.

Ms. Winterton: Yes. So that's the goal, to improve that, but I clarified to the extent possible because there are constraints in this location, and that goes to that balancing act of improvements while maintaining consistency with historic. Are there any questions on that?

On the following two (2) slides, I have a photo of the existing Bridges 2 and 3, and a rendering of what we were thinking about for Bridges 2 and 3. Some of the feedback that we've heard, and I would love the Commission's feedback as well, you know, is really the community has grown to appreciate those 1950's bridges. From an engineering perspective, when you look at the type of the rail spacing and some of the challenges with the sight distance, it actually does provide opportunities for improvements with that type of rail design. With consideration of the design standards, we always like to have crash-tested rail when we do improvements. So we have identified a crash-tested rail that sort of plays off a little bit of the historic rail. It's a structural steel tube rail, and this rail here it's called the Wisconsin Type. We went back and forth on vehicle rail only versus vehicle combo rail, and landed on a vehicle rail, which is a little bit lower and part of that is opportunities for that improvement to the sight distance. It's top-mounted, and max post spacing is 6'-6", which is that max amount that you would want to put it towards to still meet the crash-test standards. We'd probably seek to get close to that again because that visibility through the bridge is problematic.

Construction strategies. As I mentioned, the anticipated duration of construction is two (2) years, and it's depending on funding. Because these are bridges crossing the streams, it is a little bit hard, so we are talking about evaluating site conditions and how we can maintain traffic, and it's shifting the existing Acrow bridges, using them for construction, and shifting them makai to build the new bridges on alignment, and accommodating emergency access through construction. But there would have to be delays and very short-term closures for different milestones, such as moving the bridges. Another challenge for construction is leading up to these bridges, the three (3) original historic bridges crossing different streams, these are the Waioli, Waikoko, and Waipa Bridges, these are load restricted, and construction vehicles and equipment tend to be heavy. So we have evaluated this as a construction challenge, and the current recommendation is…because we do not want to affect the historic integrity of those original bridges, is to provide temporary bridges adjacent to or over so as to not touch the original bridges.

I have here, the second to last slide here, Waioli…the approach is evaluating the site conditions, utilities, right-of-way, and opportunities of where these bridges could be placed under temporary conditions would be…Waioli, mauka of the existing; Waipa, makai of the existing; and Waikoko is a very short structure right on the coastline, and there we have an opportunity to actually go up and over the existing bridge, so building behind on each side and going up and over because we really don't want to negatively impact any historic structures.

The next steps are…we really want to get feedback, continue the design process, and refine engineering through different coordination with you all, the public, we're getting feedback from the public, SHPD, and other interested parties, and prepare the analyses and the reports, and prepare an Environmental Assessment.

Any questions? Comments?

Mr. Chaffin Jr.: Yes. I would appreciate getting this package in advance. You reviewing it in front of us is difficult for me.

Ms. Winterton: Okay. I apologize for that. I did provide a presentation in advance for the last meeting; a lot of the information is similar. And we provided the drawings for each of the bridges. So we actually…in preparation for the public meeting, really took an extra step. We've done a lot of coordination with HDOT to get to a comfort level. There is a pretty big deviation from what is typically the recommended design approach, and so we were seeking to get feedback from the public as well, and I just wanted to give the latest and greatest information. Feel free to absorb this information. We'll take comments through the process, really.

Ms. Schneider: I appreciate that you've taken into consideration what those bridges looked like originally.

Ms. Griffin: Other comments? Thank you. In a general way, it's for those of us who have dealt with roads and bridges for twenty (20) years or more. Having context sensitive solutions roll right off your tongue, you know, is music. To be talking about protecting the historic bridges, rather than all of the reasons why it's too expensive, it can't be done, the people are going to fall through, you know, height limitations, materials, but hearing the "can do" aspects is really a pleasure. I must say that with the Hanalei Roads Committee that they are consulting and in agreement is a really important component to this historical review. They know about the roads up there, and bridges. Thank you.

So moving along to Hanapēpē.

Kathleen Chu: Hello. Good evening, Madam Chair and Commissioners. I'm Kathleen Chu with CH2M Hill, and if you can switch to your next presentation packet. I'm going to talk about three (3) bridges this evening; the Hanapēpē River Bridge, the Kapaʻa Stream Bridge, and Bridge No. 7E. I'll stop between each one so you guys can provide your comments on it.

Ms. Griffin: Thank you.

Respectfully Submitted,

Darcie Agaran
Commission Support Clerk

Date: 10/20/15

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

December 18, 2015

IN REPLY REFER TO:
LOG: 2015.04243
DOC: 1512JLP23
"concur APE"

J. Michael Will and Nicole Winterton
12300 West Dakota Avenue, Suite 380
Lakewood, CO 80228

RE:		
	Section:	Chapter 6E-8 and Section 106 Cultural Resources Management
	Agency:	Federal Highways Administration (FHWA)
	Project Name:	Replacement of Wainiha Bridges, HFPM-16
	Location:	Waioli, Waikoko, Waipa, Lumahai and Wainiha Ahupuaʻa, Halele District, Kauai Island
	TMK:	(4) 5-5, 5-6, 5-7, 5-8 var

Dear Mr. Will and Ms. Winterton:

The State Historic Preservation Division (SHPD) received a request for concurrence from FHWA for the temporary replacement of three bridges with temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560). The project has been determined to be is a federal action and undertaking triggering NHPA of 1966, as amended (2006), and as being subject to Hawaii Revised Statutes (HRS) Chapter 6E. The Area of Potential Effect (APE) and corresponding acreage is defined as:

- Wainiha Bridge 1: [4] 5-8-002:002 por.; 5-8-006:030-033, 046, 060, and 999 por; 0.669 acres;
- Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017-019, 030, 999 por; 5-8-007:023, 024, 031, 032, 999 por.; 2.272 acres;
- Waiʻoli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; 5-5-006:014, 888 por.; 5-6-002:002, 004, 999 por.; 0.913 acres;
- Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.; 0916 acres;
- Waikiko Bridge: [4] 5-6-003:002, 999 por.; 0.715 acres; and
- Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; 0.517 acres.

Based on the information provided, **the State Historic Preservation Officer (SHPO) concurs with the APE**.

The SHPD looks forward to continuing consultation on this undertaking, including the identification of historic properties (36 CFR Part 800.4), and the evaluation of potential adverse effects (36 CFR Part 800.5) and, if necessary, the mitigation process. **Please reference our LOG number and DOC number in all communication with this office regarding this undertaking.** The FWHA and HDOT are the offices of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking.

Please contact Jessica Puff, Architectural Historian, at (808) 692-8023 or at Jessica.L.Puff@hawaii.gov for any questions regarding architectural resources. Please contact Susan Lebo, Archaeology Branch Chief, at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov regarding any changes to the scope of work or the APE, or for any questions regarding archaeological resources or this letter.

Aloha,

Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Suite 380A
Lakewood, CO 80228-2583
Office: 720-963-3647
Fax: 720-963-3596
Michael.Will@dot.gov

December 9, 2015

In Reply Refer To:
HFPM-16

Shelly Lynch
U.S. Army Corps of Engineers,
Honolulu District,
Regulatory Office CEPOH-RO
Attn: Joy Anamizu
Building 230
Fort Shafter, Hawaii 96858-5440

Subject: Request for a Jurisdictional Determination, CFLHD/HDOT Wainiha Bridges Project

Dear Ms. Lynch:

As part of the Hawaii Bridge Program, the Federal Highway Administration, Central Federal Lands Highway Divisions (FHWA – CFLHD), in partnership with the Hawaii Department of Transportation (HDOT) is proposing to replace three temporary pre-fabricated (ACROW) bridges (Wainiha Bridges 1, 2, and 3) and place temporary one-lane bridges adjacent to or crossing over three additional one-lane bridges (Wai'oli, Waipā, and Waikoko) on Kūhiō Highway (Route 560) between Hanalei and Wainiha, on the north side of Kaua'i Island, Hawai'i (see Enclosure 1, Figure 1). CH2M HILL contracted SWCA Environmental Consultants (SWCA) on behalf of FHWA to complete a determination and delineation of potential Waters of the U.S. (WoUS) governed by the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA). The enclosed delineation report summarizes the findings of the potential WoUS delineation and determination conducted at these locations between September 30 and October 2, 2014.

The survey area comprises five non-contiguous survey areas: Wai'oli, Waipā, Waikoko, Wainiha 1, and Wainiha 2 & 3. In all, the whole survey area covers approximately 9.24 acres (3.74 hectares [ha]). Twenty-four wetland sampling points were evaluated in the survey area to determine whether wetlands or other WoUS occur. A detailed field-based determination indicates that 11 of the 24 sampling points meet the three-criterion test for wetlands (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) pursuant the 1987 Corps of Engineers Wetland Delineation Manual and the 2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Islands Region. SWCA delineated approximately 3.88 acres (1.58 ha) of potential WoUS. This comprises 2.78 acres (1.13 ha) of non-wetland WoUS and 1.10 acres (0.45) of wetlands. This conclusion is subject to confirmation by the U.S. Army Corps of Engineers.

This project is currently within the planning and design phase, and impacts to potential jurisdictional waters of the U.S. have not been calculated, to date, but unavoidable impacts to these potentially jurisdictional waters of the U.S. are anticipated given the nature of the proposed action. Upon completion of the project design and the calculation of proposed impacts to potential jurisdictional waters of the U.S., the FHWA-CFLHD will prepare and submit a permit application package, with the inclusion of our National Environmental Policy Act (NEPA) and supporting documentation. In order to streamline the permitting process, FHWA-CFLHD is notifying the U.S. Army Corps of Engineers (USACE) that FHWA-CFLHD will be serving as the lead agency for this project for the National Environmental Policy Act (NEPA) and other relevant federal laws and regulations.

This letter serves as our request to initiate your review and approval of the March 2015 wetland delineation report for this project. At this time we are requesting a preliminary jurisdictional determination from your office. We are aware that your office may determine that an approved jurisdictional determination may be more appropriate for this project; following your review of the enclosure and based on the aquatic resources identified and/or the current CWA guidance/directives. Included for your review is the following item:

- Enclosure 1: Determination and Delineation of Wetlands and Other Waters of the U.S. for the Kapa'a Stream Bridge Project; Prepared by SWCA Environmental Consultants March 2015.

Should you have questions or concerns, please do not hesitate to call Thomas Parker, at (720) 963-3688 or email at thomas.w.parker@dot.gov. Thank you for your time and consideration with this project. We look forward to working with you.

Sincerely Yours,

Mike Will,
Project Manager

Enclosures

From:	Koch, Amy - NRCS, Hilo, HI
To:	Winterton, Nicole (FHWA)
Subject:	RE: Wainiha Bridge Replacement FPPA Compliance
Date:	Thursday, February 25, 2016 11:04:41 AM

Nicole –

This email is a follow up to our phone conversation on February 18 regarding your FPPA inquiry for a bridge project in Kauai.

Because the acreage of the permanent bridge footprint that occurs on prime farmland is a fraction of an acre, you do not need to file the AD-1006.

I am now the FPPA contact at NRCS, so please contact me directly with inquires for your future projects.

Best regards,

Amy Saunders Koch
Assistant Director for Soil Science
USDA NRCS - Pacific Islands Area
808-933-8351
amy.koch@hi.usda.gov

From: Nicole.Winterton@dot.gov [mailto:Nicole.Winterton@dot.gov]
Sent: Saturday, February 06, 2016 12:37 PM
To: Koch, Amy - NRCS, Hilo, HI <amy.koch@hi.usda.gov>
Subject: RE: Wainiha Bridge Replacement FPPA Compliance

Aloha Amy,

I'm working on other files right now and realized I sent you the polyline file. The attached polygon file will work better than the previous email I sent. Sorry about that!

Thanks!

Nicole

From: Winterton, Nicole (FHWA)
Sent: Friday, February 05, 2016 8:28 PM
To: 'Koch, Amy - NRCS, Hilo, HI'
Subject: RE: Wainiha Bridge Replacement FPPA Compliance

Aloha Amy. Thank you for the information. It's very helpful. There is a small area of new right-of-way and some is unimproved. I have attached a shapefile of approximate new permanent right-of-way that is outside existing HDOT rights. It is three small polygons.

All other work is temporary.

Please let me know if you have any trouble bringing in the shapefiles.

Thanks again,

Nicole

From: Koch, Amy - NRCS, Hilo, HI [mailto:amy.koch@hi.usda.gov]
Sent: Friday, February 05, 2016 8:01 PM
To: Winterton, Nicole (FHWA)
Subject: RE: Wainiha Bridge Replacement FPPA Compliance

Nicole –
A few quick answers –

1) FPPA does not apply to temporary actions, as long as the land affected could return to "farm land" after construction is completed.
2) FPPA does not apply to projects on land already in urban development or used for water storage
3) FPPA does not apply to construction within an existing right-of-way purchased on or before August 4, 1984

Additional information can be found on our FPPA website:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/fppa/

Next steps –
If any of the items in #1-3 above apply to the entire area, then an AD-1006 is not needed. If you still aren't sure, please send me a shapefile containing the NEW PERMANENT right-of-way only. I will take a look and get back to you early next week.

Thanks!
Amy

From: Nicole.Winterton@dot.gov [mailto:Nicole.Winterton@dot.gov]
Sent: Thursday, February 04, 2016 2:18 PM
To: Koch, Amy - NRCS, Hilo, HI <amy.koch@hi.usda.gov>
Subject: Wainiha Bridge Replacement FPPA Compliance

Aloha Amy,

Mahalo for the return phone call. I am performing environmental studies and preparing an EA for a project to replace three temporary bridges on the North Shore of Kauai, west of Hanalei. The existing bridges were placed under state emergency action in 2007 as a temporary action until funding for new bridges could be secured and the environmental compliance and design could be completed. The majority of impacts are temporary, as we would provide a temporary bypass for traffic during construction. There would be some new right-of-way from both a slightly larger footprint and incorporating right-of-way that is existing transportation but is not currently captured in existing HDOT right-of-way for one reason or another. Other temporary impacts would occur at three load-restricted bridges as well (Waioli, Waipa, and Waikoko Bridges). We would erect temporary bridges in these additional locations to accommodate construction loads. (The existing historic bridges wouldn't be able to handle the loads.)

The online soil mapper has some prime farmlands, and similarly the state provided data has mapped soils that differs from the NRCS web soil survey.

Attached is a map of the project location. I brought in a shapefile of temporary area that may be affected into the Web Soil Survey, as well as new permanent right-of-way. Those maps are attached.

What are your thoughts on proceeding with the Form AD1006? In the past, Tony Rolfe would ask me for a shapefile. Would you like that? If so, would you want new permanent right-of-way only, or the entire Area of Potential Effect which includes most temporarily impacted areas?

Thanks so much for your assistance!

Nicole

Nicole Winterton
Environmental Protection Specialist
Federal Highway Administration, Central Federal Lands Highway Division
12300 West Dakota Ave., Ste. 280
Lakewood, CO 80228
(720) 963-3689

Appendix B
Public Involvement Documentation

<table>
<tr><td colspan="3">U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

RECORD OF PUBLIC MEETING</td></tr>
<tr><td>DATE:
December 9, 2014
6:00 pm to 8:00 pm</td><td>MEETING HELD ON: Project to Replace Wainiha Temporary Bridges</td><td>DIVISION:
CFLHD</td></tr>
<tr><td>LOCATION:
Hanalei Elementary School</td><td>MEETING HELD BY:
FHWA-CFLHD and HDOT</td><td>PROJECT NO.:
HI STP SR560(1)</td></tr>
<tr><td colspan="3">IN COMPANY WITH:
See Below</td></tr>
</table>

ATTENDEES

Federal Highway Administration (FHWA), Central Federal Lands Division (CFLHD)
Ed Hammontree, Hawaii Program Director
Mike Will, Hawaii Program Engineering Manager
Nicole Winterton, Environmental Lead

Hawaii Department of Transportation (HDOT) Highways Division, Kauai District
Ray McCormick, District Engineer
Fred Reyes, District Civil Engineer
Donald Smith, District Design Engineer

Ku'iwalu Consulting
Dawn N.S. Chang, Facilitator
Jessica Kaui Fu

Public/Agency Attendees
See attached sign-in sheet.

MEETING MINUTES

A. Introductions
1) Dawn Chang introduced herself as the facilitator and the purpose of the meeting. The meeting purpose is to introduce FHWA-CFLHD as a new partner in the project as well as to solicit input from the public on key issues and factors that are important to be considered in the project. Ms. Chang also reviewed meeting logistics with the group.
2) Ms. Chang introduced Ray McCormick of HDOT and Ed Hammontree, Mike Will, and Nicole Winterton of FHWA-CFLHD. She also introduced Jessica Kaui Fu who assisted with note taking.

B. Presentation (see attached)
1) An introduction to the CFLHD partnership and project was provided by Ray McCormick, HDOT Kauai District Engineer.
2) An introduction to the CFLHD Program of Projects and partnership with HDOT was

provided by Ed Hammontree, FHWA-CFLHD Program Director.

3) An overview of CFLHD and the agency's role in the project was provided by Mike Will, FHWA-CFLHD Program and Project Manager.
4) An overview of the environmental process, as well as a description of the input from the public the project team is seeking, was provided by Nicole Winterton, FHWA-CFLHD Environmental Lead.

C. Public Input Shared Verbally at the Meeting

1) Polly Phillips- Is there already an engineering company working for the state? Are we starting the process all over again? She thought that there would already be a proposed bridge at this point and is concerned that the progress made thus was not going to be taken into consideration. Would like to see an easy access to a proposal where community to directly comment on and give feedback.
   a) The project team clarified that an Engineering Design Report was prepared and will be incorporated into the project. The project isn't starting over, rather building off of the past work done.
   b) A follow-up question was posed if the report could be posted on the website. HDOT indicated that it could be; therefore CFLHD and HDOT stated they would post it so it is available for viewing.

2) Barbara Robeson- Shared background information on the Hanalei Roads Committee (HRC) and their efforts to preserve the unique one-lane bridges from Hanalei to Ha'ena. A Historic Roadway Corridor Plan was developed that stated the one-lane bridges should be preserved. The HRC developed the nomination so the road is now listed on the National Register of Historic Places. The Engineering Design Report was developed over a period of 7 years. Feedback in this process was that the 1) Railings should have a historical design and be shorter than the ones on the current temporary bridge; 2) timber decking should be considered; the part of the bridge that people drive on/over should be wooden or designed so that you hear the thumping sound; 3) Bridge 2 and 3 should be just slightly straightened to slightly improve alignment; 4) Width is a big issue. Width has been discussed and compromised, discussed and compromised. 5) Is there a height requirement for the rails of the bridges? Height of rail affects visibility from view of driver's seat.

3) Unidentified speaker - Visibility – Oncoming cars cannot be seen or are very hard to see. Visibility- Height. Color is an important consideration – short and white on the old bridges vs. tall and silver for temporary bridges.

4) Louise Sausen- Wants the bridges to look the way it used to (even if you cut it and paint it white). The residents of Ha'ena, those who drive to and from daily or frequently are experiencing stress on the roads because of tourists. The amount of them that are driving to Ha'ena and crossing the bridges has dramatically increased. Tourists need to understand one lane bridges and how to cross them respectfully. Suggests a no visitor crossing day. The closure when the temporary bridges were placed was a welcomed change.

5) Robin Drapkin- Visibility due to plant growth inhibiting drivers from seeing oncoming traffic. Even when foliage is trimmed it's hard to see. Signaling options should be considered because common courtesy doesn't always happen. Concerned about safety. Signaling should be considered so you don't guess who or what is on the other side.

6) Louise Sausen- Scott Robeson donates his time and services and cleans bridge corridors from Hanalei to Ha'ena. Maintenance of the bridges themselves and surrounding areas doesn't seem to be done very well by DOT. Overgrown plants block views of traffic.

7) Stephanie Tombrello- Has been caught in between the Wainiha double bridges more often than before. The danger of having to squeeze on the side to let opposing cars pass because cars from opposite ends of the bridge are trying to cross at the same time. Safety. Locals respect crossing protocol and tourists are unaware of them. Visibility - There seems to be more conflict with the temporary bridges, perhaps the height and color. Old bridges were lower and rails were lower.

8) Sam Lee, Kaua'i Fire Fighter- A lot of travelers drive the road and don't attend meetings. Concern about how decisions on width will be made. Possibility of 2-lanes, a bike lane, widening. A survey was done with State Parks and on a summer day 10,000 plus people are crossing daily. Many safety concerns. Ingress and egress are a major problem. Possibilities of hardening the structure to withstand tsunami (evacuation in emergency). Impact of amount of users. Safety in emergencies (rescues, fires, natural disasters) is a concern. Weight constraints in particular for emergency vehicles, for large scale disasters the largest emergency vehicles designed to fight large fire cannot cross the bridges. Design- can't see people walking. Awful fighting and road rage occurs between drivers. Volumes of traffic need to be considered. Limits of the area, and how much the bridges can hold needs to be considered. Suggests an emergency response plan be developed and included with bridge development plans.

9) Frank Rothschild - Concerned that the history of efforts to preserve the one lane bridges of the north shore will repeat. Will we have to fight again the same battles that the bridge committee has been for the past 30-40 years?

10) Polly Phillips- Residents are frustrated with the number of tourists in the area. The North Shore of Kaua'i is very special. People love to visit this unique place because of its beauty and the experience they get going there. We don't want that to change. Ha'ena is a simple place, that's why it's special.

11) Louise Sausen - "He moku he wa'a, he wa'a he moku." -Literally the island is a canoe and the canoe is an island. Moku means island and is also a Hawaiian term for land division. A figurative comparison of a canoes carrying capacity and sea faring abilities to an islands capacity of inhabitants with proper use of natural resources available. The size of this place is not going to change just like the size of the canoe is going to stay the same, its capacity does not change. Impacts felt by residents, my heart is broken because her lifestyle has been forced to change. Others should change to fit this lifestyle.

12) Carl Imparato- Maintain the character of the bridge and character of the community, its historic nature. Visual impacts need to be minimized. Railings on the side, bridge width of 10-11 feet. Honolulu office has been coming up with inconsistent excuses to widen the bridge like an increase to 16 feet wide because it must be able to fit two wheelchairs side by side, widening should be based on legitimate functionality. Plans should take into account the Ha'ena State Park Master Plan, the proposal to shuttle tourists in and out of Ha'ena. Consider the efforts of the Ha'ena Based Community Subsistence Area designation. Be open to many solutions and alternatives.

13) Brian Hennessy- Pace- Keep cars moving slowly. The more open the bridge and roadway, the faster people tend to drive. Wants people to go slow to be safe. Keeping things narrow creates restriction for speed.

14) Evelyn de Buhr- Have lived in Ha'ena for 18 years and the one lane bridges are important entry points; the way they make people stop and be aware of others is a ritual that you get to experience. It is deeply a part of what Ha'ena is.

15) Scott Robeson- Beauty, culture, life style... The one lane bridges are a big part of that. We don't want things to become big or multilane. Recognizes the fact that the bridges need to accommodate safety vehicles but suggests that the county buy safety vehicles that fit the bridge and that no high rises be built. Bridge should accommodate 100 year flood. Wainiha means wild water. The trees and debris that are washed down and get stuck under the bridge are a concern. Flow of the river should be considered. The bridges need to be safe for general use. Visibility is an issue- the sides of the bridges affect visibility. The bridges should also be lower. Strength for safety. Wide enough for a car and a pedestrian. "If you don't want to slow down, why did you come to the north shore?" Maintain historic size, people come here for the small rural size. A two lane bridge will change the character of the North Shore. Visibility- the transition between 2 and 3 creates an artificial visibility problem so you have conflict in the middles. The North Shore has ambiance; bridges shouldn't be jarring. Maintain the historic lanes, sound. You can't see oncoming traffic and how many other cars are waiting on the other side, only who comes first. Make sure traffic remains slow and calm.

16) Chris Tombrello – This area should be a UNESCO world heritage site.

17) Beau Abbot(?) – Safety on the sides of the road is a concern. There is a national plan with people figuring out how to slow and calm traffic.

18) Nicole Winterton (CFL) – In response to a question on whether Waioli, Waipa, and Waikoko were included in the project, Nicole responded that we are also studying those locations for environmental resources for temporary impacts related to needing to temporarily accommodate construction equipment.

19) Louise Sausen – Temporary bridges are wider that the originals. Because of width, the bridges don't align and makes the "S" turn worse.

20) Unidentified comment - Sign that says "Courtesy 5-7 cars" isn't always in agreement with common courtesy practice. The number often confuses tourists and they are wondering if they are the eighth car or get hostile when then see more than 7 cross as they expect it is there turn. Suggesting to change sign, that the sign say "common courtesy" only or something that encourages local protocol like "no rush, live aloha".

21) Unidentified speaker - When will bridges be constructed? 15, 10, 5 years? Concerns about traffic and construction. Liked that the team shared their experiences and previous projects because they would like this project be treated similarly, with the respect that would be given constructing a bridge in a national park.

22) Billy Kinney- Concerned about the Wainiha River and the Wainiha estuary. The river mouth is famous in Hawaiian history because of the way it changes the shores of Wainiha and the wildlife that depend on the estuary to survive. An example are all the native species of 'o'opu who travel to the very tops of the waterfalls in the back of Wainiha valley and travel

all the way to the ocean by getting carried down with the big heavy rains to spawn/reproduce. The river under these bridges are the reason for the place name WAI NIHA – the unique characteristics of the place, the land, the waters, the culture all need to be protected. Most importantly clarification to us with effects on river and all of its resources needs to be addressed.

APPROVED FOR DISTRIBUTION

2-23-15

J. Michael Will
Project Manager

Date

DISTRIBUTION:

Federal Highway Administration, CFLHD
Ed Hammontree, Hawaii Program Director
Mike Will, Hawaii Program Engineering Manager
Nicole Winterton, Environmental Lead
Jill Mathewson, Design Engineer
Bonnie Klamerus, Structural Engineer

Hawaii Department of Transportation
Ray McCormick, District Engineer
Fred Reyes, District Civil Engineer
Donald Smith, District Design Engineer

<table>
<tr><td colspan="3">U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

RECORD OF PUBLIC MEETING</td></tr>
<tr><td>DATE:
March 9, 2015 6:00 pm to 8:00 pm</td><td>MEETING HELD ON: Project to Replace Wainiha Temporary Bridges</td><td>DIVISION:
CFLHD</td></tr>
<tr><td>LOCATION:
Hanalei Elementary School</td><td>MEETING HELD BY:
FHWA-CFLHD and HDOT</td><td>PROJECT NO.:
HI STP SR560(1)</td></tr>
<tr><td colspan="3">IN COMPANY WITH:
See Below</td></tr>
</table>

ATTENDEES

Federal Highway Administration (FHWA), Central Federal Lands Division (CFLHD)
Ed Hammontree, Hawaii Program Director
Bonnie Klamerus, Bridge Engineer
Jill Locken, Lead Roadway Designer
Mike Will, Hawaii Program Engineering Manager
Nicole Winterton, Environmental Lead

Hawaii Department of Transportation (HDOT) Highways Division, Kauai District
Ray McCormick, District Engineer
Fred Reyes, District Civil Engineer
Donald Smith, District Design Engineer

Ku'iwalu Consulting
Dawn N.S. Chang, Facilitator
Jessica Kaui Fu

Public/Agency Attendees
See attached sign-in sheet.

MEETING MINUTES

A. Introductions

Dawn Chang introduced herself as the facilitator and the purpose of the meeting. The meeting purpose is to: 1) Update the public on where we are in the process, 2) Present the purpose and need developed based on past public engagement and get feedback, and 3) Present alternatives and design elements being considered and get feedback. Specific design considerations include bridge type, rail types and sizes, deck considerations, and bridge width.

B. Presentation (see attached)

A presentation was provided that provided the background of the project, issues and considerations we have heard through past public engagement, purpose and need that had been developed for the project, and bridge design considerations. After each element of the presentation, public feedback was provided verbally and through written notes on the poster boards. Public input provided through written notes on poster boards are presented below in Section C. Notes taken based on verbal input is provided in Section D, below.

C. Public Input on Design Factors Shared Via Written Notes on Meeting Boards

Vehicle Bridge Rails

CA Type 115

- No bridge rail for bikes, what keeps us from being sued in the event of someone falls off. Liability?
- This seems more historic – with mounts on bottom.
- Preferred 115.
- 115 – Looks more like historical design.
- 115 preferred.
- 115 yes on 2' 6'' rail height.
- Bridge CA 115, Low rail – good, shallow under side, 2 rails, Best Bridge.
- 15 MPH limit between #1 and #2 in Wainiha village!
- 115
- Very good in line with historic bridge.

OR BR206

- BR206 – No
- Sticks down too far.
- OR BR206 most visibility.
- OR BR206 or WI Type M (preferred)

WI Type M

- WI Type M 2nd option to 115.
- Post 2 close.
- Better than 115 allows pedestrian refuge with side of rail.
- Hanalei Road is not a road for a leisurely bicycle ride. Don't fit a bridge for bicycles in the middle of a road which doesn't accommodate bikes.

Vehicle/Bicycle Bridge Rails

CA Type 116

- 116, no on height of 3' 8'', Bikes can walk across.
- Sticks down too far.
- No- too many rails.
- No too busy.

OR BR208

- BR 208, No
- Rail, OR BR 208.
- Just because the bridge isn't currently bike friendly, does not mean it won't be in 20 years. I think we should plan for this option in the future.

- There are a lot of children that travel this bridge and I prefer the higher rails for this reason.
- 208 No.

<u>WI Type M(Comb)</u>

- NO WI – M.
- Too close.
- WI – M No.

Bridge Deck Considerations

- I want what is sustainable and would need least maintenance.
- Save the trees…use concrete. Could make concrete look like wood for aesthetics. I could go without the sound. Don’t care so much about sound, safety more important.
- Wood for aesthetic purpose is not reasonable or prudent.
- No wood – extra cost and maintenance, safety issue.
- No wood.
- Consideration of durable wood for bridge deck: (i.e) Ipay (sp.?).
- Timber on top of concrete is preferred. This is historic for timber.
- Save the trees.
- Best choice that give sound. Sound is CHARACTERISTIC.
- Wood is good. Historic.
- Sound not too big an issue, but wood over concrete or concrete looking like wood.
- I vote for timber on top of concrete! Concrete made to look like timber will look cheap and cheesy.
- No wood.
- (Note takers note- there is an arrow pointing to the end of deck and railing of bridge on this comment) Wood rub rail/curb similar to Hanalei Bridge.
- Texture deck- for sound not imitation wood.
- Wood.
- Concrete is fine with me. Could look like wood.
- Wood is slippery over time, can hydroplane with big rains. Dangerous and concrete is fine.

Bridge Width – 11-foot Considerations

- Mixed. I both want it to be historical yet also want the emergency vehicles to pass. Doug
- Want it historical yet want emergency vehicles to pass. Darci
- Per phone call with Carl Imparato- this is his preferred BR/HRC.
- Narrow bridges keep traffic slowed down. 11’ is better than 16’.
- 11ft!!! This is a road that is slow, friendly, and wonderful, and HISTORIC!
- Narrow width deters larger buses carrying more tourists to area.
- Narrow width is aligned with historical bridge.
- Narrow width means less overall footprint of bridge.
- Narrower width is better aligned with how road also becomes narrower from Hanalei to Ha’ena.
- Narrower width = slower cars
- Low speed. Forces car to go slow. Safer.
- Safer for all users.

- 16'- people will speed. Especially if the roads grade is more level. GO 11'.
- 11' is historic. 16' not historic. Traffic goes faster on 16'. Faster traffic is less safe for pedestrians.
- 11' is not wide (enough) for equipment that is needed to maintain the road. 14' is minimum I would need to get equipment in.
- Lifestyle, small changes add up to Big changes. Keep Historic.

<u>Bridge Width – 16-foot Considerations</u>

- 16' does not account for pedestrians unless shoulder width is on one side.
- Too large of a width. 16' invites potential for cars to "think" they can pass each other
- Marry the historical aesthetic with today's needs and future needs. What worked in 1905 will not work for today or future generations.
- I prefer 16' width, safer for kids and families with increased traffic.
- Better for trailers and larger vehicles.
- Allows cars to go too fast over the bridge.
- Higher speed. Limit lane width with wood curb.

<u>Other Alternative Considerations?</u>

- Work with the county and state to mandate shuttle service during bridge construction, local traffic only.
- There are several businesses in Haena that serve the community and feed families. They need to remain accessible and uninterrupted.

<u>Considerations with Advancing Two-Lane Bridge</u>

- NO 2-lane bridges.
- NO Two lane bridge!
- Two Lanes:
  -Less wait time, we have more traffic now, modern road meet modern needs. -Too fast, we are developing shuttle buses, changed to modern bridge =   change the North Shore culture and lifestyle.
- NO 2 lane respect the historic road and bridge.
- No 2 lane.
- No way to make a slow wide bridge.
- Need to change not the road!
- Ha'ena State Park Master Plans EIS could potentially reduce vpd over the bridges.
- Non-Historic. Costly. Although traffic has increased people behavior and driving habits.

<u>Construction Approach and Alignment Considerations:</u>

- I like the idea of keeping acrow bridge up during construction of new bridges.
- Recommend: move acrow makai(toward the ocean), construct/rehab in historic corridor.
- Lower roadway. Better line of sight. Safety should be #1. Build temporary bridge please!!
- Leave enough room between 2 & 3 for at least 2 cars for drivers to correct errors in judgement.
- 2 lanes, thumbs down.
- The original road width and one lane bridges generated an environment, a culture, a lifestyle, and a way of living that we all came here for. If you change these things you LOSE some of that.

- Alignment should be straightened, safer, efficient.
- Align bridge #1 better!!

<u>Waikoko, Waioli, Waipa Temporary Access Considerations:</u>
- Barge into Wainiha, clean out county park for staging.

<u>Bridge Width- No Action Alternative</u>

<u>Advantages and Disadvantages:</u>
- No-Build alt. NOT preferred because of current issues with acrow.
- Isn't this being considered only because "no build altern." Is an EIS requirement?
- NOT ACCEPTABLE! Acrow bridges have created numerous problems.
- Caused community to dislike one way bridges.

<u>Bridge Width – Any Other Consideration?</u>

<u>Other Bridge Width Recommendations and Potential Benefits?</u>
- Consider separate pedestrian bridge mauka of new bridge.
- Wider = Faster = Lifestyle Change

D. Public Input Shared Verbally at the Meeting

<u>Purpose & Need Feedback:</u>
- I think that you guys did a good job at capturing the communities concerns and feedback. I care greatly about the impacts to the estuary, stream life, and environment but also have concerns for neighbors/those living right near the bridges. I live on Alaeke rd., the road right between bridges 2 & 3. During the construction of the ACROW bridges, the default staging area on Alaeke rd. was right where the school bus stop is. The machinery was staged right there and was a convienient stop but also a spot where kids ride their bikes, catch the bus, etc. Please be mindful of those kinds of impacts when planning.
- Cost for residents building homes, please consider weight capacity of bridge and rebuild the bridges capable for vehicles carrying large/heavy loads with items like construction materials.
- Restore the white bridges that were once there. Alignment and maintainence and control of vegetation is very important. Feedback from previous meetings was good and well captured.
- Problems of the ACROW bridges are temporary, therefore the problems with them are temporary as well.   The question is how will we design the bridges to be as they were before and address all these other functional issues while fitting with historical road requirements. What the ACROW bridges are or not able to do is irrelevant. What was there before is the project! Comparing it to what the 1904 bridge was to now.
- Keep it how it was and address the operational issues.
- Under Alternate Considerations (during presentation), "Replacement of the ACROW bridges" is an unclear statement.
- Water area under the bridge in as issue. The height of opening? What does that mean? Increased hydraulic opening?
- Timeline for these bridges requested. When??

Bridge Type Feedback:

- Box beam? Big concrete? Can we build the long beams here?
- Can that design hold two lanes?
- River clearance 2ft. deep. 21/2 ft. total depth.
- Water passage an issue. X design versus II
- The stream that passes under bridge 2 is much shallower than bridge 3. It raises higher and quicker and traps more debris. Is river on under bridge 2 is shallow most of the time and I am much more concerned with flow under bridge 2 than 3.
- What is the difference between the low corridor of the old bridge to the proposed bridge?
- What is no bridge/no action?
- Historical hydraulic capacity versus that of the proposed plan?
- Bridge height compromise for hydraulic opening, money/cost spent to build, visibility being a big issue because you can't see the oncoming traffic.
- Ala Eke Rd. that connects bridges 2 and 3 that area is the high point of that road and where residents of the road park their cars during floods.
- The solid cement beams will divert water to the sides of the bridge and cause flooding to the residents who live around the bridge.
- What is no rise??

Bridge Rails Feedback:

- Visibility!
- Why design bridges that accommodate bicyclists when the roads around the bridges do not? Building a bridge with a bike lane is not necessary because the roads on both sides they connect to do not have bike lanes and are very narrow.
- What are the chances of getting the money for this project?

Bridge Width Feedback:

- Historic designation is of the utmost importance, to return it back to what is was when we asked for the designation.
- Will the community's comments from 2012 be represented? Diminished? Unconsidered?
- Why do we want the historical design of the bridge? Is like asking a blind man to describe an elephant? The road and bridge design is an essential ingredient to our community, culture, and lifestyle. If we make them wider it is a little thing that changes a lot of aspects of our lifestyle. It is the characteristics of the north shore and if you don't like it don't live down here or disrupt the lifestyle of this place.
- The narrower the slower people go. There should be no discussion of two lanes! To discuss two lanes is going backwards for me. Our community has made it clear that two lanes is unacceptable.
- Signs are important.
- Keep it narrow so the bikes don't go with the cars at the same time.
- Blind spot, line of sight, are there any considerations to alignment? The amount of traffic recommends a more straight line of sight.
- I am concerned about the removal of vegetation, especially the hau on the Ha'ena side of bridge 3, the land that the hau is on is county land and they need to do their part to clean it to increase visibility.
- How can we restrict driving to residents only during construction? What sorts of construction notice will be sent out? How will people know about construction plans and be aware of when and how things are happening? How will the problems of construction of the bridges be addressed? What about the use of Ha'ena/Wainiha resources? And how will traffic be controlled?

- Consider businesses that will be affected during construction.
- Respect historical status, address functionality and the need for emergency vehicles to cross bridges.
- Consider Ha’ena State Park planning process and changes that will bring about on the north shore.
- Short term vs. long term impacts
- Elevate the Ha’ena end of Bridge 3 so you can see better.
- Raise bridge 2 to be equal with 3 so you can see and widen the gap and round off the turn in between the bridges so you can see oncoming traffic and large vehicles or vehicles towing trailers have an easier time crossing the bridges and increased visibility.

<table>
<tr><td colspan="3" align="center">U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

RECORD OF PUBLIC MEETING</td></tr>
<tr><td>DATE:
September 15, 2015 6:00 pm to 8:00 pm</td><td>MEETING HELD ON: Project to Replace Wainiha Temporary Bridges</td><td>DIVISION:
CFLHD</td></tr>
<tr><td>LOCATION:
Hanalei Elementary School</td><td>MEETING HELD BY:
FHWA-CFLHD and HDOT</td><td>PROJECT NO.:
HI STP SR560(1)</td></tr>
<tr><td colspan="3">IN COMPANY WITH:
See Below</td></tr>
</table>

ATTENDEES

Federal Highway Administration (FHWA), Central Federal Lands Division (CFLHD)
Bonnie Klamerus, Bridge Engineer
Mike Will, Hawaii Program Engineering Manager
Nicole Winterton, Environmental Lead

Hawaii Department of Transportation (HDOT) Highways Division, Kauai District
Ray McCormick, District Engineer
Fred Reyes, District Civil Engineer
Donald Smith, District Design Engineer

Ku'iwalu Consulting
Dawn N.S. Chang, Facilitator
Emmaleah Stauber

Public/Agency Attendees
See attached sign-in sheet.

MEETING MINUTES

A. Introduction

Dawn started the meeting discussing the purpose which is to let the public know that FHWA is continuing its commitment in a proactive way on the Wainiha bridge replacement project. They are once again coming to the community for feedback on critical issues with the project in response to community interest and asking the government to come in early. The goal of the process is to engage the community in discussions before the EIS is prepared. FHWA will share responses to the public meetings and discussions with HDOT and proposed actions on decisions so want to capture comments.

B. Presentation (see attached)

A presentation was provided that provided the background of the project, issues and considerations we have heard through past public engagement, purpose and need that had been developed for the project, and alternatives and alternatives dismissed from further consideration.

C. Discussion Items during Presentation

Mike Will, Project Manager, FHWA-CFLHD: Discussed Central Federal Lands Division is a cradle to grave organization and therefore Mike will continue his role throughout the design and construction of the project. There have been several years of engagement so far with the community on the development of the Kuhio Highway report. Got input from the locals to define purpose and need. Must marry the project goals from the public with standard engineering design.

Decking: proposing a concrete deck that is stamped to look like timber. Timber has high maintenance and gets slippery.

Fred Reyes, HDOT, question: Can you color the deck concrete to look like timber? Answer: Yes

Mike Will: Detours are planned at the Waioli, Waipa, Waikoko bridges during construction and the goal is to minimize ROW and utility impacts and bridge length. Anticipate 24 hour road closures for installation and demolition of each of the detour bridges. Waikoko may need a closure to build abutments and then another to launch the bridge in place to bridge over the existing bridge.

Nicole: Need feedback on construction approach, proposed design, what would be impacted.

D. Facilitated Discussion with Public Questions and Input (facilitated by Dawn Chang)

Notes from questions asked by meeting attendees, as well as input, are included below. Public questions and input is in black text, and agency and facilitator responses are in *red text and italicized*.

1. Johnny Whitman, HRC: Clarify whether the three approach briges need to be replaced prior to the Wainiha Bridges. Mike Will*: No, just need to create access for the construction and to get materials into Wainiha.* What will the timing be on the road closures with the construction of the 3 temporary bridges (Waioli, Waipa, Waikoko [WWW])? *It is anticipated that sporadic 24 hours road closures will be necessary to construct each of the three approach birdges (Waioli, Waipa, Waikoko). The Wainiha Stream Bridges will also necessitate complete 24 hour closures.* Felt that 24 hour closures would be acceptable if there was advanced notice because the community dealt with it during the construction of the Wainiha ACROW bridges. *A public Information program is planned to be implemented alerting the road users of impending travel impacts during construction. Timing of the notification will allow for the road users to plan accordingly.*

2. Question: Is first phase getting temp bridges in so that you can build the permanent Wainiha Bridgges. *Mike Will: yes that will be first phase of work.* Question: What is the timing of the detour bridges in place? *Mike Will: Design and permitting complete in 2016-17 but funding may cause delays.*

3. Unidentified Speaker: Are the 24 hour closures for construction of all the bridges? Just the 3 WWW bridges or for Wainiha too? *The sporadic 24 hour closure will be necessary to construct the temporary bridges at (Wainiha, Waioli, Waipa, Waikoko).* What is the projected timeframe for the construction of the 3 WWW bridges? *The timeframe will be dependent on the contractors sequencing of operations, but we anticipate 1-24 hour period for construction of the temporary abutments and 1-24 hour period for placement of the bridge deck, on each bridge.*

4. Unidentified Speaker: What is the official designation of the historic road area? Are there specific rules that are involved in the construction? How much say does the public have in what occurs in the area? *NW: That segment of roadway is on the National Register. Anything on the NR of Historic properties goes thru the Section 106 Fed and State process. Requires consultation with SHPO and other agencies/groups Identify effects and ways to mitigate. Agency makes the decision with SHPO and consulting party input. Dawn: public comments are considered and when public documents come out, the public will have the chance to comment.*

5. Tin-Tin Pu'ulei: What's the plan? How will this construction affect the community and disturb our lives? The construction of the ACROW Bridge caused a great disruption and hardship to the families and communities in the area and I am against any further construction. Building a new bridge will cause too much inconvenience for the families that live in the area. Hawaiians who are from that area and call it home should have the ultimate say in how/if this new bridge is constructed. We don't want a two-lane bridge or any new bridge that will allow for bigger trucks and tour buses and more traffic and tourism. We don't want to encourage any further development of the area.
   How will construction affect our lives? The construction crew took too long with the construction of the ACROW Bridge. How long will this really take? You said 24 hours – can you stick to that timeline?
   What about the environmental impacts? I witnessed construction crews dumping concrete into the Wainiha River during the ACROW construction. I am convinced that this led to fish die offs and a distinct decline in the presence of O'opu Nakea. I am against any further construction.
   We do not want changes, but if there has to be change, we want it to be for the better, which means we don't want wider bridges.

   Thank you for your comments. We will consider and document your concerns.

6. Julie Mai: Are you replacing the bridges at WWW? *The three bridges approaching the project are not scheduled for replacement or rehabilitation as part of the Wainiha bridge replacement project.* Can we build at night? How long will the temporary bridges be at WWW? *We estimate the bridges would be needed to support construction traffic associated with the Wainiha Bridge replacement project for a period of approximately 1.5 to 2 years.* Can we bring the material for the Wainiha Bridge in on barges rather than build the WWW temporary bridges? *This can be considered.* Do we have to build a new bridge at Wainiha? *The existing ACROW bridges are considered temporary and are not designed for long term use. For long term access, new bridges will need to be constructed. The plan is for the existing temporary bridges to be re-used and slid over as bypass bridges during construction of the new Wainiha bridges.* Can't we just improve the existing ACROW? *See prior response.* Tourists are already confused on how to navigate the existing bridges. We need to limit confusion somehow and make things really clear so tourists aren't backing up traffic. Maybe we can pass something out at

hotels that tells the tourists how to drive on the bridges and around construction and where they can and can't park. *Thank you for your comment. We will consider and document your concerns.*

7. Geraldine (last name unknown): The difference in height between the road and the bridge is an impediment to visibility – will that be resolved? There are problems with vegetation along the road also. *The new Wainiha #2 and #3 bridges are planned to be lowered by approximately 2' – 4'. The lower bridge elevation along with the new bridge railing will provide better visibility for the road users.* Will the middle section of road between the bridges be maintained and landscaped?

8. Blake Covett: What is the timeline for completion? *Completion is dependent on when funding is available for construction. With funding secured, the bridges are estimated to take approximately 1.5 to 2 years to construct.*

9. Frank Rothschild: If the Wainiha Bridge cannot be constructed until the WWW bridges are done, then how much more time is the project really going to take? *The three WWW bridges do not need to be improved prior construction of the Wainiha Bridges, however, temporary access for construction traffic at the three bridges does need to be completed prior to work on the Wainiha bridges. This includes placement of temporary bridges which will be completed as part of the Wainiha Bridge project.* Where is the funding coming from? *Federal / State Transportation Program Funding.* How will funding delays affect the projected timeline? Will the same contractor be used for the temporary bridges as the permanent bridges? *MW: may have 2 contractors so that can get temp bridges in place in advance of the Wainiha bridges. With all the same funding.*

10. Unidentified Speaker: Will the WWW bridges be similar to the existing Wainiha ACROW Bridge? *The contract will not specify the types of temporary bridges that will be required giving more flexibility to manage costs.* Can the panels be lower than the ones they have in Wainiha so that we avoid the visibility issues? *This is dependent on the length and type of bridge selected. Management of sight distance will be an element considered during the design of the temporary bridges.*

11. Comment: There is concern that the temporary bridges at the WWW bridges will not come out. *HDOT answer: The old bridges will stay in place and temp bridges will be taken out. MW: contract will require that the bridges be taken out.*

12. Beau Blair: What is the difference in the spans of bridges 2 & 3? How will the center be configured? *Answer: The Wainiha #1 and #2 bridges will be single span bridges. The Wainiha #3 bridge will be 3 spans similar to the original bridges.*
During the Wainiha ACROW construction there were shuttles and barges to assist in getting residents where they needed to go during bridge closures. We need to consider transportation accommodations with these constructions as well. What is the width of the current ACROW Bridge?
There must be a plan for preferential parking for north shore residents at all public parking areas and beaches throughout the construction period. Tourists take up all the parking spots that will be critical for residents dealing with shuttling and other transportation inconveniences during construction. *These ideas will be considered.*

13. Unidentified Speaker: Will the public have access to the temporary WWW bridges so we can have 2 way traffic lanes during construction? *The Waioli and Waipa temporary*

bridges will be single lane bridges, paralleling the existing bridges, with use for construction traffic only. The Waikoko temporary bridge also be a single lane bridge that will span over the top of the existing bridge. This bridge will be used for both construction and local traffic.

14. Unidentified Speaker: The community demands that there must be funding for building of all the bridges – the 3 temporary at WWW and Wainiha 1,2, and 3 – prior to any construction begins. We do not want a long, drawn out construction process. We do not want the WWW bridges to be constructed and then we still have to wait around for funding of the Wainiha Bridge. Instead of 24 hour closures, can we just do night closures? *We will consider your comment.* How many 24 hour closures will there be? *It is anticipated that there will be 2-24 hours closures for each of the bridges constructed. We have worked with the ACROW bridge company who estimates 24-hour closures as was experienced when installing the current temporary bridges.* We need to ensure there will be adequate, widespread notification before the 24 hour closures occur. *A public Information program is planned to be implemented alerting the road users of impending travel impacts during construction. Timing of the notification will allow for the road users to plan accordingly.*

15. Evelyn (last name unknown): We like the sound that it makes when you drive over the wooden bridge – can we replicate that somehow when you build the new bridge? *We will consider your comment.*

16. Unidentified Speaker: Everyone wants the bridge to be 11' wide like the old bridge. It is the original width and we like the feel of it and the community wants it. We are not comfortable with the wider width. Let's keep it historic. *We will consider your comment.*

17. Danielle Candelaria: There are already existing traffic issues because of tourist traffic in the area. This will be compounded exponentially by the construction. Can we cap tourist traffic during construction? *We will consider your comment.* Or can we make very specific designated locations for tourist parking only and resident parking only? *We will consider your comment.* Residents need to commute to work and should have priority access. Tourist delays are disruptive as is. Residents don't have the same parking access that was available during the previous closures. *Thank you for the valuable input. We will consider your comment.*

E. Meeting Closeout

Dawn closed the meeting by letting everyone know that there will be additional comment opportunity during the EA review period and that the presentation and boards from this meeting will be on the website. Take a handout.

Appendix C
Determination and Delineation of Wetlands and Other Waters of the U.S. for the Wainiha Bridges Project

SWCA®
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

Determination and Delineation of Wetlands and Other Waters of the U.S. for the Wainiha Bridges Project

Kauaʻi Island, Hawaiʻi

Prepared for

Federal Highway Administration,
Central Federal Lands Highway Administration

and

CH2M HILL

Prepared by

SWCA Environmental Consultants

December 2015

DETERMINATION AND DELINEATION OF WETLANDS AND OTHER WATERS OF THE U.S. FOR THE WAINIHA BRIDGE PROJECT

KAUA‘I ISLAND, HAWAI‘I

Prepared for

Federal Highway Administration,
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 280
Lakewood, Colorado 80228
(720) 963-3689

and

CH2M HILL
1132 Bishop Street, Suite 1100
Honolulu, Hawai‘i 96813
(808) 943-1133

Prepared by

SWCA Environmental Consultants
Bishop Square ASB Tower
1001 Bishop Street, Suite 2800
Honolulu, Hawai‘i
(808) 548-7899
www.swca.com

SWCA Project No. 30745

Revised December 3, 2015

WATERS OF THE U.S. DETERMINATION/DELINEATION SUMMARY

PROJECT NAME: Wainiha Bridges

SITE LOCATION: Kaua‘i Island, Hawai‘i
22.212935°N, -159.543670°W

OWNER: Federal Highway Administration, Central Federal Lands Highway Division
Hawai‘i Department of Transportation

SURVEY DATES: September 30–October 2, 2014

PROJECT STAFF: Brian Nicholson, Wetland Specialist
Tiffany Bovino Agostini, Botanist/Project Manager
Bryson Luke, Field Technician

SUMMARY

The Federal Highway Administration (FHWA) Central Federal Lands Highway Division, in partnership with the State of Hawai‘i Department of Transportation (HDOT), is proposing to replace three temporary pre-fabricated (ACROW) bridges (Wainiha Bridges 1, 2, and 3) and place temporary one-lane bridges adjacent to or crossing over three additional one-lane bridges (Wai‘oli, Waipā, and Waikoko) on Kūhiō Highway (Route 560) between Hanalei and Wainiha, on the north side of Kaua‘i Island, Hawai‘i (see Figure 1). CH2M HILL contracted SWCA Environmental Consultants (SWCA) on behalf of FHWA to complete a determination and delineation of potential Waters of the U.S. (WoUS) governed by the Clean Water Act and the Rivers and Harbors Act. This report summarizes the findings of the potential WoUS delineation and determination conducted at these locations between September 30 and October 2, 2014. It is broken into six sections, one for each bridge location.

The survey area comprises five non-contiguous survey areas: Wai‘oli, Waipā, Waikoko, Wainiha 1, and Wainiha 2 & 3. In all, the whole survey area covers approximately 9.24 acres (3.74 hectares [ha]). Twenty-four wetland sampling points were evaluated in the survey area to determine whether wetlands or other WoUS occur. A detailed field-based determination indicates that 11 of the 24 sampling points meet the three-criterion test for wetlands (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology) pursuant the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai‘i and Pacific Islands Region*. SWCA delineated approximately 3.88 acres (1.58 ha) of potential WoUS. This comprises 2.78 acres (1.13 ha) of non-wetland WoUS and 1.10 acres (0.45) of wetlands. This conclusion is subject to confirmation by the U.S. Army Corps of Engineers.

This page intentionally blank

CONTENTS

APPENDICES

FIGURES

TABLES

ABBREVIATIONS

CFR	Code of Federal Regulations
CWA	Clean Water Act
CWB	Clean Water Branch
CWRM	Commission on Water Resource Management
DOH	Department of Health
FAC	Facultative
FACW	Facultative Wetland
FHWA	Federal Highway Administration
GPS	global positioning system
ha	hectare(s)
HDOT	State of Hawai‘i Department of Transportation
m	meter(s)
MHW	mean high water
MHHW	mean higher high water
m	meter
mm	millimeter(s)
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWP	Nationwide Permit
OBL	Obligate
SCAP	Stream Channel Alteration Permit
SWCA	SWCA Environmental Consultants
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WoUS	Waters of the U.S.

This page intentionally blank

1. INTRODUCTION

This report describes the extent and location of potential Waters of the U.S. (WoUS) in the Wainiha Bridges survey area in Kaua‘i County, State of Hawai‘i. The survey area covers 9.24 acres (3.74 hectares [ha]). The regulatory setting, project background, and proposed project description are described below.

1.1. Regulatory Setting

The U.S. Army Corps of Engineers (USACE) derives its regulatory authority over WoUS from two federal laws: 1) Section 10 of the Rivers and Harbors Act of 1899 and 2) Section 404 of the Clean Water Act (CWA) of 1972.

Under Section 404 of the CWA, dredged and fill material may not be discharged into jurisdictional WoUS (including wetlands) without a permit. Wetlands are a subset of jurisdictional WoUS and are jointly defined by the USACE and the U.S. Environmental Protection Agency (40 Code of Federal Regulations [CFR] 230.3) as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.”

Section 10 of the Rivers and Harbors Act of 1899 prevents unauthorized obstruction or alteration of navigable WoUS. Navigable waters are defined as “subject to the ebb and flow of the tide and/or presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce” (33 CFR 322.2(a)). A Section 10 permit is required for non-fill discharging activities that would place any structure below, within, or over navigable WoUS, or would involve excavation/dredging or deposition of material or any obstruction or alteration in navigable WoUS.

The new CWA Rule, which went in to effect on August 28, 2015 (with exclusions), defines WoUS subject to agency jurisdiction as follows (40 CFR 230.3):

1. Navigable waters
2. Interstate waters and wetlands
3. Territorial seas
4. Impoundments of WoUS
5. Tributaries to 1–3
    a. A *tributary* is defined as water that contributes flow, either directly or through another water, including an impoundment, into Category 1–3 waters.
    b. Requires both an ordinary high water mark (OHWM) and bed/banks.
    c. Can be human-made.
6. Adjacent waters to 1 –5
7. Similarly situated waters with significant nexus (e.g., Prairie potholes, vernal pools)
8. Case-specific waters with significant nexus
    a. within a 100-year floodplain, but more than 1,500 feet from an OHWM, or
    b. within 4,000 feet of an OHWM or high tide line.

The 1987 *Corps of Engineers Wetlands Delineation Manual* (USACE 1987 Manual; USACE 1987), as amended, outlines the technical guidelines and methods for identifying and delineating wetlands potentially subject to Section 404 of the CWA. This manual is supplemented by the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Islands Region* (Hawai'i and Pacific Island Regional Supplement; USACE 2012).

The limits of jurisdiction for non-wetland, tidally influenced WoUS extend to the high tide line or mean high water (MHW) line. A more conservative approach than the MHW, the mean higher high water (MHHW) line, is often used. The jurisdictional boundary for non-tidal, non-wetland waters is the OHWM.

1.2. Project Background

The Federal Highway Administration (FHWA) Central Federal Lands Highway Division, in partnership with the State of Hawai'i Department of Transportation (HDOT), is proposing to replace the three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) between Hanalei and Wainiha, on the north side of Kaua'i Island, Hawai'i (Figure 1). These three bridges are located along Kūhiō Highway between mile post (MP) 6.4 and 6.7 near the mouth of the Wainiha Stream before it feeds into Wainiha Bay. The previous bridges at these three locations were replaced under state emergency actions in 2004 and 2007 with temporary ACROW bridges as a temporary measure to keep the roadway open until design and environmental compliance for the new structures could be completed. The three bridges are owned and maintained by HDOT.

In addition, the project requires the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway located at Wai'oli, Waipā, and Waikoko Streams that access the Wainiha Bridges project site. These historic bridges have low load capacities, and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges.

1.3. Proposed Project Description

FHWA and HDOT propose to remove the existing three temporary ACROW bridges and abutments at Wainiha Bridges 1, 2, and 3, and replace them with new one-lane, concrete girder bridges that closely match the existing alignment. The width of the new bridges would be close to the existing bridge widths to maintain the existing roadway character. The existing, temporary ACROW bridges at the Wainiha project site would be shifted makai to accommodate traffic during construction of the new bridges. All components of the temporary bridges would be removed upon completion of the project.

Construction access to Wainiha Bridges 1, 2, and 3 can only be provided from east of the project location; therefore, the project also requires placement of temporary one-lane bridges adjacent to or crossing over three additional one-lane bridges along Kūhiō Highway: Wai'oli (MP 3.93), Waipā (MP 3.90), and Waikoko (MP 4.22). Temporary structures will be placed adjacent to or over the Wai'oli, Waipā, and Waikoko Bridges to accommodate construction loads needed for the project and to avoid affecting the historic integrity of these bridges. No piers are anticipated at these three load-restricted bridges; however, length limitations may require an abutment to encroach minimally into the stream channel on one or both sides of Wai'oli Stream and Waipā Stream. No in-water work is anticipated at Waikoko Stream.

In addition, two potential staging areas would also be required as part of the project. These are proposed along Kūhiō Highway near Lumahai Beach, one on the southwest side of the road and one on the east side of the road. Staging would also occur at each bridge location.

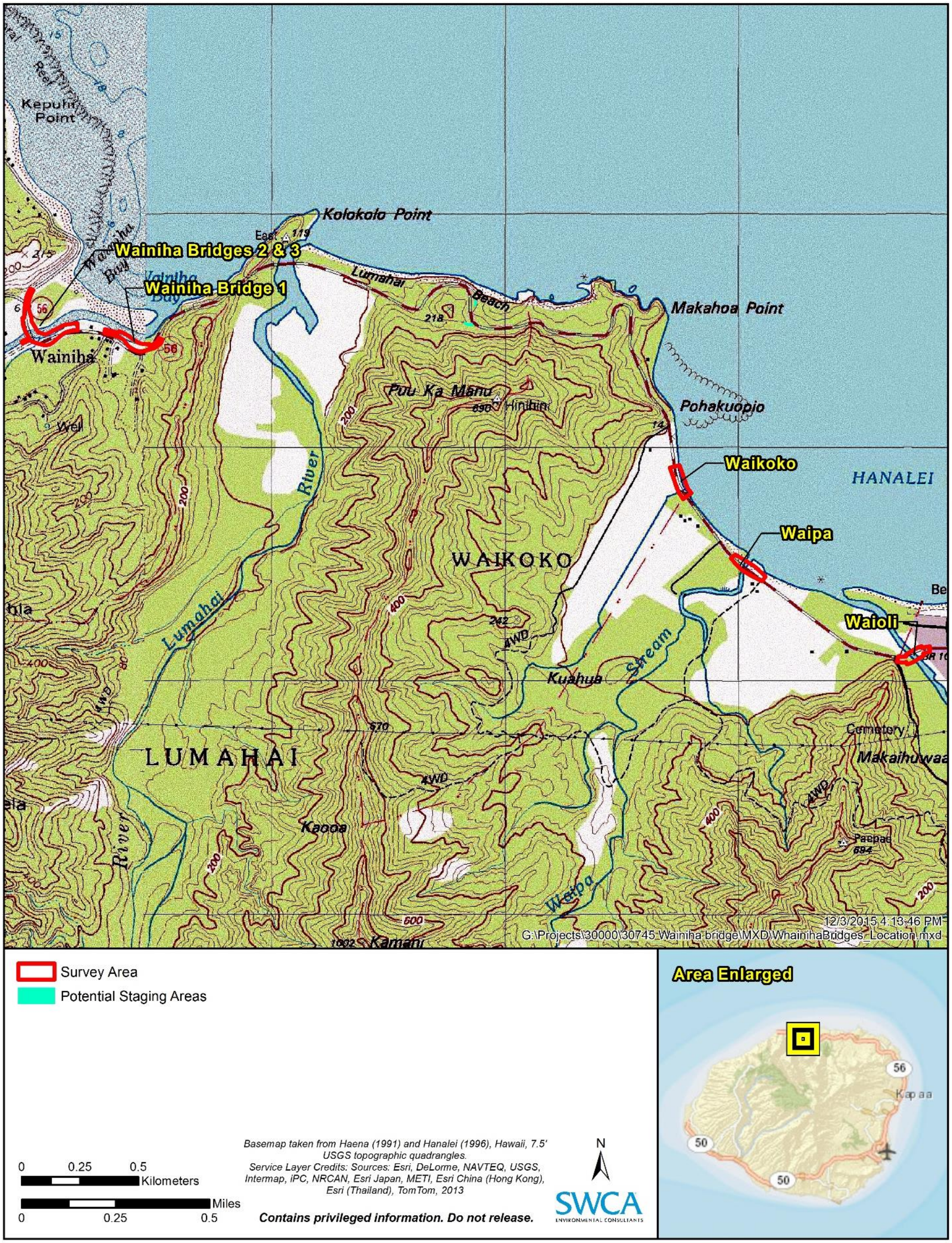


Figure 1. Location of the survey area.

2. METHODOLOGY

Before the wetland delineation fieldwork, SWCA reviewed aerial photography, topographic maps, and data sets, including the Natural Resources Conservation Service (NRCS) SSURGO dataset, U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) data, the U.S. Geological Survey (USGS) National Hydrography Dataset, the *State of Hawai‘i Atlas of Hawaiian Watersheds & Their Aquatic Resources* (Parham et al. 2008), the State of Hawai‘i Department of Aquatic Resources dataset, and other available publications, technical reports, and geographic information systems datasets to collect information on wetlands and WoUS potentially in the survey area.

SWCA biologists conducted the WoUS determination and delineation fieldwork between September 30 and October 2, 2014. The geographic coordinates of sampling points and features were collected in the field with Trimble GeoXT 6000 Series global positioning system (GPS) unit, and data were post-processed in ArcGIS using GPS Correct to sub-meter accuracy. The linear length and acreage of these features were calculated by projecting these point and line data files in a geographic information system.

2.1. Wetlands

Biologists employed methods for determining the presence of wetlands as prescribed by the USACE 1987 Manual (USACE 1987) and the Hawai‘i and Pacific Island Regional Supplement (USACE 2012). Based on these documents, jurisdictional wetlands are identified using the following three criteria: hydrophytic vegetation, hydric soils, and wetland hydrology. All three criteria must be present for an area to be considered a wetland, unless the site is disturbed. An explanation of the three wetland criteria is provided below. Wetland determination data forms prepared during the survey are included in Appendix A. Results maps and survey area photographs are provided in Appendices B and C, respectively.

2.1.1. Vegetation

The USACE defines *hydrophytic vegetation* as “the community of macrophytes that occurs in areas where inundation or soil saturation is either permanent or of sufficient frequency and duration to influence plant occurrence” (USACE 2012). The *State of Hawai‘i 2014 Wetland Plant List* (Lichvar et al. 2014) designates wetland indicator statuses for plants in the Hawaiian Islands. The use of plant indicators helps estimate the probability of a species occurring in wetlands versus uplands. Plants are considered hydrophytes if they are classified as Obligate (OBL), Facultative Wetland (FACW), or Facultative (FAC). Descriptions of the plant indictor statuses are provided in Table 1.

At each sampling point, the absolute percentage cover was estimated for each plant species within each vegetation strata (i.e., tree, shrub, herb, woody vine). These species were then compared with *State of Hawai‘i 2014 Wetland Plant List* (Lichvar et al. 2014). Taxonomy and nomenclature follow Wagner et al. (1999, 2012), Wagner and Herbst (2003), and Staples and Herbst (2005).

Table 1. Wetland Plant Indicators

Plant Indicator	Code	Description
Obligate Wetland species	OBL	Almost always is a hydrophyte, rarely in uplands.
Facultative Wetland species	FACW	Usually is a hydrophyte, but occasionally found in uplands.
Facultative species	FAC	Commonly occurs as either a hydrophyte or non-hydrophyte.
Facultative Upland species	FACU	Occasionally is a hydrophyte, but usually occurs in uplands.
Upland species	UPL	Rarely is a hydrophyte, almost always in uplands.

Source: Lichvar et al. (2012).

2.1.2. Soils

The NRCS defines a *hydric soil* as one that is "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (NRCS 2010). The NRCS National List of Hydric Soils (NRCS 2012) for Kaua'i Island includes 12 hydric soils for the island. SWCA compared the NRCS National List of Hydric Soils with soils mapped in the survey area by the NRCS.

This generalized soil survey does not always capture the true hydric condition of the soils on individual sites; therefore, on-site soil evaluations of wetlands by specialists are also necessary. Soil characteristics were determined in the field by digging pits using a trenching shovel. SWCA biologists identified soil samples in the field with standardized color chips (i.e., Munsell Soil Color Charts; Kollmorgen Instruments Corporation 1998) of hue, value, and chroma, and by texture (sand, silt, clay, loam, muck, and peat). Anaerobic soil conditions and the presence of gleyed soils were of particular interest (USACE 1987).

2.1.3. Hydrology

Wetland hydrology examines the behavior of water in wetlands. Indicators of wetland hydrology are classified as primary or secondary. Examples of primary hydrologic indicators in Hawai'i include soil saturation, high water table, surface water, hydrogen sulfide odor, sediment and drift deposits, algal mats, iron deposits, and the presence of tilapia (*Oreochromis* sp./*Sarotherodon* sp.) redds or aquatic fauna (USACE 2012). Secondary regional hydrologic indicators include surface soil cracks and geomorphic position. One primary indictor or any two secondary indicators must be present to conclude that wetland hydrology is present (USACE 2012). SWCA evaluated both primary and secondary hydrology indicators at each sampling point.

2.2. Non-Wetland Waters

Potential non-wetland WoUS, including ephemeral, intermittent, and perennial streams, were delineated based on the high tide line or OHWM. SWCA field personnel delineated the boundaries of tidal non-wetland waters by recording the location of the high tide line. The *high tide line* is defined as the intersection of the land with the water's surface at the maximum height reached by a rising tide (33 CFR 328). The high tide line was determined in the field based on physical characteristics or indicators. Examples of indicators include line of oil or scum, deposit of fine shell or debris, vegetation lines, tide gauges, topography, or other suitable means.

3. DESCRIPTION OF THE SURVEY AREA

The survey area is on the west side of the Island of Kaua‘i between Hanalei and Wainiha along Kūhiō Highway (Route 560) (see Figure 1). The survey area comprises five non-contiguous survey areas: Wai‘oli, Waipā, Waikoko, Wainiha 1, and Wainiha 2 & 3 (as described below). In all, the whole survey area covers approximately 9.24 acres (3.74 ha), as outlined in Table 2. The two staging areas were not surveyed for potential WoUS.

Table 2. Acreage of Bridge Survey Areas

Bridge Survey Area	Acres
Wai‘oli	1.26
Waipā	1.45
Waikoko	1.46
Wainiha 1	1.60
Wainiha 2 & 3	3.47
Total	**9.24**

A general description of the survey area is provided below. More detailed descriptions of each of the five areas are provided in Sections 3.1 through 3.5.

Hydrology

Mean annual rainfall in the survey area is approximately 89.5 inches (2,275 millimeters [mm]). Rainfall is typically highest in March and lowest in June (Giambelluca et al. 2013). The closest rainfall gauge to the survey area (Wainiha [WNHH1]) experienced 7.78 inches (198 mm) of rain for 2014 through the end of October, which is slightly above average (National Oceanic and Atmospheric Administration (NOAA)/National Weather Service 2014). Waters passing under Waikoko, Waipā, and Wai‘oli Bridges flow into Hanalei Bay, whereas waters passing under Wainiha 1, 2, & 3 flow into Wainiha Bay. Maps of the National Hydrography Dataset and NWI data are provided in Appendix D.

Flora

A description of the vegetation at each area is provided in the sections below. No state or federally listed threatened, endangered, or candidate endangered plant species, or rare native Hawaiian plant species, were observed in the survey area during the survey by SWCA (SWCA 2015).

Fauna

Several federally and state-listed animal species were observed during the survey or are likely to occur in the survey area based on habitat or previous surveys. These species are the Hawaiian coot (*Fulica alai*), Hawaiian gallinule or ‘alae ‘ula (*Gallinula galeata sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*), Hawaiian duck (*Anas wyvilliana*), nēnē or Hawaiian goose (*Branta* sandvicensis), Hawaiian petrel (*Pterodroma sandwichensis*), Newell’s shearwater (*Puffinus auricularis newelli*), band-rumped storm petrel (*Oceanodroma castro*), Hawaiian hoary bat (*Lasiurus cinereus semotus*), Hawaiian monk seal (*Neomonachus schauinslandi*), green sea turtle (*Chelonia mydas*), and hawksbill sea turtle (*Eretmochelys imbricata*). In addition, surrounding waters are designated as marine critical habitat for the Hawaiian monk seal (SWCA 2015).

3.2. Waiʻoli Stream Bridge

The Waiʻoli Bridge survey area covers approximately 1.26 acres (0.51 ha) and is roughly 1,300 feet (396 meters [m]) from the Waiʻoli Stream mouth. The existing bridge is approximately 100 feet (30.5 m) long and 15 feet (4.5 m) wide. The survey area encompasses parts of two residential parcels on the makai (seaward) side of the bridge and part of one residential parcel and an undeveloped parcel on the mauka (landward) side of the bridge. All four parcels were observed during the site visit.

Elevations in the survey area range from sea level to roughly 28 feet (8.5 m) above sea level. The NRCS identifies three soil types in the Waiʻoli Bridge survey area (Table 3): Mokuleia fine sandy loam; Mokuleia clay loam, poorly drained variant; and rock outcrop (Foote et al. 1972; NRCS 2013). The Mokuleia clay loam, poorly drained variant soil type is listed as a hydric soil (NRCS 2012).

Table 3. Soils in Waiʻoli Survey Area

Soil Series	Acres	Hydric
Mokuleia clay loam, poorly drained variant (W)	0.02	Yes
Mokuleia fine sandy loam (Mr)	0.64	No
Rock outcrop	0.31	N/A
Water > 40 acres	0.29	N/A
Total	**1.26**	

Source: NRCS (2013).

The NWI program identifies three wetlands or aquatic resource types in the survey area (Table 4): Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH); Palustrine, Emergent, Persistent, Semipermanently Flooded (PEMF); and Palustrine, Forested, Seasonally Flooded (PFOC). The State of Hawaiʻi and the USGS identify Waiʻoli Stream traversing the survey area (Appendix D).

Table 4. National Wetland Inventory results for Waiʻoli Survey Area

Wetland Classification Code	Acres	Description
PEMF	0.02	Palustrine, Emergent, Persistent, Semipermanently Flooded
PFOC	0.34	Palustrine, Forested, Seasonally Flooded
R2UBH	0.05	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
Total	**0.42**	

Source: USFWS (2014).

Four vegetation types are present at the Waiʻoli Bridge survey area: ruderal vegetation, ornamental landscaping, emergent wetland, and hau thicket. On the makai side of the bridge, the vegetation is dominated by ornamental landscaping, which is characterized by manicured lawns of wide-leaved carpetgrass (*Axonopus compressus*), interspersed with herbaceous plants (Figure C1, Appendix C). Ornamental plantings adjacent to residences on both sides of the bridge include Areca palm (*Dypsis lutescens*), mango (*Mangifera indica*), red ginger (*Alpinia purpurata*), ti (*Cordyline fruticosa*), and torch ginger (*Etlingera elatior*). Taro vine (*Epipremnum pinnatum*) is climbing on several trees, and umbrella sedge (*Cyperus involucratus*) is present along the stream's edge. On the mauka side, a dense mat of the non-native California grass (*Urochloa mutica*) is present on the western side of the stream. Ruderal vegetation occurs along the highway right-of-way and is primarily dominated by wedelia (*Sphagneticola trilobata*), Hilo grass (*Paspalum conjugatum*), java plum (*Syzygium cumini*), and giant reed (*Arundo donax*). The indigenous hau (*Hibiscus tiliaceus*) also forms small dense stands along the stream on both sides of the highway.

3.3. Waipā Stream Bridge

The Waipā Bridge survey area is approximately 0.5 mile (0.8 kilometer [km]) west of Hanalei and covers approximately 1.45 acres (0.59 ha). The existing bridge is approximately 80 feet (24.4 m) long and 25 feet (7.6 m) wide. The survey area consists of wooded, undeveloped parcels on both the makai (seaward) and mauka (landward) side of the bridge. There is also a recreational area for Kamehameha Schools on the makai side. All parcels were surveyed during the site visit, although small portions of the residential areas on the east side of the stream were not accessed.

Elevations in the survey area range from sea level to roughly 11 feet (3.4 m) above sea level. The NRCS identifies two soil types in the survey area (Table 5): Mokuleia fine sandy loam and beaches (Foote et al. 1972; NRCS 2013). Neither is listed as a hydric soil (NRCS 2012).

Table 5. Soils in Waipā Survey Area

Soil Series	Acres	Hydric
Beaches	0.86	N/A
Mokuleia fine sandy loam (Mr)	0.28	No
Water > 40 acres	0.29	N/A
Total	**1.43**	

Source: NRCS (2013).

The NWI program identifies two wetland and aquatic resource types in the survey area (Table 6): Palustrine, Forested, Seasonally Flooded (PFOC) and Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded (R3UBH). The State of Hawai'i and the USGS identify Waipā Stream traversing the survey area (Appendix D).

Table 6. National Wetland Inventory Results for Waipā Survey Area

Wetland Classification Code	Acres	Description
PFOC	0.30	Palustrine, Forested, Seasonally Flooded
R3UBH	0.15	Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded
Total	**0.45**	

Source: USFWS (2014).

At the Waipā Bridge survey area, the vegetation is dominated by a dense hau thicket on both sides of the bridge (Figure C2, Appendix C). Little to no other plants occur in this vegetation type. Along the stream's edge, in areas where hau is not present, umbrella sedge and California grass are common. The ruderal vegetation type at Waipā is dominated by Hilo grass, Guinea grass (*Urochloa maxima*), wedelia, elephant grass (*Cenchrus purpureus*), West Indian dropseed (*Sporobolus indicus*), and basketgrass (*Oplismenus* *hirtellus*). Maunaloa (*Canavalia cathartica*) is climbing throughout. Ironwood trees (*Casuarina equisetifolia*) and false kamani (*Terminalia catappa*) are also present, primarily on the makai side of the bridge. The native kou (*Cordia subcordata*) is planted just along the edge of the survey area near the recreation area.

3.4. Waikoko Stream Bridge

The Waikoko Bridge survey area is approximately 0.8 mile (1.3 km) west of Hanalei and covers approximately 1.46 acres (0.59 ha). The existing bridge is approximately 25 feet (7.6 m) long and 15 feet (4.6 m) wide. The survey area consists of a beach on the makai (seaward) side of the bridge and densely vegetated areas on the mauka (landward) side of the bridge. All four parcels were observed during the site visit.

Elevations in the survey area range from sea level to roughly 15 feet (4.5 m) above sea level. The NRCS identifies one soil type in the survey area (Table 7), Mokuleia fine sandy loam, which is not listed as a hydric soil (NRCS 2012).

Table 7. Soils in the Waikoko Survey Area

Soil Series	Acres	Hydric
Mokuleia fine sandy loam	1.39	No
Total	**1.39**	

Source: NRCS (2013).

The NWI program identifies two wetland and aquatic resource types in the survey area (Table 8): Marine, Intertidal, Unconsolidated Shore, Irregularly Flooded (M2USP) and Riverine, Upper Perennial, Rock Bottom, Permanently Flooded (R3RBH). The State of Hawaiʻi and the USGS identify Waikoko Stream traversing the survey area (Appendix D).

Table 8. National Wetland Inventory Results for Waikoko Survey Area

Wetland Classification Code	Acres	Description
M2USP	0.12	Marine, Intertidal, Unconsolidated Shore, Irregularly Flooded
R3RBH	0.05	Riverine, Upper Perennial, Rock Bottom, Permanently Flooded
Total	**0.17**	

Source: USFWS (2014).

The vegetation types in the Waikoko Bridge survey area are ruderal vegetation, mixed non-native forest, hau thicket, and ornamental landscaping. Hau thickets are present on the mauka side of the bridge, adjacent to standing water. The mixed non-native forest is dominated by ironwood trees and large false kamani trees that create a dense canopy. Taro vine, maunaloa, and maile pilau (*Paederia foetida*) are climbing over trees, and patches of lauaʻe fern (*Phymatosorus grossus*) are present in the understory. The most common species in the ruderal vegetation along the highway are wedelia, wide-leaved carpetgrass, Guinea grass, Hilo grass, dallis grass (*Paspalum dilatatum*), narrow-leaved plantain (*Plantago lanceolata*), and short-stature koa haole (*Leucaena leucocephala*) (Figure C3, Appendix C). Naupaka (*Latin name*), ti, hala (*Pandanus tectorius*), and coconut trees (*Cocos nucifera*) are planted in the survey area. The native *Cyperus polystachyos* and nanea (*Vigna marina*) were also seen at the survey area.

3.5. Wainiha Bridge 1

The Wainiha Bridge 1 survey area covers approximately 1.60 acres (0.65 ha). The bridge itself spans an ephemeral drainage or backwater of the estuary. The survey area consists of an estuary on the makai (seaward) side of the bridge and undeveloped vegetated and residential parcels on the mauka (landward) side of the bridge. The Wainiha General Store is just northwest of the survey area. The entire area was accessible during the site visit.

Elevations in the survey area range from sea level to roughly 26 feet (7.9 m) above sea level. The NRCS identifies four soil types in the survey area (Table 9): Hanamāʻulu silty clay, Mokuleia fine sandy loam, beaches, and rough broken land (Foote et al. 1972; NRCS 2013). None of the soil types are listed as a hydric soil (NRCS 2012).

Table 9. Soils in the Wainiha Bridge 1 Survey Area

Soil Series	Acres	Hydric
Beaches	0.68	N/A
Hanamāʻulu silty clay, 3 to 8 percent slopes	0.005	No
Mokuleia fine sandy loam	0.63	No
Rough broken land	0.03	N/A
Water > 40 acres	0.26	NA
Total	**1.60**	

Source: NRCS (2013)

The NWI program does not identify any wetlands or aquatic habitats in the Wainiha Bridge 1 survey area (USFWS 2014). Adjacent to the survey area is an estuarine resource (Estuarine, Subtidal, Unconsolidated Bottom, Subtidal [E1UBL]). The State of Hawaiʻi and USGS also do not show any water features in the Wainiha Bridge 1 survey area.

The vegetation types in the Wainiha Bridge 1 survey area are ruderal vegetation, mixed non-native forest, hau thicket, and ornamental landscaping. The hau thicket and mixed non-native forest are present on the mauka side of the bridge immediately adjacent to the stream. The mixed non-native forest is characterized by large, spreading false kamani trees, with only a few scattered seedlings and lauaʻe fern in the understory. The ruderal vegetation occurs in and along the highway right-of-way and in heavily disturbed areas (Figure C4, Appendix C). The water's edge is dominated by umbrella sedge and California grass. On the flatter, drier areas, this vegetation type is largely composed of elephant grass, wedelia, Guinea grass, dallis grass, and short koa haole. *Neonotonia wightii*, maunaloa vine, and moon flower (*Ipomoea alba*) are climbing in trees and over shrubs. Ornamental trees and shrubs are planted adjacent to houses, including ti, hibiscus (*Hibiscus* spp.), Turk's cap (*Malvaviscus penduliflorus*), and beefsteak plant (*Acalypha wilkesiana*). Mowed lawns of wide-leaved carpetgrass and Bermuda grass (*Cynodon dactylon*) are interspersed with weedy grasses and low-growing herbaceous species.

3.6. Wainiha Bridges 2 & 3

The Wainiha Bridges 2 & 3 survey area is adjacent to Wainiha Bay and spans the Wainiha Stream. The survey area covers approximately 3.47 acres (1.40 ha). The existing bridges are approximately 300 feet (91.4 m) long and 15 feet (4.5 m) wide. The survey area encompasses parts of residential parcels and a heavily vegetated parcel on the makai (seaward) side of the bridge and part of residential parcels and an agricultural area on the mauka (landward) side of the bridge. The agricultural area and associated residence were not accessible during the site visit.

Elevations in the survey area range from sea level to roughly 18 feet (5.4 m) above sea level. The NRCS identifies the following two soil types in the survey area (Table 10): Mokuleia clay loam, poorly drained variant and Hanalei silt clay, 0%–2% slopes (Foote et al. 1972; NRCS 2013). Both soil types are considered hydric (NRCS 2012).

Table 10. Soils in the Wainiha Bridges 2 & 3 Survey Area

Soil Series	Acres	Hydric
Hanalei silty clay, 0 to 2 percent slopes	2.58	Yes
Mokuleia clay loam, poorly drained variant	0.23	Yes
Water > 40 acres	0.65	N/A
Total	**3.47**	

Source: NRCS (2013).

The NWI program identifies four wetland and water types in the survey area (Table 11): Palustrine, Emergent, Semipermanently Flooded, Excavated (PEMFx); Palustrine, Forested, Seasonally Flooded (PFOC); Riverine, Tidal, Unconsolidated Bottom, Permanent-Tidal (R1UBV); and Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH). The State of Hawai‘i and the USGS identify two segments of Wainiha Stream traversing the survey area (Appendix D). The total length of this stream, according to the *Atlas of Hawaiian Watersheds & Their Aquatic Resources* (Parham et al. 2008), is 1.1 miles (1.8 km).

Table 11. National Wetland Inventory Results for the Wainiha Bridges 2 & 3 Survey Area

Wetland Classification Code	Acres	Description
PEMFx	0.05	Palustrine, Emergent, Semipermanently Flooded, Excavated
PFOC	0.15	Palustrine, Forested, Seasonally Flooded
R1UBV	0.33	Riverine, Tidal, Unconsolidated Bottom, Permanent-Tidal
R2UBH	0.05	Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
Total	**0.58**	

Source: USFWS (2014).

The most dominant vegetation types in the Wainiha Bridges 2 & 3 survey area are emergent wetland and hau thicket. The emergent wetland is a dense mat of non-native California grass. It occurs in the portions of the survey area immediately adjacent to Wainiha Stream (Figure C5, Appendix C). Few other species occur in this mat, although Guinea grass, umbrella sedge, and Job’s tears (*Coix lachryma-jobi*) are widely scattered. The most common grasses and herbaceous species found in the ruderal vegetation type in the Wainiha Bridges 2 & 3 survey area are basketgrass, wedelia, Guinea grass, California grass, Hilo grass, honohono (*Commelina diffusa*), and Spanish needle (*Bidens alba*) (Figure C6, Appendix C). Seedlings of non-native trees are sparsely scattered within the right-of-way. Large false kamani trees are also in the survey area, often covered in climbing taro vines. Several other vines are present, including taro vine, maunaloa, *Neonotonia wightii*, and white thunbergia (*Thunbergia fragrans*). Pai‘i‘ihā (*Cyclosorus dentatus*) and young Chinese fan palm (*Livistona chinensis*) are common in the understory. Ornamental species are also planted.

4. RESULTS

Of the 9.24 acres (3.74 ha) surveyed, approximately 3.88 acres (1.58 ha) were delineated as potential WoUS. This comprises 2.78 acres (1.13 ha) of non-wetland WoUS and 1.10 acres (0.45 ha) of wetlands (Table 12). The results for each bridge survey area are discussed in further detail below. The results maps are provided in Appendix B and photographs are provided in Appendix C.

Table 12. Acreage of Potential Waters of the U.S. in the Wainiha Bridges Project Survey Area

Wetland Classification Code	Classification Description	Acres
Wetlands		
PEM	Palustrine Emergent Marsh	0.39
PFO	Palustrine Forested	0.71
	Wetlands Subtotal	*1.10*
Non-Wetlands		
E1 (E1UBL)	Estuarine Subtidal	0.37
M2 (M2USP)	Marine Intertidal	0.51
R1 (R1UBV)	Riverine Tidal	1.54
R2 (R2UBH, R2)	Riverine Lower Perennial	0.36
	Non-Wetlands Subtotal	*2.78*
	Total	**3.88**

4.1. Wai‘oli Stream Bridge

Approximately 0.31 acre (0.13 ha) of non-wetland WoUS and 0.24 acre (0.10 ha) of wetlands (PEM and PFO) were delineated in the Wai‘oli survey area (see Appendix B). The types and acreage of WoUS delineated by SWCA are summarized in Table 13.

Table 13. Potential Waters of the U.S. Delineated in the Wai‘oli Survey Area

WoUS ID	Wetland Classification Code	Acres
14	R2UBH	0.31
15	PEM	0.04
16	PFO	0.10
17	PEM	0.05
18	PEM	0.05
Total		**0.55**

4.1.1. Wetlands

As shown in Table 14, three of the five sampling points evaluated by SWCA in the survey area met the three-criterion test indicative of wetland conditions pursuant to the USACE 1987 Manual and the Hawaiʻi and Pacific Island Regional Supplement. Upland, non-wetland points analogous to wetland points were identified where necessary, and boundary lines were delineated following changes in topography, substrate, vegetation communities, and/or soil indicators. The wetland determination data forms for the sampling points are included in Appendix A and results map are provided in Appendix B.

Table 14. Determination of Sampling Points at the Waiʻoli Survey Area

Sampling Point	Hydrophytic Vegetation Present?	Hydric Soil Present?	Wetland Hydrology Present?	Is the Sampling Point a Wetland?
1	Y	Y	Y	Y
2	N	N	N	N
3	Y	Y	Y	Y
4	N	N	N	N
5	Y	Y	Y	Y

Note: Wetland sampling points are highlighted in gray.

Vegetation

Three of the sampling points had hydrophytic vegetation. The dominant plants observed at the three wetland sampling points are hau (FAC), wide-leaved carpetgrass (FAC), California grass (FACW), Job's tears (FAW), and umbrella sedge (FACW).

Soils

Hydric soils were identified in three of the five sampling points. None of the sampling points were in an area with hydric soils, as listed by the NRCS (NRCS 2012); however, sampling points 1, 3, and 4 are classified as Water > 40 acres by NRCS. Thick Dark Surface (A12) was recorded at sampling point 1, and Depleted Matrix (F3) was recorded at sampling points 3 and 5. No hydric soils were identified at any other sampling points in the Waiʻoli survey area.

Hydrology

Wetland hydrology indicators were observed at three of the five sampling points. Saturation (A3) and High Water Table (A2) was present at all three sampling points. A complete listing of hydrology data collected at all sampling points is provided in Appendix A.

4.1.2. Non-Wetland Waters

A single perennial non-wetland water (Waiʻoli Stream) was identified in the survey area (see Appendix B). This segment of Waiʻoli Stream is likely to be occasionally influenced by the tide due to its proximity to the ocean. The high tide line was determined using topography (i.e., a break in the slope and elevation) and vegetation lines.

4.2. Waipā Stream Bridge

In all, approximately 0.31 acre (0.13 ha) of tidal, non-wetland WoUS (R1) and 0.27 acre (0.11 ha) of wetlands (PFO) were delineated in the Waipā survey area (see Appendix B). The types and acreage of WoUS delineated by SWCA are summarized in Table 15.

Table 15. Potential Waters of the U.S. Delineated in the Waipā Survey Area

WoUS ID	Wetland Classification Code	Acres
12	R1UBV	0.31
13	PFO	0.15
20	PFO	0.12
Total		**0.58**

4.2.1. Wetlands

As shown in Table 16, three of the eight points evaluated by SWCA at the Waipā survey area met the three-criterion test indicative of wetland conditions pursuant to the USACE 1987 Manual and the Hawai‘i and Pacific Island Regional Supplement. Upland, non-wetland points analogous to wetland points were identified where necessary, and boundary lines were delineated following changes in topography, substrate, vegetation communities, and/or soil indicators. The wetland determination data forms for the sampling points are included in Appendix A.

Table 16. Determination of Sampling Points at the Waipā Survey Area

Sampling Point	Hydrophytic Vegetation Present?	Hydric Soil Present?	Wetland Hydrology Present?	Is the Sampling Point a Wetland?
1	Y	Y	Y	Y
2	Y	N	N	N
3	Y	N	N	N
4	Y	N	N	N
5	Y	Y	Y	Y
6	Y	N	N	N
7	Y	Y	Y	Y
8	Y	N	N	N

Note: Wetland sampling points are highlighted in gray.

Vegetation

All eight sampling points had hydrophytic vegetation. The dominant plants observed at the wetland sampling points are hau (FAC), wedelia (FAC), and umbrella sedge (FACW). Complete vegetation data collected at all sampling points are provided in Appendix A.

Soils

Hydric soils were identified in three of the eight sampling points. All three wetland sampling points are located on the Beaches (BS) soil type, although sampling point 5 occurs near the boundary of Hanalei silty clay loam, 0 to 2 percent slopes (HmA) listed by the NRCS as a hydric soil (NRCS 2012). Sandy Redox (S5) was recorded at all three positive wetland sampling points. No hydric soils were identified at any other sampling points in the survey area.

Hydrology

Wetland hydrology indicators were observed at three of the eight sampling points. Oxidized Rhizospheres on Living Roots (C3) were present at all three positive wetland sampling points. Water Marks (B1) were also observed at sampling point 1, and Saturation (A3) was observed at sampling point 5. A complete listing of hydrology data collected at all sampling points is provided in Appendix A.

4.2.2. Non-Wetland Waters

A single perennial, non-wetland water (Waipā Stream) was identified in the survey area (see Appendix B). This segment of Waipā Stream was determined to be tidally influenced due to its proximity to the ocean and the presence of marine/estuarine biota observed during SWCA's fieldwork. The high tide line was determined based on topography and the vegetation line. The stream mouth is shaped by a variety of natural conditions, and shifts throughout the year. Natural conditions influencing elevation and physical features near the mouth include streamflow, sediment deposition, ocean tide, and wave action.

4.3. Waikoko Stream Bridge

Approximately 0.80 acre (0.32 ha) of tidal, non-wetland WoUS (R1 and M2) and 0.04 acre (0.02 ha) of wetlands (PFO) were delineated in the Waikoko survey area (Figure 4). The types and acreage of WoUS delineated by SWCA are summarized in Table 17.

Table 17. Potential Waters of the U.S. Delineated in the Waikoko Survey Area

WoUS ID	Wetland Classification Code	Acres
10	M2USP	0.51
11	R1UBV	0.29
19	PFO	0.04
Total		**0.84**

4.3.1. Wetlands

As shown in Table 18, two of the four points evaluated by SWCA in the survey area met the three-criterion test indicative of wetland conditions pursuant to the USACE 1987 Manual and the Hawai'i and Pacific Island Regional Supplement. Upland, non-wetland points analogous to wetland points were identified where necessary, and boundary lines were delineated following changes in topography, substrate, vegetation communities, and/or soil indicators. The wetland determination data forms for the sampling points are included in Appendix A.

Table 18. Determination of Sampling Points at the Waikoko Survey Area

Sampling Point	Hydrophytic Vegetation Present?	Hydric Soil Present?	Wetland Hydrology Present?	Is the Sampling Point a Wetland?
1	Y	N	N	N
2	Y	Y	Y	Y
3	Y	N	N	N
4	Y	Y	Y	Y

Note: Wetland and other WoUS sampling points are highlighted in gray.

Vegetation

All four sampling points had hydrophytic vegetation present. The dominant plant observed at the two WoUS sampling points was hau (FAC). Complete vegetation data collected at all sampling points are provided in Appendix A.

Soils

The NRCS places all four sampling points within the Mokuleia fine sandy loam (Mr) soil type, which is not listed as a hydric soil type (NRCS 2012). However, hydric soils were identified in two of the four sampling points. The Sandy Redox (S5) hydric soil indicator was present at sampling points 2 and 4. No hydric soils were identified at any other sampling points in the survey area.

Hydrology

Wetland hydrology indicators were observed at two of the four sampling points. High Water Table (A2), saturation (A3), and Sediment Deposits (B2) were present at the two wetland sampling points. Geomorphic Position (D2) was also noted at both points. Depth of the High Water Table ranged from 0.5 to 6.0 inches (12.8 to 152.4 mm) at these sites. A complete listing of hydrology data collected at all sampling points is provided in Appendix A.

4.3.2. Non-Wetland Waters

Waikoko Stream, a perennial, tidal stream, was identified in the survey area (see Appendix B). This portion of Waikoko Stream in the survey area is tidal. Waikoko Stream is connected to the Pacific Ocean (Hanalei Bay) depending on the tidal and rainfall.

4.4. Wainiha Bridge 1

Approximately 0.37 acre (0.15 ha) of estuarine non-wetland WoUS (Estuarine, Subtidal [E1]) and 0.05 acre (0.02 ha) of riverine non-wetland WoUS (Riverine, Lower Perennial [R2]) were delineated in the Wainiha Bridge 1 survey area (see Appendix B). The types and acreage of WoUS delineated by SWCA are summarized in Table 19.

Table 19. Potential Waters of the U.S. Delineated in the Wainiha Bridge 1 survey area.

WoUS ID	Wetland Classification Code	Acres
08	E1UBL	0.37
09	R2	0.05
Total		**0.42**

4.4.1. Wetlands

As shown in Table 20, the only sampling point evaluated by SWCA in the survey area did not meet the three-criterion test indicative of wetland conditions pursuant to the USACE 1987 Manual and the Hawai‘i and Pacific Island Regional Supplement (see Appendix B). The wetland determination data form for the sampling point is included in Appendix A.

Table 20. Determination of Sampling Points at the Wainiha Bridge 1 Survey Area

Sampling Point	Hydrophytic Vegetation Present?	Hydric Soil Present?	Wetland Hydrology Present?	Is the Sampling Point a Wetland?
1	Y	N	N	N

Note: Wetland sampling points are highlighted in gray.

Vegetation

Hydrophytic vegetation is present at the sampling point because of the abundance of false kamani (FAC). Vegetation data collected at the sampling point is provided in Appendix A.

Soils

Hydric soils were not identified at the sampling point.

Hydrology

No wetland hydrology indicators were observed at the sampling point.

4.4.2. Non-Wetland Waters

A single perennial, non-wetland water (Wainiha Stream) was identified in the survey area (see Appendix B). This segment of Wainiha Stream was determined to be tidally influenced because of its proximity to the ocean and the salinity observed during SWCA’s fieldwork. The high tide line was determined using topography, as well as the vegetation line.

4.5. Wainiha Bridges 2 & 3

In all, approximately 0.94 acre (0.38 ha) of tidal, non-wetland WoUS (R1) and 0.55 acre (0.22 ha) of wetlands (PEM and PFO) were delineated in the survey area (see Appendix B). The types and acreage of WoUS delineated by SWCA are summarized in Table 21.

Table 21. Potential Waters of the U.S. Delineated in the Wainiha Bridges 2 & 3 Survey Area

WoUS ID	Wetland Classification Code	Acres
01	PFO	0.30
02	PEM	0.14
03	R1UBV	0.32
04	PEM	0.09
05	PEM	0.02
06	R1UBV	0.62
Total		**1.49**

4.5.1. Wetlands

As shown in Table 22, three of the six sampling points evaluated by SWCA in the survey area met the three-criterion test indicative of wetland conditions pursuant to the USACE 1987 Manual and the Hawaiʻi and Pacific Island Regional Supplement (Appendix B). Upland, non-wetland points analogous to wetland points were identified where necessary, and boundary lines were delineated following changes in topography, substrate, vegetation communities, and/or soil indicators. The wetland determination data forms for the sampling points are included in Appendix A.

Table 22. Determination of Sampling Points at the Wainiha Bridges 2 & 3 Survey Area

Sampling Point	Hydrophytic Vegetation Present?	Hydric Soil Present?	Wetland Hydrology Present?	Is the Sampling Point a Wetland?
1	Y	N	N	N
2	Y	Y	Y	Y
3	Y	N	N	N
4	Y	Y	Y	Y
5	Y	N	N	N
6	Y	Y	Y	Y

Note: Wetland sampling points are highlighted in gray.

Vegetation

All six sampling points had hydrophytic vegetation present. The dominant plants observed at the three wetland sampling points are California grass (FACW), Guinea grass, hau (FAC), and wedelia (FAC). Complete vegetation data collected at all sampling points are provided in Appendix A.

Soils

Hydric soils were identified in three of the six sampling points. Of the three wetland sampling points, the NRCS soil map places sampling points 4 and 6 in Hanalei silty clay, 0 to 2 percent slopes (HnA), listed as a hydric soil (NRCS 2012). The NRCS soil map places sampling point 2 in a Water (W) feature, although it occurs near the boundary of HnA soil. Redox Depressions (F8) were recorded at sampling points 2 and 6. No hydric soils were identified at any other sampling points in the survey area.

Hydrology

Wetland hydrology indicators were observed at three of the six sampling points. Saturation (A3) was present at sampling point 2, Surface Water (A1) was present at sampling point 4, and a High Water Table (A2) was observed sampling point 6. A complete listing of hydrology data collected at all sampling points is provided in Appendix A.

4.5.2. Non-Wetland Waters

A single perennial, non-wetland water (Wainiha Stream) was identified in the survey area (see Appendix B). This segment of Wainiha Stream was determined to be tidally influenced because of its proximity to the ocean and the presence of marine/estuarine biota observed during SWCA's fieldwork. The high tide line was determined using topography (i.e., a break in the slope and elevation) and vegetation line.

In addition, three human-made ditches were identified in the Wainiha Bridges 2 & 3 survey area (see Appendix B).

5. CONCLUSIONS

SWCA sampled conditions at 24 sampling points in the survey area to determine whether wetlands or other WoUS exist and to delineate the boundaries between these resources and uplands. In SWCA's professional opinion, 11 of the 24 points satisfy the criteria to be a wetland pursuant to the USACE 1987 Manual or the recent Hawai'i and Pacific Island Regional Supplement. SWCA delineated approximately 0.39 acre (15.78 ha) of PEM and 0.71 acre (0.28 ha) of PFO wetlands. In addition, SWCA delineated 2.78 acres (1.13 ha) of non-wetland waters comprising 1.90 acres (0.77 ha) of riverine, 0.37 acre (0.15 ha) of estuarine, and 0.51 acre (0.20 ha) of marine. Human-made ditches were also delineated near Wainiha Bridges 2 &3. The wetlands and streams are potential WoUS because of their connection to the Pacific Ocean. It is unknown whether the ditches have a "significant nexus."

This information is being incorporated into planning and design documents in an effort to avoid and minimize impacts to jurisdictional waters wherever practicable. For any unavoidable impacts, FHWA will consult with the appropriate Federal and State regulatory agencies including the USACE and the State Department of Health (DOH) Clean Water Branch (CWB) and obtain all necessary permits before commencing any in water work.

Because the project involves non-fill discharging activities over a WoUS, a Section 10 permit may be required. If the proposed project intends to place dredged or fill material within the delineated feature (e.g., bridge foundations or pillars), it could be subject to either a Section 10 or Section 404 Permit. These conclusions are subject to confirmation by the USACE Honolulu District.

The general rule regarding the state Section 401 water quality certification is, if the USACE identifies that a permit (NWP/LOP/SIP) under Section 404 is required, the applicant will likely need a Section 401 water quality certification from DOH CWB. If the CWB responds and requires a 401 water quality certification, it can take several months to a year to process. In addition, a Stream Channel Alteration Permit (SCAP) may be required from the Commission on Water Resource Management (CWRM), depending on the activities proposed. SWCA recommends submitting a Request for Determination (RFD) from CWRM. If a SCAP is required, the permit timeframe is 90 days.

6. LITERATURE CITED

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens. 1972. *Soil Survey of the Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lana'i, State of Hawai'i.* U.S. Department of Agriculture, Soil Conservation Service.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.L. Chen, P.S. Chu, J.K. Eischeid, and D.M. Delparte. 2013. Online Rainfall Atlas of Hawai'i. Bull. Amer. Meteor. Soc. 94, 313–316, doi: 10.1175/BAMS-D-11-00228.1. Available at: http://rainfall.geography.hawaii.edu. Accessed on November 7, 2014.

Kollmorgen Instruments Corporation. 1998. Munsell Soil Color Charts revised washable edition. Baltimore: Kollmorgen Instruments Corporation.

Lichvar, R.W., M. Butterwick, N.C. Melvin, and W.N. Kirchner. 2014. State of HAWAI'I 2014 Wetland Plant List, The National Wetland Plant List: 2014 Update of Wetland Ratings. *Phytoneuron* 2014-41:1–42.

Lichvar, R., N. Melvin, M. Butterwick, and W. Kirchner. 2012. *National Wetland Plant List Indicator Rating Definitions*. ERDC/CRREL TN-12-1. Hanover, New Hampshire: U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Available at: http://www.fws.gov/wetlands/documents/National-Wetland-Plant-List-Indicator-Rating-Definitions.pdf. Accessed November 24, 2015.

National Oceanic and Atmospheric Administration/National Weather Service, Weather Forecast Office Honolulu. 2014. Hydrology in Hawai'i. Available at: http://www.prh.noaa.gov/hnl/hydro/pages/sep14sum.php. Accessed on November 7, 2014.

Natural Resources Conservation Service (NRCS). 2010. *Field Indicators of Hydric Soils in the United States, Version 7.0,* edited by L.M. Vasilas, G.W. Hurt, and C.V. Noble. U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with the National Technical Committee for Hydric Soils.

———. 2012. Hydric Soils State Lists, Hydric Soils of Hawai'i. Available at: ftp://ftp-fc.sc.egov.usda.gov/NSSC/Hydric_Soils/Lists/hydric_soils.xlsx. Accessed December 7, 2012.

———. 2013. Web Soil Survey. Available at: http://websoilsurvey.nrcs.usda.gov/. Accessed November 7, 2014.

Parham, J.E., G.R. Higashi, E.K. Lapp, D.G. K. Kuamoo, R.T. Nishimoto, S. Hau, J.M. Fitzsimons, D.A. Polhemus, and W.S. Devick. 2008. *Atlas of Hawaiian Watersheds & Their Aquatic Resources*. Copyrighted website published by the Hawaii Division of Aquatic Resources, Department of Land and Natural Resources. Available at: www.hawaiiwatershedatlas.com. Accessed November 24, 2015.

Staples, G.W. and D.R. Herbst. 2005. A Tropical Garden Flora: Plants Cultivated in the Hawaiian Islands and Other Tropical Places. Honolulu, Hawai'i: Bishop Museum Press.

SWCA. 2015. Biological Resource Survey Report for the Wainiha Bridges Project. Prepared for Federal Highway Administration, Central Federal Lands Highway Administration and CH2M Hill.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual*. Wetlands Research Program Technical Report Y-87-1 (online edition). Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf. Accessed November 24, 2015.

———. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Islands Region Version 2.0*, edited by J.F. Berkowitz, J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-12-5. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U.S. Fish and Wildlife Service (USFWS). 2014. National Wetlands Inventory. Available at: http://www.fws.gov/wetlands. Accessed September 2014.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. *Manual of the Flowering Plants of Hawai'i.* Volumes I and II. Revised edition. Honolulu, Hawai'i: University of Hawai'i Press.

Wagner, W.L., and D.R. Herbst. 2003. *Supplement to the* Manual of the Flowering Plants of Hawai'i. Version 3.1 (12 Dec 2003). Available at: http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/ManualSupplement3.pdf. Accessed November 24, 2015.

Wagner, W.L., D.R. Herbst, N. Khan, and T. Flynn. 2012. Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawai'i and Hawai'i's Ferns and Fern Allies. Version 1.3. Available at: http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/Hawaiian_vascular_plant_updates_1.3.pdf. Accessed November 24, 2015.

This page intentionally blank

Appendix A

Data Forms

WETLAND DETERMINATION DATA FORM – Hawai'i and Pacific Islands Region

Project/Site: Waikoko Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 15:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P1

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-003-002

Landform (hillslope, coastal plain, etc.): Roadside fill/slope Local relief (concave, convex, none): none

Lat: 22.2077258139 N Long: -159.517009659 W Datum: NAD UTM 4N Slope (%): 10

Soil Map Unit Name: Mokuleia fine sandy loam (Mr) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	Is the Sampled Area within a Wetland? Yes ___ No X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10')			
1. Hibiscus tillaceous (Talipariti tiliaceum)	85	Y	FAC
2.			
3.			
4.			
5.			
	85 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Phymatosorus grossus	40	Y	FACU
2. Megathyrsus maximus	5	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	45 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1. Epipremnum pinnatum	20	Y	FAC
2.			
	20 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- [X] 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:

SOIL

Sampling Point: P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5 YR 3/3	100					Loam	
8-18	10 YR 4/3	100					Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________________

Depth (inches): ______________________

Hydric Soil Present? **Yes** ______ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No X Depth (inches):

Water Table Present? Yes _____ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes _____ No X Depth (inches):

Wetland Hydrology Present? **Yes** ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Waikoko Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 15:20

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P2

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-003-002

Landform (hillslope, coastal plain, etc.): Floodplain, Base of Slope Local relief (concave, convex, none): none

Lat: 22.2077116447 N Long: -159.517039571 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Mokuleia fine sandy loam (Mr) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks:

10 ft down slope of P1

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceous	95	Y	FAC
2.			
3.			
4.			
5.			
	95 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

only tree stratum

SOIL

Sampling Point: P2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 5/2	80	7.5 YR 5/6	20		M	Sandy Loam	Redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Sandy Redox (S5)

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):
Water Table Present?	Yes X	No ___	Depth (inches): 6"
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 2"

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High Water Table (A2), Saturation (A3), Sediment Deposits (B2), Geomorphic Position (D2)

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Waikoko Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 15:40

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P3

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-003-002

Landform (hillslope, coastal plain, etc.): Roadside depression Local relief (concave, convex, none): none

Lat: 22.2066798706 N Long: -159.516495614 W Datum: NAD UTM 4N Slope (%): 2

Soil Map Unit Name: Mokuleia fine sandy loam (Mr) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Terminalia catappa	80	Y	FAC
2. Hibiscus tillaceus (Talipariti tiliaceum)	20	Y	FAC
3.			
4.			
5.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1. Terminalia catappa	10	Y	FAC
2.			
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- [X] 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 3/3	100					Clay Loam	
12-24	5 Y 3/2	80	5 Y 6/3	20			Sandy Clay Loam	Sand but no redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Muck Presence (A8)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Dark Surface (S7)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Stratified Layers (A5)
___ Sandy Mucky Mineral (S1)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No X

Remarks:

Color variation in layers of sand. Does not seem to be a function of anaerobic conditions. Might be depositional.

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Tilapia Nests (B17)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):
Water Table Present? Yes ______ No X Depth (inches):
Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waikoko Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 16:10

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P4

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-003-002

Landform (hillslope, coastal plain, etc.): Floodplain, Base of Slope Local relief (concave, convex, none): none

Lat: 22.2076390733 N Long: -159.516953035 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Mokuleia fine sandy loam (Mr) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	Is the Sampled Area within a Wetland? Yes X No ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

edge of water

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceous (Talipariti tiliaceum)	95	Y	FAC
2.			
3.			
4.			
5.			
	95 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:
only tree stratum

SOIL

Sampling Point: P4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 5/2	80	7.5 YR 5/6	20		M	Sandy Loam	Redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Sandy Redox (S5)

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?	X		0.5"
Saturation Present? (includes capillary fringe)	X		surface

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

High Water Table (A2), Saturation (A3), Sediment Deposit (B2), Geomorphic Position (D2)

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Waipa Stream Bridge   City: Hanalei   Sampling Date: 9.30.2014   Time: 14:20

Applicant/Owner: HDOT   State/Terr/Comlth.: HI   Island: Kauai   Sampling Point: P1

Investigator(s): B Nicholson / B Luke / T Agostini   TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Coastal Plain   Local relief (concave, convex, none): Concave

Lat: 22.2043095223 N   Long: -159.514358202 W   Datum: NAD UTM 4N   Slope (%): 1

Soil Map Unit Name: Beaches   NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed?   Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks:

Point 30' from edge of road, makai

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceus (Talipariti tiliaceum)	90	Y	FAC
2.			
3.			
4.			
5.			
	90 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

Dense hau

SOIL

Sampling Point: P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 2/2	100					Loam	Organic layer
6-17	2.5 Y 6/3	96	7.5 YR 5/6	4			Sand	Oxidized roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Sandy Redox (S5). Technically Sandy Redox should have a chroma of 2 or less but strong hydrology indicators for hydric conditions

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- X Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):
Water Table Present?	Yes ___	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Indicators are Water Marks (B1), Oxidized Roots (C3), Geomorphic Position (D2)
Depression area connected to river.

WETLAND DETERMINATION DATA FORM – Hawai'i and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 9.30.2014 Time: 14:40

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P2

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Road Fill Slope Local relief (concave, convex, none): Concave

Lat: 22.2042880825 N Long: -159.514395423 W Datum: NAD UTM 4N Slope (%): 5

Soil Map Unit Name: Beaches NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks:

Roadside fill, upland area near highway, 4ft from edge of pavement.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Hibiscus tillaceus (Talipariti tiliaceum)	5	Y	FAC
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 15')			
1. Paspalum conjugatum	40	Y	FAC
2. Cenchrus purpureus	30	Y	FAC
3. Sphagneticola trilobata	30	Y	FAC
4. Kyllinga brevifolia	5	N	FAC
5.			
6.			
7.			
8.			
	105 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

- __ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- __ 3 - Prevalence Index is ≤3.0[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: P2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5 YR 3/2	100						
2-14	5 YR 4/4	90	5 YR 3/4	5			Clay Loam	not redox
			5 YR 5/8	5	C	M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Muck Presence (A8)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Dark Surface (S7)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Stratified Layers (A5)
___ Sandy Mucky Mineral (S1)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

Likely fill material. Does not contain 10% redox req for F21

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Tilapia Nests (B17)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):
Water Table Present? Yes ______ No X Depth (inches):
Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Along roadside (makai)

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 8:10

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P3

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Coastal Plain Local relief (concave, convex, none): none

Lat: 22.204322351 N Long: -159.514114114 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Beaches NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cordia subcordata	30	Y	FACU
2. Hibiscus tillaceus (Talipariti tiliaceum)	5	N	FAC
3.			
4.			
5.			
	35 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 15')			
1. Sphagneticola trilobata	60	Y	FAC
2. Paspalum conjugatum	30	Y	FAC
3. Bidens alba	3	N	UPL
4. Epiprenum pinnatum	3	N	FAC
5.			
6.			
7.			
8.			
	96 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: P3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 3/2	100					Loam	organic matter
3-24	10 YR 5/3	100	10 YR 5/6				Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? **Yes** ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 08:35

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P4

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Coastal plain Local relief (concave, convex, none): none

Lat: 22.203940981 N Long: -159.513639538 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Beaches NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceus (Talipariti tiliaceum)	85	Y	FAC
2. Terminalia catappa	15	N	FAC
3.			
4.			
5.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 15')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 3/2	100					Loam	
3-24	10 YR 5/3	96	10 YR 5/6	4			Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ **No** X

Remarks:

Sand after 3", did not form clear hydrology indicator (oxidized roots). Possibly due to coral parent material.

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Some indication of past flooding, but no distinct drift line. Frequency of flooding unclear. No hydrology after flood event on 9/30.

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 09:15

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P5

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Floodplain Local relief (concave, convex, none): none

Lat: 22.2037999569 N Long: -159.513884112 W Datum: UTM 4N Slope (%): 0

Soil Map Unit Name: Beaches NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 5')			
1. Hibiscus tillaceus	15	Y	FAC
2.			
3.			
4.			
5.			
	15 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Sphagneticola trilobata	50	Y	FAC
2. Cyperus involucratus	40	Y	FACW
3. Canavalia cathartica	10	N	FACU
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 5')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 2/1	100					Loam Clay	Organic and rocks
4-16	7.5 YR 6/2	97	7.5 YR 5/6	3			Sand Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- _X_ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Sandy redox (S5)

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ☒ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- _X_ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):
Water Table Present?	Yes X	No ___	Depth (inches): 16"
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 4-5"

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Faint oxy rhizo

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 09:35

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P6

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Coastal plain Local relief (concave, convex, none): none

Lat: 22.20382004250 N Long: -159.51384455600 W Datum: NAD UTM 4N Slope (%): 2

Soil Map Unit Name: Beaches NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceus	60	Y	FAC
2. Terminalia catappa	35	Y	FAC
3. Casuarina equisetifolia	10	N	FACU
4.			
5.			
	105 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 5')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 3/1	100					Clay Loam	
3-20	2.5 YR 6/3	100					Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

No redox; not gleyed

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Leaves not correct color for water stain (not greyed out), maybe just wet from rain/flood event 9/30

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 09:45

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P7

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Coastal plain Local relief (concave, convex, none): none

Lat: 22.2041018105 N Long: -159.514292215 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Beaches NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are “Normal Circumstances” present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceus (Talipariti tiliaceum)	90	Y	FAC
2.			
3.			
4.			
5.			
	90 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 2/1	100					Clay Loam	
6-22	7.5 YR 5/2	95	5 YR 5/6	5			Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Sandy redox (S5)

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):
Water Table Present?	Yes ___	No X	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Oxidized Rhizospheres

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waipa Stream Bridge City: Hanalei Sampling Date: 10.1.2014 Time: 10:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P8

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-6-004-022

Landform (hillslope, coastal plain, etc.): Roadfill slope Local relief (concave, convex, none): none

Lat: 22.2041308608 N Long: -159.514249206 W Datum: NAD UTM 4N Slope (%): 25-30

Soil Map Unit Name: Beaches NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10')			
1. Hibiscus tillaceus	75	Y	FAC
2.			
3.			
4.			
5.			
	75 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1. Syzygium cumini	5	Y	FAC
2. Psidium guajava	5	Y	FACU
3.			
4.			
5.			
	10 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Oplismenus hirtellus	50	Y	FAC
2. Sphagneticola trilobata	30	Y	FAC
3. Canavalia cathartica	5	N	FACU
4. Cyperus involucratus	5	N	FACU
5.			
6.			
7.			
8.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 80 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	5 YR 3/3	100					Clay Loam	Fill mat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ______ No X

Remarks:

Likely some fill along road

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waioli Stream Bridge City: Hanalei Sampling Date: 9.30.2014 Time: 9:55

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P1

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-5-006-888

Landform (hillslope, coastal plain, etc.): Floodplain Local relief (concave, convex, none): none

Lat: 22.2003320554 N Long: -159.507080326 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Water > 40 acres NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks:

Spot is a ridge in middle running parallel to river.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tiliaceus	80	Y	FAC
2.			
3.			
4.			
5.			
	80 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Cyperus involucratus	40	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

Some Java plum in overstory outside plot.

SOIL

Sampling Point: P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-22	10 YR 2/1	100					Clay Loam	Mineral layer w/ organic mat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** X **No**

Remarks:

Assumed to be Thick Dark Surface n(A12). Did not reach depleted layer due to presence of water in soil pit.

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?	X		1
Saturation Present? (includes capillary fringe)	X		1

Wetland Hydrology Present? **Yes** X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Just above OHWM and HTL
Land owner says river mouth was seasonally blocked by sandbar, so river is high. Heavy rains flood much of the area w/ water.

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Waioli Stream Bridge City: Hanalei Sampling Date: 9.30.2014 Time: 10:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P2

Investigator(s): B Nicholson / B Luke TMK/Parcel: 4-5-6-002-003

Landform (hillslope, coastal plain, etc.): Road fill slope Local relief (concave, convex, none): none

Lat: 22.2003553107 N Long: -159.507206301 W Datum: NAD UTM 4N Slope (%): 6

Soil Map Unit Name: Rock Outcrop NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are “Normal Circumstances” present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tiliaceus	100	Y	FAC
2.			
3.			
4.			
5.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1. Leucaena leucocephala	20	Y	UPL
2. Erythrina sp.	15	Y	UPL
3.			
4.			
5.			
	35 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Sphagneticola trilobata	30	Y	FAC
2. Desmodium incanum	10	N	FACU
3. Commelina diffusa	5	N	FACW
4. Coix lacryma-jobi	5	N	FACW
5. Cyperus involucratus	3	N	FACW
6. Canavalia cathartica	3	N	FACU
7.			
8.			
	56 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	13	x 2 = 26
FAC species	130	x 3 = 390
FACU species	13	x 4 = 52
UPL species	35	x 5 = 175
Column Totals:	191 (A)	643 (B)

Prevalence Index = B/A = 3.37

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks:
Hibiscus growing over site but not rooted in site.

SOIL

Sampling Point: P2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-20	2.5 YR 2.5/2	100					Clay Loam	Mineral layer w/ organic mat

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Muck Presence (A8)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Dark Surface (S7)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Stratified Layers (A5)
___ Sandy Mucky Mineral (S1)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

Dark soil but not organic. Likely road fill brought in from outside area.

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Tilapia Nests (B17)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches):

Water Table Present? Yes ______ No ______ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waioli Stream Bridge City: Hanalei Sampling Date: 9.30.2014 Time: 10:35

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P3

Investigator(s): B Nicholson / B Luke TMK/Parcel: 4-5-5-005-021

Landform (hillslope, coastal plain, etc.): Floodplain (landscaped lawn) Local relief (concave, convex, none): none

Lat: 22.2005365818 N Long: -159.507131692 W Datum: NAD UTM 4N Slope (%): 1

Soil Map Unit Name: Water >40 acres NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No ____	**Is the Sampled Area within a Wetland?** **Yes** X **No** ____
Hydric Soil Present?	Yes X No ____	
Wetland Hydrology Present?	Yes X No ____	

Remarks:

Site sampled in lawn of residential property adjacent to river/stream

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Axonopus compressus	90	Y	FAC
2. Zingiber zerumbet	5	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:
Disturbed. Lawn/landscaped.

SOIL

Sampling Point: P3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10 YR 4/2	100					Clay Loam	
8-16	10 YR 4/2	90	5 YR 5/6	10			Clay Loam	Oxidized roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches):

Water Table Present? Yes X No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 8

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waioli Stream Bridge City: Hanalei Sampling Date: 9.30.2014 Time: 10:55

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P4

Investigator(s): B Nicholson / B Luke TMK/Parcel: 4-5-5-005-021

Landform (hillslope, coastal plain, etc.): Road fill slope Local relief (concave, convex, none): none

Lat: 22.2004949286 N Long: -159.507126367 W Datum: NAD UTM 4N Slope (%): 2

Soil Map Unit Name: Water >40 acres NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes ____ No X	

Remarks:

Site sampled along roadside near residential property adjacent to river/stream.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10')			
1. Dypsis lutescens	30	Y	UPL
2.			
3.			
4.			
5.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Hedychium coronarium	13	Y	FAC
2. Axonopus compressus	3	N	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	16 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks:

Disturbed. Lawn/landscaped just off road.

SOIL

Sampling Point: P4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10 YR 4/4	100					Clay Loam	Lots of roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches):

Water Table Present? Yes ______ No ______ Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No hydrology indicator.

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Waioli Stream Bridge City: Hanalei Sampling Date: 10.2.2014 Time: 11:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P5

Investigator(s): B Nicholson / T Agostini TMK/Parcel: 4-5-5-006-999

Landform (hillslope, coastal plain, etc.): floodplain Local relief (concave, convex, none): none

Lat: 22.200524379 N Long: -159.506776675 W Datum: NAD UTM 4N Slope (%): 2

Soil Map Unit Name: Mokuleia fine sandy loam NWI classification: R2UBH

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks:

In depression in larger floodplain 10 ft from river.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
= Total Cover	0		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
= Total Cover	0		
Herb Stratum (Plot size: 10')			
1. Coix lacryma-jobi	40	Y	FACW
2. Urochloa mutica	30	Y	FACW
3. Cyperus involucratus	20	Y	FACW
4. Sphagneticola trilobata	10	N	FAC
5.			
6.			
7.			
8.			
= Total Cover	100		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
= Total Cover	0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

Lawn/landscaped Etlingera elatior overhanging, but not rooted so not included in herb stratum.

SOIL

Sampling Point: P5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	5 YR 4/2	90	5 YR 4/6	10				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches):

Water Table Present? Yes X No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): surface

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Wainiha Bridge 1 City: Hanalei Sampling Date: 10.1.2014 Time: 10:30

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P1

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-006-030

Landform (hillslope, coastal plain, etc.): Road fill slope Local relief (concave, convex, none): none

Lat: 22.2123199949 N Long: -159.539403697 W Datum: NAD UTM 4N Slope (%): 1

Soil Map Unit Name: Mokuleia fine sandy loam (Mr) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Terminalia catappa	90	Y	FAC
2. Hibiscus tiliaceus (Talipariti tiliaceum)	15	N	FAC
3.			
4.			
5.			
	105 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1. Spathodea campanulata	2	N	FACU
2. Schefflera actinophylla	2	N	UPL
3.			
4.			
5.			
	4 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Terminalia catappa (seedlings)	5	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	5 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

☒ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

Shrubs /saps <5% and not dominant

SOIL

Sampling Point: P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	5 YR 4/4	100					Sandy Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

6 feet above water line, top of steep bank.

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Wainiha Bridge 2&3 City: Hanalei Sampling Date: 10.1.2014 Time: 11:30

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P1

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-007-999

Landform (hillslope, coastal plain, etc.): Road fill slope Local relief (concave, convex, none): none

Lat: 22.2126118491 N Long: -159.54362189 W Datum: NAD UTM 4N Slope (%): 1

Soil Map Unit Name: Hanalei Silty Clay, 0 to 2 percent slopes (HnA) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks:

Edge of gravel road

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceus (Talipariti tiliaceum)	5	Y	FAC
2.			
3.			
4.			
5.			
	5 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Oplismenus hirtellus	40	Y	FAC
2. Sphagneticola trilobata	30	Y	FAC
3. Commelina diffusa	10	N	FACW
4. Desmodium incanum	10	N	FACU
5. Megathyrsus maximus	5	N	FAC
6. Hedychium coronarium	5	N	FAC
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: P1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10 YR 3/2	100					Clay	Road Fill

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

Edge of gravel road along top of bank

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Wainiha Bridge 2&3 City: Hanalei Sampling Date: 10.1.2014 Time: 12:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P2

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-007-024

Landform (hillslope, coastal plain, etc.): Road fill slope Local relief (concave, convex, none): none

Lat: 22.2125637789 N Long: -159.544054269 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Water >40 acres NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes X	No ____
Wetland Hydrology Present?	Yes X	No ____

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks:

Just off road between bridges. Lower topography than P1 but still above river

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Urochloa mutica	80	Y	FACW
2. Sphagneticola trilobata	20	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5 YR 3/1	100					Clay Loam	
8-22	7.5 YR 3/1	90	5 YR 4/6	10		m	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Redox depressions (F8)

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches):

Water Table Present? Yes X No ___ Depth (inches): 18"

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 9"

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Saturation (A3) Geomorphic position (D2)

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Wainiha Bridge 2&3 City: Hanalei Sampling Date: 10.1.2014 Time: 12:45

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P3

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-006-030

Landform (hillslope, coastal plain, etc.): Roadfill slope Local relief (concave, convex, none): none

Lat: 22.2127790695 N Long: -159.543438947 W Datum: NAD UTM 4N Slope (%): 2

Soil Map Unit Name: Water > 40 acres NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** ___ **No** X
Hydric Soil Present?	Yes ___	No X	
Wetland Hydrology Present?	Yes ___	No X	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Megathyrsus maximus	35	Y	FAC
2. Sphagneticola trilobata	30	Y	FAC
3. Urochloa mutica	25	Y	FACW
4. Mimosa pudica	10	N	FACU
5.			
6.			
7.			
8.			
	110 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: P3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	7.5 YR 3/3	100					Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No X

Remarks:

Hit asphalt at 13 inches - fill material

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? Yes ______ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawai'i and Pacific Islands Region

Project/Site: Wainiha Bridge 2&3 City: Hanalei Sampling Date: 10.1.2014 Time: 13:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P4

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-007-999

Landform (hillslope, coastal plain, etc.): Flood plain Local relief (concave, convex, none): none

Lat: 22.2140023821 N Long: -159.543817411 W Datum: NAD UTM 4N Slope (%): 0

Soil Map Unit Name: Hanalei Silty Clay, 0 to 2 percent slopes (HnA) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X	No ___	
Wetland Hydrology Present?	Yes X	No ___	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10')	Absolute % Cover	Dominant Species?	Indicator Status
1. Hibiscus tillaceus (Talipariti tiliaceum)	95	Y	FAC
2.			
3.			
4.			
5.			
	95 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Urochloa mutica	5	Y	FACW
2. Megathyrsus maximus	5	Y	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	10 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: P4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Muck Presence (A8)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Dark Surface (S7)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Stratified Layers (A5)
___ Sandy Mucky Mineral (S1)
___ Red Parent Material (F21)
___ Very Shallow Dark Surface (TF12)
X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? Yes X **No**

Remarks:

No soil pit, standing water in large area

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

X Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ Tilapia Nests (B17)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Sparsely Vegetated Concave Surface (B8)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Salt Deposits (C5)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches): 26-36"
Water Table Present?	Yes ___	No ___	Depth (inches):
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches):

Wetland Hydrology Present? Yes X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawaiʻi and Pacific Islands Region

Project/Site: Wainiha Bridge 2&3 City: Hanalei Sampling Date: 10.1.2014 Time: 13:35

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P5

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-007-999

Landform (hillslope, coastal plain, etc.): coastal plain Local relief (concave, convex, none): none

Lat: 22.2143801834 N Long: -159.543773988 W Datum: NAD UTM 4N Slope (%): 5

Soil Map Unit Name: Mokuleia clay loam, poorly drained variant (Mta) NWI classification: UPL

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____
Hydric Soil Present?	Yes ____	No X
Wetland Hydrology Present?	Yes ____	No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10')			
1. Terminalia catappa	95	Y	FAC
2.			
3.			
4.			
5.			
	95 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1. Epipremnum pinnatum	50	Y	FAC
2.			
	50 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

SOIL

Sampling Point: P5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	5 YR 4/3						Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ______ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No X Depth (inches):

Water Table Present? Yes ______ No X Depth (inches):

Saturation Present? (includes capillary fringe) Yes ______ No X Depth (inches):

Wetland Hydrology Present? **Yes** ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Hawai‘i and Pacific Islands Region

Project/Site: Wainiha Bridge 2&3 City: Hanalei Sampling Date: 10.1.2014 Time: 14:00

Applicant/Owner: HDOT State/Terr/Comlth.: HI Island: Kauai Sampling Point: P6

Investigator(s): B Nicholson / B Luke / T Agostini TMK/Parcel: 4-5-8-006-030

Landform (hillslope, coastal plain, etc.): coastal plain Local relief (concave, convex, none): none

Lat: 22.2133320768 N Long: -159.543789661 W Datum: NAD UTM 4N Slope (%): 3

Soil Map Unit Name: Hanalei silty clay, 0 to 2 percent slopes NWI classification: PFOC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?** **Yes** X **No** ___
Hydric Soil Present?	Yes X	No ___	
Wetland Hydrology Present?	Yes X	No ___	

Remarks:

makai side of highway

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 10')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 10')			
1. Urochloa mutica	80	Y	FACW
2. Sphagneticola trilobata	20	Y	FAC
3. Cyperus involucratus	2	N	FACW
4.			
5.			
6.			
7.			
8.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 10')			
1.			
2.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

☒ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ Problematic Hydrophytic Vegetation[1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

SOIL

Sampling Point: P6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	7.5 YR 3/1	100					Clay Loam	
8-22	7.5 YR 3/1	90	5 YR 4/6	10		M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Muck Presence (A8)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Dark Surface (S7)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Stratified Layers (A5)
- ___ Sandy Mucky Mineral (S1)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

Redox depressions (F8)

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Tilapia Nests (B17)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Fiddler Crab Burrows (C10) (Guam, CNMI, and American Samoa)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Salt Deposits (C5)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?	X		9"
Saturation Present? (includes capillary fringe)	X		

Wetland Hydrology Present? **Yes** X **No** ___

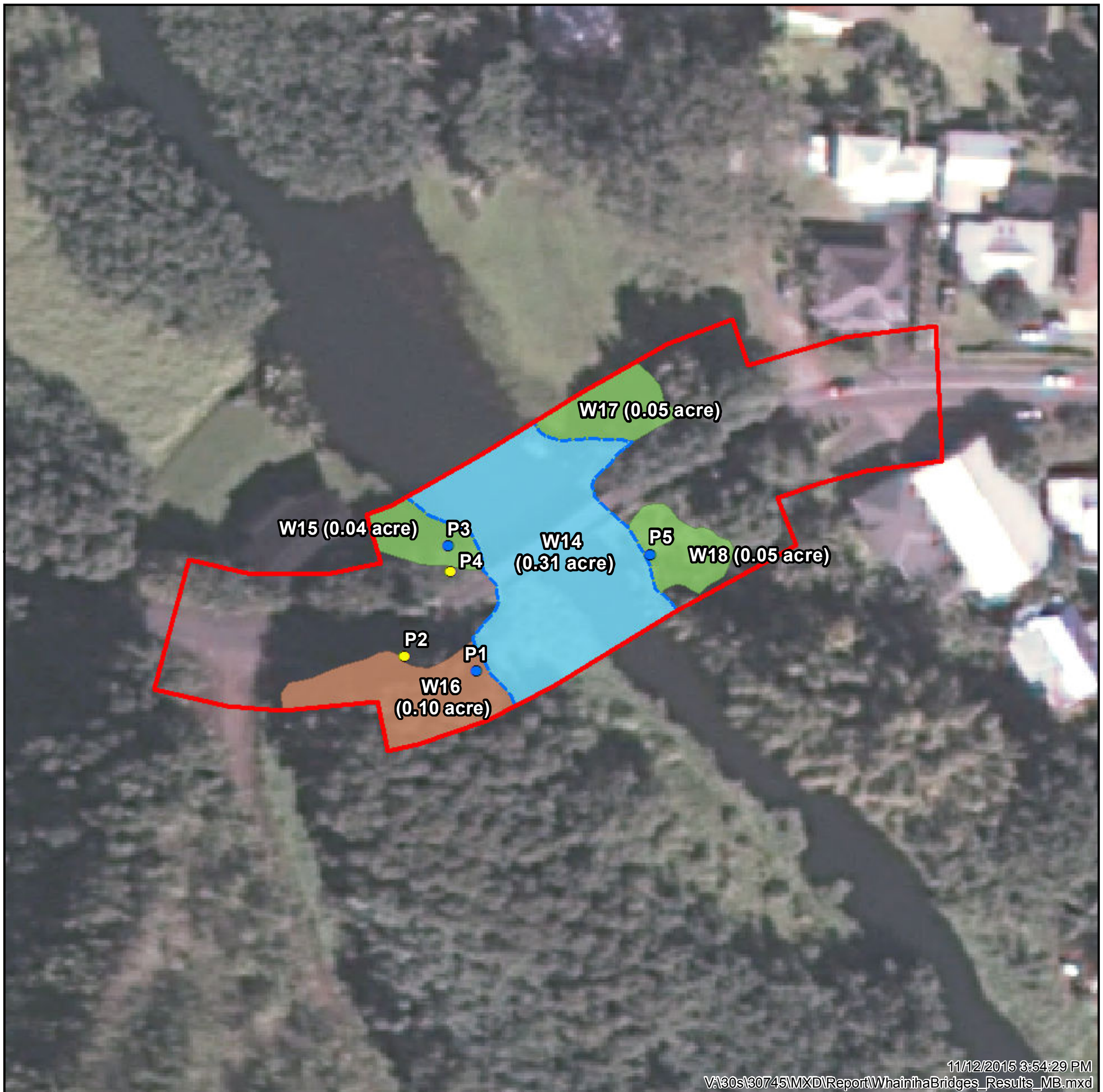
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Geomorphic position (D2)

Appendix B

Results Maps



Data Points

- Upland
- Wetland

Wetlands/WOUS

- PEM
- PFO
- R2UBH

High Tide Line

Survey Area

0 10 20 Meters

0 50 100 Feet

High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

N

SWCA ENVIRONMENTAL CONSULTANTS

Data Points
- Upland
- Wetland

Wetlands/WOUS
- PFO
- R1UBV

High Tide Line

Survey Area

0 10 20 Meters

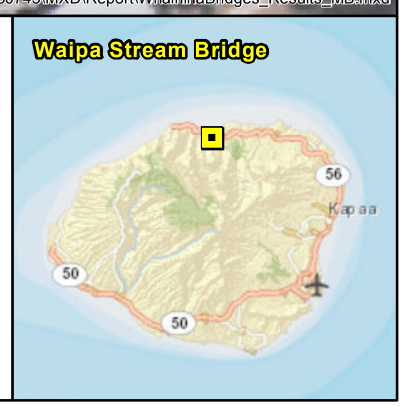
0 50 100 Feet

High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

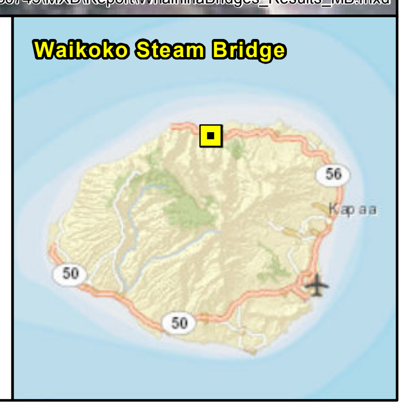
N

SWCA
ENVIRONMENTAL CONSULTANTS



High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010. Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.



Data Points
- Upland
- Wetland

Wetlands/WOUS
- E1UBL
- R2RB

High Tide Line
OHWM
Survey Area

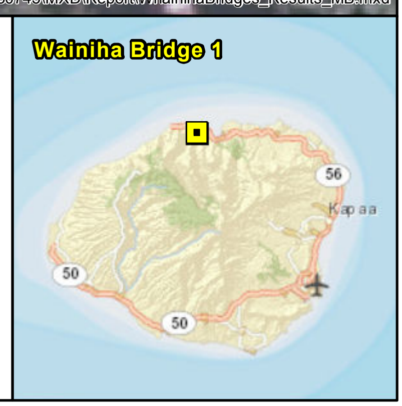
0 10 20 Meters
0 50 100 Feet

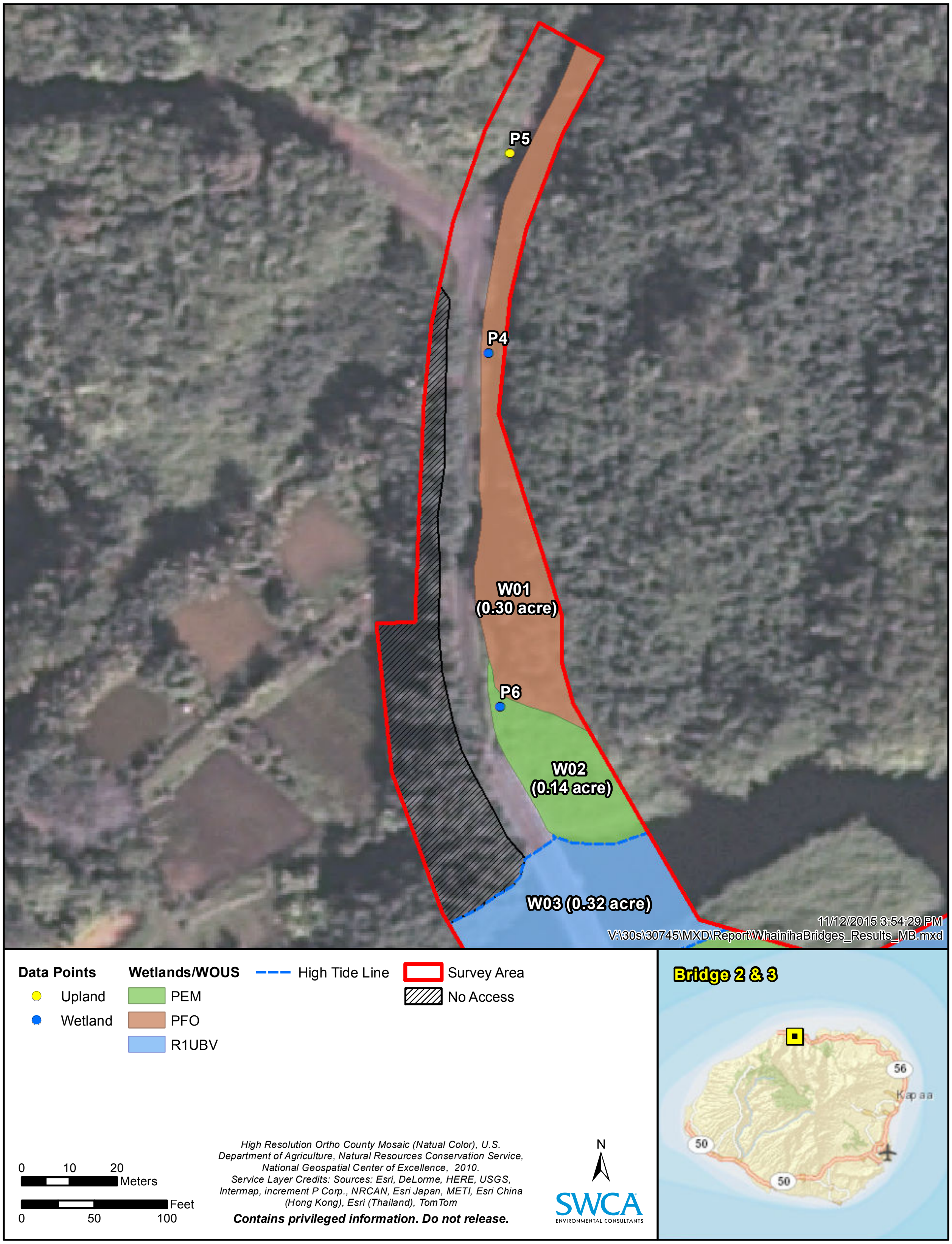
High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010. Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

N

SWCA
ENVIRONMENTAL CONSULTANTS

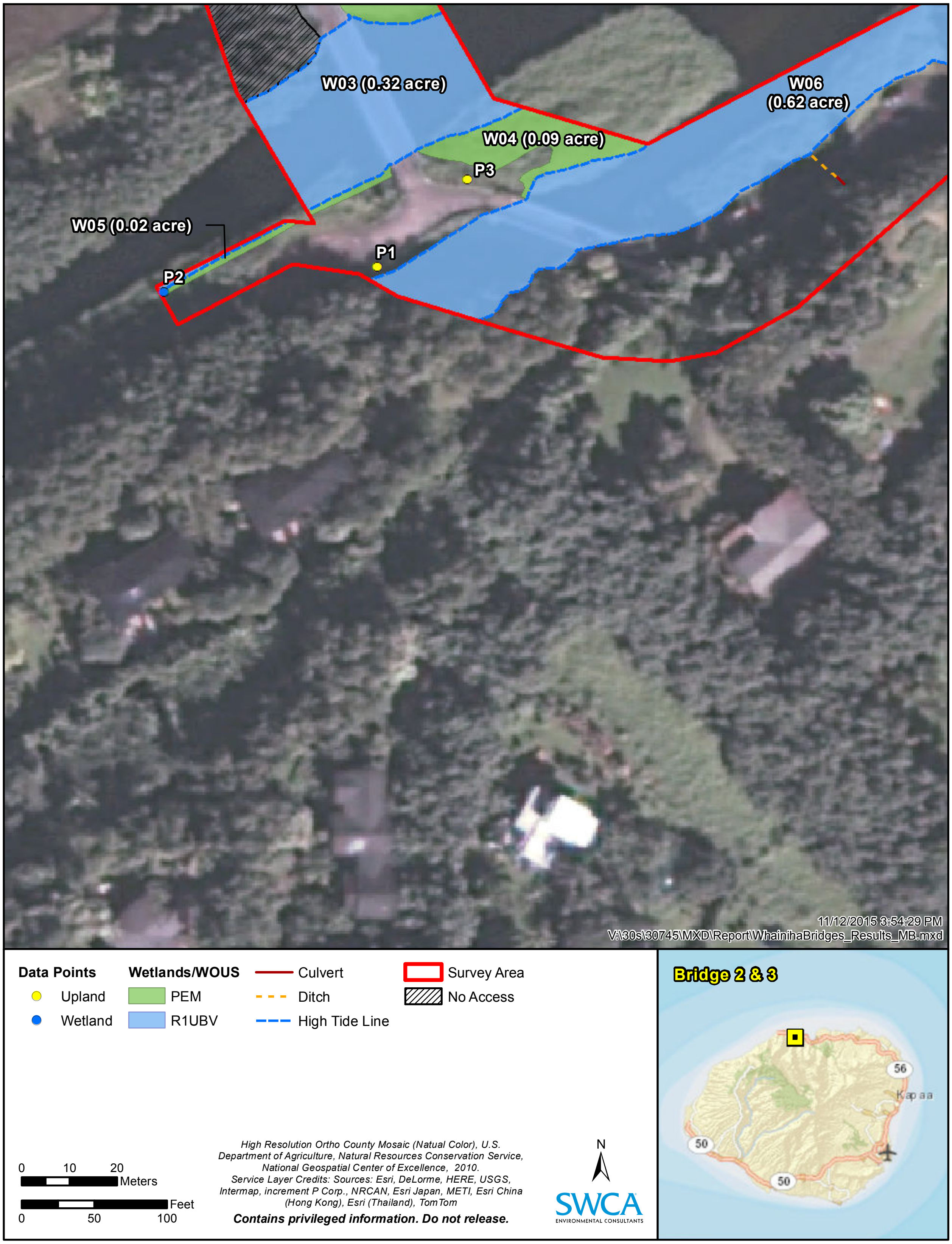




High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010. Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

SWCA ENVIRONMENTAL CONSULTANTS


W03 (0.32 acre)
W06
(0.62 acre)
W04 (0.09 acre)
P3
W05 (0.02 acre)
P1
P2
11/12/2015 3:54:29 PM
V:\30s\30745\MXD\Report\WhainihaBridges_Results_MB.mxd
Data Points
Upland
Wetland
Wetlands/WOUS
PEM
R1UBV
Culvert
Ditch
High Tide Line
Survey Area
No Access
Bridge 2 & 3
56
Kapaa
50
50
0 10 20 Meters
0 50 100 Feet
High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom
Contains privileged information. Do not release.
N
SWCA
ENVIRONMENTAL CONSULTANTS

Data Points
- Upland
- Wetland

Wetlands/WOUS
- R1UBV

- Culvert
- Ditch
- High Tide Line

- Survey Area

0 10 20 Meters

0 50 100 Feet

High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

N

SWCA ENVIRONMENTAL CONSULTANTS

Appendix C

Survey Area Photographs

Figure C1. Waiʻoli Bridge taken from the makai west bank.

Figure C2. Waipā Bridge taken from the mauka east bank.

Figure C3. Waikoko Bridge at road, taken from the south.

Figure C4. Wainiha Bridge 1 taken from the makai east bank.

Figure C5. Wainiha Bridge 2 taken from the mauka east bank.

Figure C6. Wainiha Bridge 3 taken from the mauka east bank.

This page intentionally blank

Appendix D

National Wetland Inventory and National Hydrography Dataset Maps

Survey Area

National Hydrography Dataset

Artificial Path/Connector

Coastline

National Wetlands Inventory

E1UBL

0 10 20
Meters

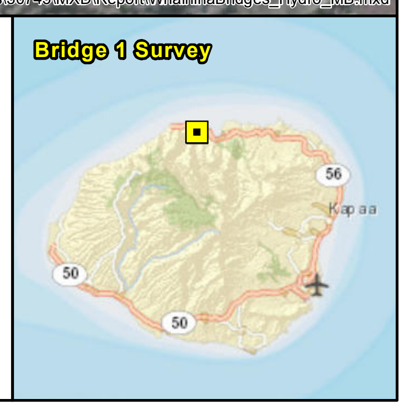
Feet
0 50 100

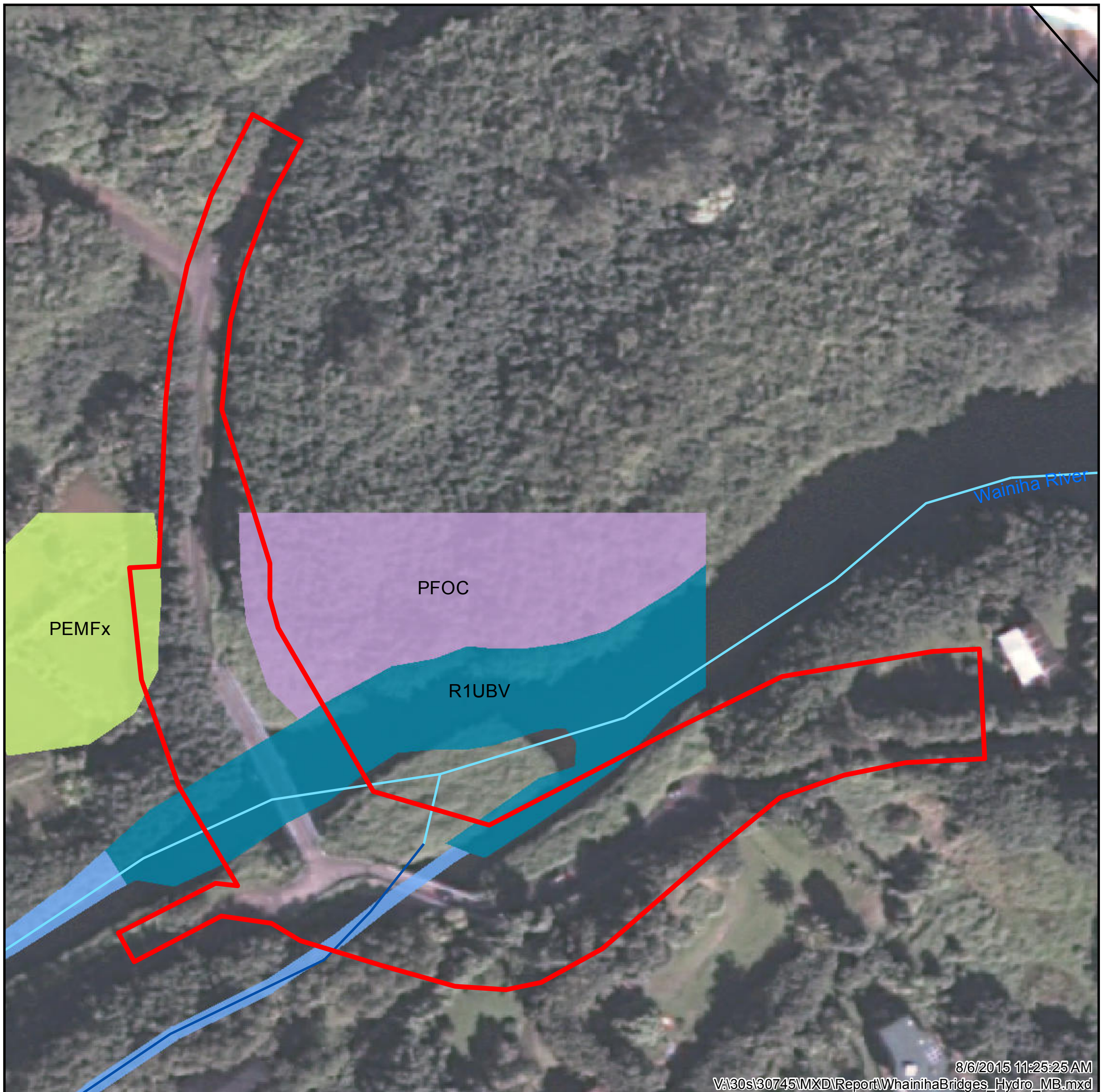
High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

N

SWCA
ENVIRONMENTAL CONSULTANTS





Survey Area

National Hydrography Dataset

- Artificial Path/Connector
- Coastline
- Stream/River

National Wetlands Inventory

- PEMFx
- PFOC
- R1UBV
- R2UBH

0 10 20
Meters

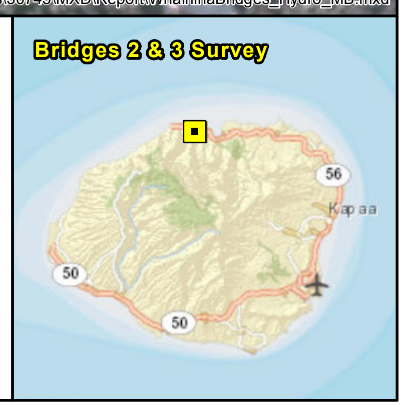
Feet
0 50 100

High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

Contains privileged information. Do not release.

N

SWCA
ENVIRONMENTAL CONSULTANTS



Survey Area

National Hydrography Dataset

- Coastline
- Stream/River

National Wetlands Inventory

- M1RFL
- M2USN
- M2USP
- PEMFx
- R3RBH

0 10 20 Meters

0 50 100 Feet

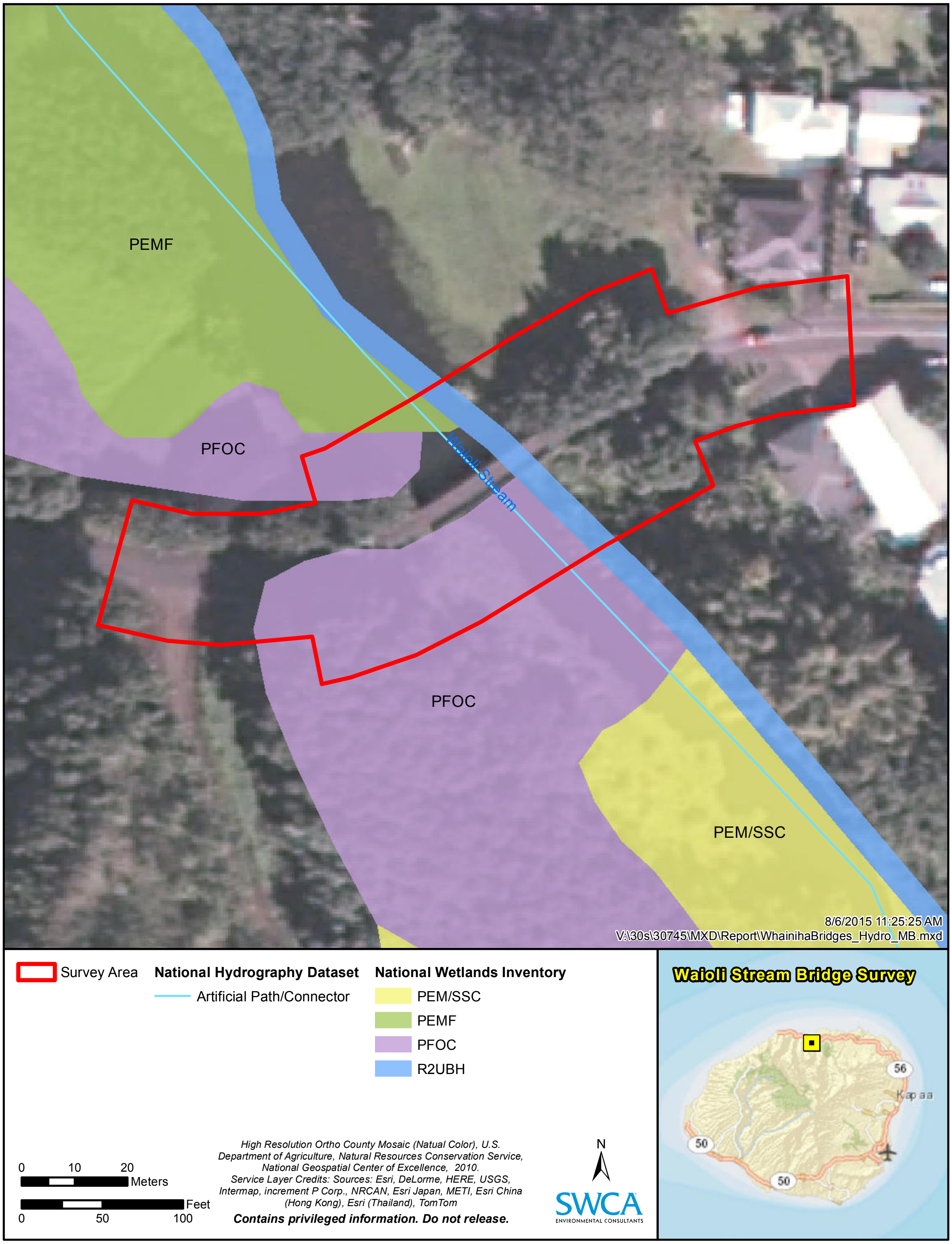
High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom

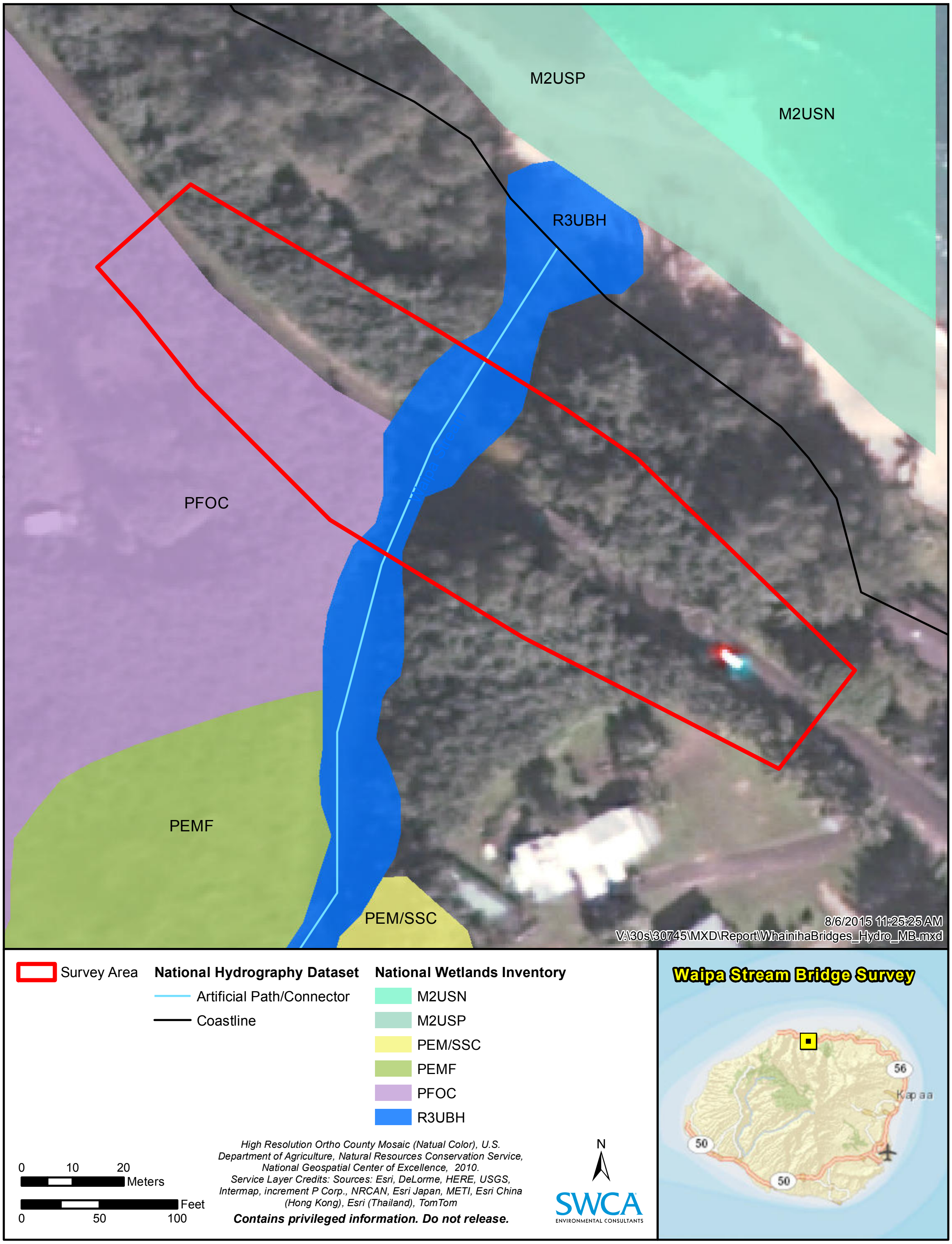
Contains privileged information. Do not release.

N

SWCA ENVIRONMENTAL CONSULTANTS

Waikoko Steam Bridge Survey


PEMF
PFOC
Waioli Stream
PFOC
PEM/SSC
8/6/2015 11:25:25 AM
V:\30s\30745\MXD\Report\WhainihaBridges_Hydro_MB.mxd
Survey Area
National Hydrography Dataset
Artificial Path/Connector
National Wetlands Inventory
PEM/SSC
PEMF
PFOC
R2UBH
0 10 20 Meters
0 50 100 Feet
High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom
Contains privileged information. Do not release.
N
SWCA
ENVIRONMENTAL CONSULTANTS
Waioli Stream Bridge Survey
56
Kapaa
50
50



M2USP
M2USN
R3UBH
PFOC
PEMF
PEM/SSC
8/6/2015 11:25:25 AM
V:\30s\30745\MXD\Report\WhainihaBridges_Hydro_MB.mxd
Survey Area
National Hydrography Dataset
Artificial Path/Connector
Coastline
National Wetlands Inventory
M2USN
M2USP
PEM/SSC
PEMF
PFOC
R3UBH
0 10 20 Meters
0 50 100 Feet
High Resolution Ortho County Mosaic (Natual Color), U.S. Department of Agriculture, Natural Resources Conservation Service, National Geospatial Center of Excellence, 2010.
Service Layer Credits: Sources: Esri, DeLorme, HERE, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom
Contains privileged information. Do not release.
N
SWCA
ENVIRONMENTAL CONSULTANTS
Waipa Stream Bridge Survey
56
50
50

Appendix D
Biological Resource Survey Report for the Wainiha Bridges Project

SWCA
ENVIRONMENTAL CONSULTANTS
Sound Science. Creative Solutions.®

Biological Resource Survey Report for the Wainiha Bridges Project

Prepared for

Federal Highway Administration, Central Federal Lands Highway Administration

and

CH2M HILL

Prepared by

SWCA Environmental Consultants

November 2015

BIOLOGICAL RESOURCE SURVEY REPORT FOR THE WAINIHA BRIDGES PROJECT

Prepared for

Federal Highway Administration, Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 280
Lakewood, Colorado 80228
(720) 963-3689

and

CH2M HILL
1132 Bishop Street, Suite 1100
Honolulu, Hawaiʻi 96813
(808) 943-1133

Prepared by

SWCA Environmental Consultants
Bishop Square ASB Tower
1001 Bishop Street, Suite 2800
Honolulu, Hawaiʻi
(808) 548-7899
www.swca.com

SWCA Project No. 30745

Revised November 30, 2015

EXECUTIVE SUMMARY

The Federal Highway Administration, Central Federal Lands Highway Division (FHWA), in partnership with the Hawai‘i Department of Transportation (HDOT), is proposing to replace three bridges that span Wainiha Stream and to provide temporary bridges across Waioli, Waipā, and Waikoko Streams along Kūhiō Highway (Route 560) on the Island of Kaua‘i. CH2M HILL contracted SWCA Environmental Consultants (SWCA) on behalf of FHWA to conduct biological studies for the project in support of the National Environmental Policy Act (NEPA) document. This report summarizes the findings of the biological resource survey conducted in the survey area by SWCA biologists between September 29, 2014, and October 2, 2014.

Several federally and state-listed animal species were observed during the survey or are likely to occur in the survey area based on habitat or previous surveys. These species are the Hawaiian coot (*Fulica alai*), Hawaiian gallinule (*Gallinula galeata sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*), and Hawaiian duck (*Anas wyvilliana*) (these four species are collectively referred to as waterbirds); nēnē or Hawaiian goose (*Branta* sandvicensis); Hawaiian petrel (*Pterodroma sandwichensis*), Newell’s shearwater (*Puffinus auricularis newelli*), and band-rumped storm petrel (*Oceanodroma castro*) (these three species are collectively referred to as seabirds); Hawaiian hoary bat; Hawaiian monk seal (*Neomonachus schauinslandi*); and green sea turtle (*Chelonia mydas*) and hawksbill sea turtle (*Eretmochelys imbricata*) (these two species are collectively referred to as sea turtles). In addition, portions of the survey area fall within recently designated marine critical habitat for the Hawaiian monk seal. Best management practices (BMPs) are provided to minimize impacts to these listed animals and their habitat during construction.

None of the species recorded in the lower or estuarine portions of the surveyed streams are state- or federally listed threatened, endangered, proposed or candidate species. However, native fishes and aquatic invertebrates have been recorded in the stream, including all five native species of ‘o‘opu (*Eleotris sandwicensis*, *Lentipes concolor*, *Stenogobius hawaiiensis*, *Awaous stamineus*, and *Sicyopterus stimpsoni*), the two native ‘ōpae species (*Atyoida bisulcata* and *Macrobrachium grandimanus*), and three native species of snails (*Neritina granosa*, *Theodoxus vespertinus*, and *T. cariosus*). Precautions should be taken not to impede upstream and downstream movement of these species. Appropriate recommendations to avoid and minimize impacts to aquatic resources will ultimately depend on final project designs and plans.

No state- or federally listed threatened, endangered, proposed or candidate endangered plant species, or rare native Hawaiian plant species, were observed in the survey area during the survey. The survey area does not contain critical habitat for threatened or endangered plants. The vegetation in the survey area is composed of five main vegetation types: 1) ruderal vegetation, 2) emergent wetland, 3) hau thicket, 4) mixed non-native forest, and 5) ornamental landscaping. The proposed bridge project is not expected to have a significant, adverse impact on botanical resources.

Single-day water quality sampling and additional water quality data suggest elevated turbidity levels within the surveyed streams. Short-term impacts from ground disturbance during the project’s construction phase have the potential to impact water quality; however, implementation of BMPs at the site would greatly reduce or eliminate these impacts.

This page intentionally blank

CONTENTS

FIGURES

TABLES

1. INTRODUCTION

The Federal Highway Administration, Central Federal Lands Highway Division (FHWA), in partnership with the Hawai‘i Department of Transportation (HDOT), is proposing to reconstruct three bridges on Kūhiō Highway (Route 560) on the Island of Kaua‘i. CH2M HILL contracted SWCA Environmental Consultants (SWCA) on behalf of FHWA to complete a biological resource survey for the project. The project involves improvements to six bridges along Kūhiō Highway between Hanalei and Wainiha (Figure 1). Three temporary bridges (referred to as Wainiha 1, 2, and 3) are scheduled to be replaced, and three load-restricted bridges that cross Waioli, Waipā, and Waikoko Streams may require temporary bridges or supplemental support for construction access. The proposed project is part of the environmental compliance process to provide permanent replacement bridges.

This report summarizes the findings of the biological resource survey conducted at the Wainiha Bridge survey area by SWCA Biologists Ling Ong (wildlife scientist), Tiffany Bovino Agostini (botanist), Bryson Luke (field technician), and Brian Nicholson (wetland specialist) between September 29, 2014, and October 2, 2014. The survey was conducted in support of the environmental compliance efforts for the project, including the National Environmental Policy Act (NEPA), Section 7 of the Endangered Species Act (ESA) of 1973 (as amended), Section 10 of the Rivers and Harbors Act of 1899, and Section 404 of the Clean Water Act of 1972.

2. DESCRIPTION OF THE SURVEY AREA

The survey area is on the west side of the Island of Kaua‘i between Hanalei and Wainiha along Kūhiō Highway (Route 560) (see Figure 1). The survey area comprises five non-contiguous survey areas: Waioli, Waipā, Waikoko, Wainiha 1, and Wainiha 2 & 3 (as described below). In all, the whole survey area covers approximately 9.24 acres (3.74 hectares [ha]), as outlined in Table 1.

Mean annual rainfall at the survey areas is approximately 89.5 inches (2,275 millimeters [mm]). Rainfall is typically highest in March and lowest in June (Giambelluca et al. 2013). The closest rainfall gauge to the survey area (Wainiha [WNHH1]) experienced 7.78 inches (198 mm) of rain for 2014 through the end of October, which is slightly above average (National Oceanic and Atmospheric Administration (NOAA)/National Weather Service 2014). Waters passing under Waikoko, Waipā, and Waioli Bridges flow into Hanalei Bay, whereas waters passing under Wainiha 1, 2, & 3 flow into Wainiha Bay.

Each bridge survey area is discussed in further detail below.

Table 1. Acreage of Bridge Survey Areas

Bridge Survey Area	Acres
Waioli	1.26
Waipā	1.45
Waikoko	1.46
Wainiha 1	1.60
Wainiha 2 & 3	3.47
Total	**9.24**

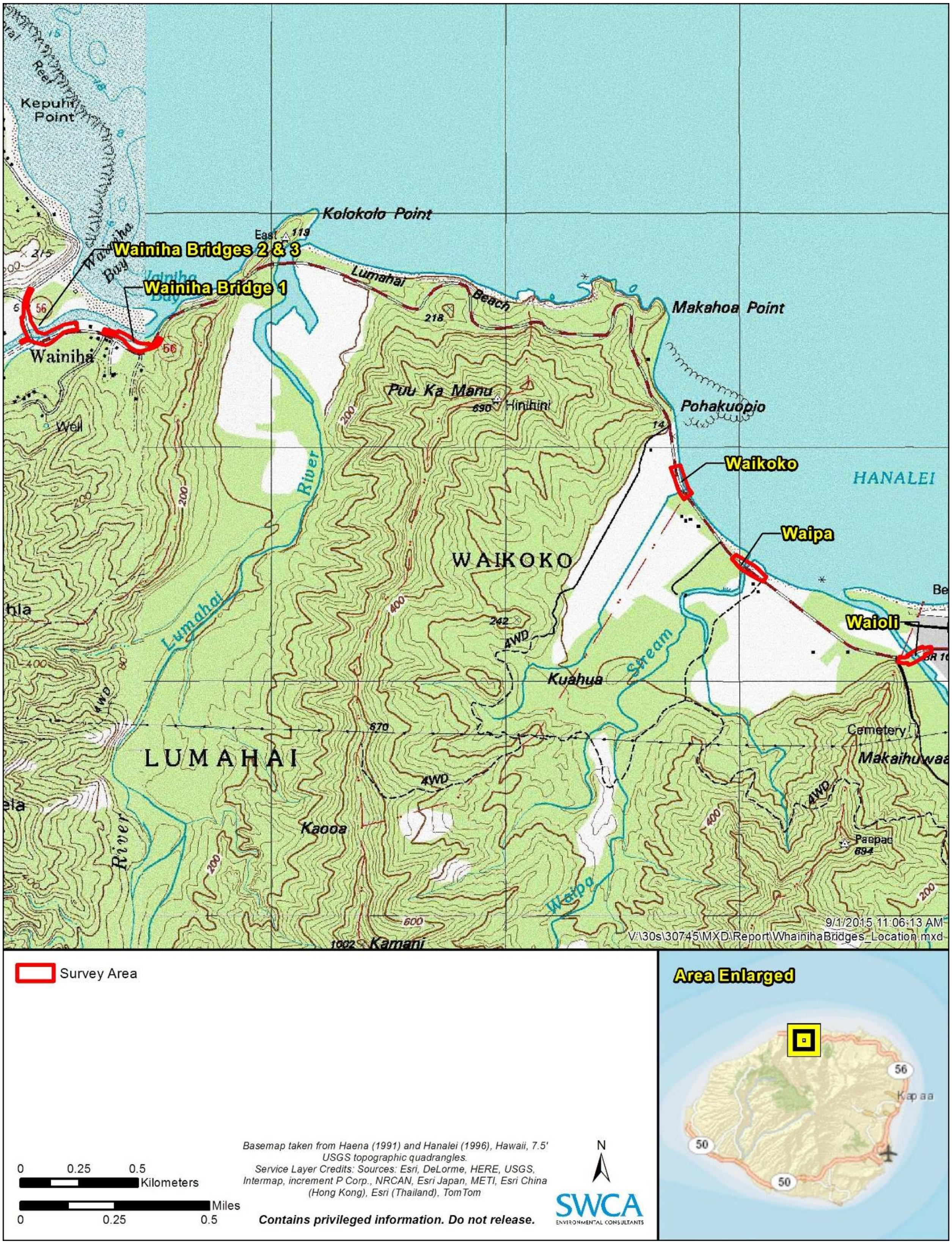


Figure 1. Survey areas.

2.1. Waioli

The Waioli Bridge survey area covers approximately 1.26 acres (0.51 ha). The existing bridge is approximately 100 feet (30.5 meters [m]) long and 15 feet (4.5 m) wide. The survey area encompasses parts of two residential parcels on the makai (seaward) side of the bridge and part of one residential parcel and an undeveloped parcel on the mauka (landward) side of the bridge. All four parcels were observed during the site visit.

Elevations in the survey area range from sea level to roughly 28 feet (8.5 m) above sea level. The Natural Resources Conservation Service (NRCS) identifies the following three soil types in the survey area: Mokuleia fine sandy loam; Mokuleia clay loam, poorly drained variant; and rock outcrop (Foote et al. 1972; NRCS 2013). The Mokuleia clay loam, poorly drained variant (Mta) soil type is listed as a hydric soil (NRCS 2012).

The National Wetlands Inventory (NWI) program identifies three wetlands or aquatic resource types in the survey area. These consist of Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH); Palustrine, Emergent, Persistent, Semipermanently Flooded (PEMF); and Palustrine, Forested, Seasonally Flooded (PFOC). The State of Hawaiʻi and the U.S. Geological Survey identify Waioli Stream traversing the survey area.

2.2. Waipā

The Waipā Bridge survey area is approximately 0.5 mile (0.8 kilometer [km]) west of Hanalei and covers approximately 1.45 acres (0.59 ha). The existing bridge is approximately 80 feet (24.4 m) long and 25 feet (7.6 m) wide. The survey area consists of wooded, undeveloped parcels on both the makai (seaward) and mauka (landward) side of the bridge. There is also a recreational area for Kamehameha Schools on the makai side. All four parcels were surveyed during the site visit, although small portions of the residential areas on the east side of the stream were not accessed.

Elevations in the survey area range from sea level to roughly 11 feet (3.4 m) above sea level. The NRCS identifies two soil types in the survey area: Mokuleia fine sandy loam and beaches (Foote et al. 1972; NRCS 2013). Neither is listed as a hydric soil (NRCS 2012).

The NWI program identifies two wetland and aquatic resource types in the survey area. These consist of Palustrine, Forested, Seasonally Flooded (PFOC) and Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded (R3UBH). The State of Hawaiʻi and the U.S. Geological Survey identify Waipā Stream traversing the survey area.

2.3. Waikoko

The Waikoko Bridge survey area is approximately 0.8 mile (1.3 km) west of Hanalei and covers approximately 1.46 acres (0.59 ha). The existing bridge is approximately 25 feet (7.6 m) long and 15 feet (4.6 m) wide. The survey area consists of a beach on the makai (seaward) side of the bridge and densely vegetated areas on the mauka (landward) side of the bridge. All four parcels were observed during the site visit.

Elevations in the survey area range from sea level to roughly 15 feet (4.5 m) above sea level. The NRCS identifies one soil type in the survey area, Mokuleia fine sandy loam, which is not listed as a hydric soil (NRCS 2012).

The NWI program identifies two wetland and aquatic resource types in the survey area. These consist of Marine, Intertidal, Unconsolidated Shore, Irregularly Flooded (M2USP) and Riverine, Upper Perennial, Rock Bottom, Permanently Flooded (R3RBH). The State of Hawaiʻi and the U.S. Geological Survey identify Waikoko Stream traversing the survey area.

2.4. Wainiha Bridge 1

The Wainiha Bridge 1 survey area covers approximately 1.60 acres (0.65 ha). The bridge itself spans an ephemeral drainage or backwater of the estuary. The survey area consists of an estuary on the makai (seaward) side of the bridge and undeveloped vegetated and residential parcels on the mauka (landward) side of the bridge. The Wainiha General Store is just northwest of the survey area. The entire area was surveyed during the site visit.

Elevations in the survey area range from sea level to roughly 26 feet (7.9 m) above sea level. The NRCS identifies the following four soil types in the survey area: Hanamaulu silty clay, Mokuleia fine sandy loam, beaches, and rough broken land (Foote et al. 1972; NRCS 2013). None of the soil types are listed as a hydric soil (NRCS 2012).

The NWI program does not identify any wetlands or aquatic habitats in the Bridge 1 study area. Adjacent to the study area is an estuarine resource (Estuarine, Subtidal, Unconsolidated Bottom, Subtidal [E1UBL]).

2.5. Wainiha Bridges 2 & 3

The Wainiha Bridges 2 & 3 survey area is adjacent to Wainiha Bay and spans the Wainiha Stream. The survey area covers approximately 3.47 acres (1.40 ha). The existing bridges are approximately 300 feet (91.4 m) long and 15 feet (4.5 m) wide. The survey area encompasses parts of residential parcels and heavily vegetated parcel on the makai (seaward) side of the bridge and part of residential parcels and an agricultural area on the mauka (landward) side of the bridge. The agricultural area and associated residence were not accessible during the site visit.

Elevations in the survey area range from sea level to roughly 18 feet (5.4 m) above sea level. The NRCS identifies the following two soil types in the survey area: Mokuleia clay loam, poorly drained variant and Hanalei silt clay, 3%–8% slopes (Foote et al. 1972; NRCS 2013). Both soil types are considered hydric (NRCS 2012).

The NWI program identifies four wetland and water types in the survey area. These consist of Palustrine, Emergent, Semipermanently Flooded, Excavated (PEMFx); Palustrine, Forested, Seasonally Flooded (PFOC); Riverine, Tidal, Unconsolidated Bottom, Permanent-Tidal (R1UBV); and Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded (R2UBH).

The State of Hawaiʻi and the U.S. Geological Survey identify two segments of Wainiha Stream traversing the survey area. The total length of this stream, according to the *Atlas of Hawaiian Watersheds & Their Aquatic Resources* (Parham et al. 2008) is 1.1 miles (1.8 km).

3. METHODS

SWCA reviewed available scientific and technical literature regarding natural resources in and near the survey area. This literature review encompassed a thorough search of refereed scientific journals, technical journals and reports, environmental assessments and environmental impact statements, relevant government documents, and unpublished data that provide insight into the natural history and ecology of the area. SWCA also reviewed available geospatial data, aerial photographs, and topographic maps of the survey area.

Four SWCA biologists conducted a field reconnaissance of the survey area between September 29, 2014, and October 2, 2014. Representative portions of the area were driven or walked to describe vegetation types, fauna, and wetlands or streams, as well as known or suspected threatened, endangered, proposed or candidate wildlife or plant species. Basic water quality samples were also collected from each bridge.

3.1. Flora

A pedestrian survey was conducted in the survey area to record common plant species and vegetation types, as well as rare or listed plant species. Areas more likely to support native plants (e.g., rocky outcrops and shady areas) were more intensively examined. A comprehensive list of all plant species present in the survey area was not within the scope of this survey.

Plants recorded during the survey are indicative of the season (“rainy” vs. “dry”) and the environmental conditions at the time of the survey. As environmental conditions change, it is likely that species and plant abundances also undergo temporal or seasonal changes.

3.2. Terrestrial and Aquatic Fauna

Fauna surveys consisted of a pedestrian survey *before* 11 am or *after* 4 pm when wildlife was most likely active. Field observations of birds were conducted using 8 × 30–mm binoculars. Visual and auditory observations were included in the survey. All observed birds, mammals, reptiles, amphibians, fish, and invertebrate species were noted during the survey.

Field surveys for the endangered Hawaiian hoary bat or ‘ōpe‘ape‘a (*Lasiurus cinereus semotus*) were not conducted; however, areas of suitable habitat for foraging and roosting were noted when present.

3.3. Wetlands and Streams

Instream surveys (i.e., mask and snorkel) were not conducted by SWCA because heavy rains on September 29 resulted in high turbidity and low visibility. Aquatic species were visually observed from the surface. The description of aquatic species is supplemented with information from previous known stream surveys.

SWCA also conducted a survey for potential waters of the U.S. The methods and results of that survey are summarized in a separate report (SWCA in prep.).

3.4. Water Quality

Basic water quality samples were collected from each bridge survey area on October 2, 2014, between 08:10 and 10:30 am. Two sampling locations were established at each bridge survey area, one upstream of the bridge and one downstream of the bridge. Samples were analyzed for the following parameters: temperature, pH, turbidity, total suspended solids (TSS), salinity, and dissolved oxygen (DO) (Table 2). Water samples were collected at least 6 inches (152 mm) below the water surface, and two samples were collected in areas where water depth exceeded 6 inches.

Temperature, pH, conductivity, DO, and salinity were field measured in situ using a handheld YSI 556 Multiparameter System portable meter. Data were collected by submerging the meter's probe into the water until a stabilized value was measured. Turbidity was field measured on-site using a Hanna HI 93703 portable microprocessor turbidity meter. The meters were calibrated per manufacturer's specifications to ensure proper functioning.

For TSS, grab samples were collected by submerging a clean container into the water column and collecting a sample free of floating debris and sediment. The water was then poured into sample containers provided by the analytical laboratories. All samples were labeled with the sample identification number, date, time, and name of sampler, then placed in a cooler with ice and cooled to 4 degrees Celsius. A chain of custody form was completed for each set of samples. Samples were packaged and sent by Hawaiian Airlines Cargo to Food Quality Labs (FQ Labs) in Honolulu.

Table 2. Field Equipment and Analytical Methods

Parameter	Analytical Method	Laboratory
Temperature	YSI 556 Meter	Field measured
DO	YSI 556 Meter	Field measured
Salinity	YSI 556 Meter	Field measured
pH	YSI 556 Meter	Field measured
Turbidity	Hanna HI 93703	Field measured
TSS	SM 2540D	FQ Labs

Samples for all parameters were collected on the same day for the purpose of describing the water quality for the NEPA document. Other information recorded at this time included tide height during sampling, weather conditions and recent weather events, and other activities that may have impacted water quality of the one-time water sample.

Field measurements and laboratory results were compared to the Water Quality Standards (WQS) listed in Hawai‘i Administrative Rules, Title 11, Chapter 54 (HAR 11-54). WQS are based on a geometric mean for each parameter. A minimum of three samples must be collected to calculate the geometric mean; however, only one sample was collected at each sampling location on a single day. A single data set is not sufficient for determining compliance with WQS; however, comparison of data with WQS can provide some information about the waterbody. The water quality results were also compared to historic water quality results provided by the Hawai‘i Department of Health (DOH), when available.

4. RESULTS

Several federally and state listed species were observed during the survey or are likely to occur in the survey area based on habitat or previous surveys. These species are the Hawaiian coot (*Fulica alai*), Hawaiian gallinule (*Gallinula galeata sandvicensis*), Hawaiian stilt (*Himantopus mexicanus knudseni*), and Hawaiian duck (*Anas wyvilliana*) (these four species are collectively referred to as waterbirds); nēnē or Hawaiian goose (*Branta* sandvicensis); Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), and band-rumped storm petrel (*Oceanodroma castro*) (these three species are collectively referred to as seabirds); Hawaiian hoary bat; Hawaiian monk seal (*Neomonachus schauinslandi*); and green sea turtle (*Chelonia mydas*) and hawksbill sea turtle (*Eretmochelys imbricata*) (these two species are collectively referred to as sea turtles). These species are discussed further in the sections below.

Portions of the survey area contain designated critical habitat for the endangered Hawaiian monk seal.

4.1. Flora

No state or federally listed threatened, endangered, proposed or candidate endangered plant species, or rare native Hawaiian plant species, were observed in the survey area during the survey. The survey area does not contain critical habitat for threatened or endangered plants. Six native Hawaiian plants—*Cyperus polystachyos*, hala (*Pandanus tectorius*), hau (*Hibiscus tiliaceus*), kou (*Cordia subcordata*), nanea (*Vigna marina*), and naupaka (*Scaevola taccada*)—were seen during the survey[1]. These species are indigenous, or are found in Hawai'i and elsewhere. None of these species are considered rare (Wagner et al. 1999).

The vegetation in the survey area is composed of five main vegetation types: 1) ruderal vegetation, 2) emergent wetland, 3) hau thicket, 4) mixed non-native forest, and 5) ornamental landscaping. Ruderal vegetation occurs in and along the highway right-of-way and in heavily disturbed areas. Emergent wetland is present adjacent to streams and is dominated by a dense mat of the non-native California grass (*Urochloa mutica*). Hau thicket also occurs adjacent to standing water; it is characterized by a dense stand of hau trees. The mixed non-native forest is composed of a mix of non-native trees and herbaceous understory. Ornamental landscaping is common adjacent to houses and buildings, where trees and shrubs are planted or lawns maintained. The vegetation in each bridge survey area is described in further detail below.

4.1.1. Waioli

Four vegetation types are present at the Waioli Bridge survey area: ruderal vegetation, ornamental landscaping, emergent wetland, and hau thicket. On the makai side of the bridge, the vegetation is dominated by ornamental landscaping, which is characterized by manicured lawns of wide-leaved carpetgrass (*Axonopus compressus*), interspersed with herbaceous plants (Figure 2). Ornamental plantings adjacent to residences on both sides of the bridge include Areca palm (*Dypsis lutescens*), mango (*Mangifera indica*), red ginger (*Alpinia purpurata*), ti (*Cordyline fruticosa*), and torch ginger (*Etlingera elatior*). Taro vine (*Epipremnum pinnatum*) is climbing on several trees, and umbrella sedge (*Cyperus involucratus*) is present along the stream's edge. On the mauka side, a dense mat of the non-native California grass is present on the western side of the stream. Ruderal vegetation occurs along the highway right-of-way and is primarily dominated by wedelia (*Sphagneticola trilobata*), Hilo grass (*Paspalum conjugatum*), java plum (*Syzygium cumini*), and giant reed (*Arundo donax*). The indigenous hau also forms small dense stands along the stream on both sides of the highway.

1 The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012). Common/Hawaiian names are provided first, followed by scientific names in parenthesis. If no common or Hawaiian name is known, only the scientific name is provided.

4.1.2. Waipā

At the Waipā Bridge survey area, the vegetation is dominated by a dense hau thicket on both sides of the bridge (Figure 3). Little to no other plants occur in this vegetation type. Along the stream's edge, in areas where hau is not present, umbrella sedge and California grass are common. The ruderal vegetation type at Waipā is dominated by Hilo grass, Guinea grass (*Urochloa maxima*), wedelia, elephant grass (*Cenchrus purpureus*), West Indian dropseed (*Sporobolus indicus*), and basketgrass (*Oplismenus hirtellus*). Maunaloa (*Canavalia cathartica*) is climbing throughout. Ironwood trees (*Casuarina equisetifolia*) and false kamani (*Terminalia catappa*) are also present, primarily on the makai side of the bridge. The native kou (*Cordia subcordata*) is planted just along the edge of the survey area near the recreation area.

4.1.3. Waikoko

The vegetation types in the Waikoko Bridge survey area are ruderal vegetation, mixed non-native forest, hau thicket, and ornamental landscaping. Hau thickets are present on the mauka side of the bridge, adjacent to standing water. The mixed non-native forest is dominated by ironwood trees (*Casuarina equisetifolia*) and large false kamani trees that create a dense canopy. Taro vine, maunaloa, and maile pilau (*Paederia foetida*) are climbing over trees, and patches of laua'e fern (*Phymatosorus grossus*) are present in the understory. The most common species in the ruderal vegetation along the highway are wedelia, wide-leaved carpetgrass, Guinea grass, Hilo grass, Dallis grass (*Paspalum dilatatum*), narrow-leaved plantain (*Plantago lanceolata*), and short-stature koa haole (*Leucaena leucocephala*) (Figure 4). Naupaka, ti, hala, and coconut trees (*Cocos nucifera*) are planted in the survey area. The native *Cyperus polystachyos* and nanea (*Vigna marina*) were also seen at this survey area.

Figure 2. Lawn (right side) and hau thicket (left side) at the Waioli Bridge survey area (looking mauka/ upstream).

Figure 3. Dense hau thicket at the Waipā Bridge survey area (looking mauka/ upstream).

Figure 4. Waikoko Bridge survey area ornamental landscaping and ruderal vegetation.

4.1.4. Wainiha Bridge 1

The vegetation types within the Wainiha Bridge 1 survey area are ruderal vegetation, mixed non-native forest, hau thicket, and ornamental landscaping. The hau thicket and mixed non-native forest are present on the mauka side of the bridge immediately adjacent to the stream. The mixed non-native forest is characterized by large, spreading false kamani trees, with only a few scattered seedlings and laua‘e fern in the understory. The ruderal vegetation occurs in and along the highway right-of-way and in heavily disturbed areas (Figure 5). The water’s edge is dominated by umbrella sedge and California grass. On the flatter, drier areas, this vegetation type is largely composed of elephant grass, wedelia, Guinea grass, Dallis grass, and short koa haole. *Neonotonia wightii*, maunaloa vine, and moon flower (*Ipomoea alba*) are climbing in trees and over shrubs. Ornamental trees and shrubs are planted adjacent to houses, including ti, hibiscus (*Hibiscus* spp.), Turk's cap (*Malvaviscus penduliflorus*), and beefsteak plant (*Acalypha wilkesiana*). Mowed lawns of wide-leaved carpetgrass and Bermuda grass (*Cynodon dactylon*) are interspersed with weedy grasses and low-growing herbaceous such as tick trefoil (*Desmodium triflorum*) and creeping indigo (*Indigofera spicata*).

4.1.5. Wainiha Bridge 2 & 3

The most dominant vegetation types in the Wainiha Bridges 2 & 3 survey area are emergent wetland and hau thicket. The emergent wetland is a dense mat of non-native California grass. It occurs in the portions of the survey area immediately adjacent to Wainiha Stream (Figure 6). Few other species occur in this mat, although Guinea grass, umbrella sedge, and Job’s tears (*Coix lachryma-jobi*) are widely scattered. Hau thickets also cover large portions of the survey area. The most common grasses and herbaceous species found in the ruderal vegetation type in the Wainiha Bridges 2 & 3 survey area are basketgrass, wedelia, Guinea grass, California grass, Hilo grass, honohono (*Commelina diffusa*), and Spanish needle (*Bidens alba*) (Figure 7). Seedlings of koa haole, java plum, African tulip (*Spathodea campanulata*), and octopus tree (*Schefflera actinophylla*) are sparsely scattered within the right-of-way. Large false kamani trees are also in the survey area, often covered in climbing taro vines. Several other vines are present, including taro vine, maunaloa, *Neonotonia wightii*, and white thunbergia (*Thunbergia fragrans*). Pai‘i‘ihā (*Cyclosorus dentatus*) and young Chinese fan palm (*Livistona chinensis*) are common in the understory. Ornamental species planted in the survey area include white ginger (*Hedychium coronarium*), coconut trees, hala, hibiscus, snowbush (*Breynia disticha*), kukui (*Aleurites moluccana*), and *Acalypha* spp.

Figure 5. Wainiha Bridge 1 survey area (makai/ downstream side).

Figure 6. Vegetation near the Wainiha Bridges 2 & 3 survey area (makai/downstream side).

Figure 7. Wainiha Bridges 2 & 3 survey area (mauka/upstream side).

4.2. Terrestrial Fauna

4.2.1. Avifauna

In all, 16 bird species were documented (Table 3). Of these, four are federally and state listed: Hawaiian gallinule, Hawaiian coot, Hawaiian duck, and Hawaiian goose or nēnē. Endangered Hawaiian stilt are also likely to occur. Other birds observed during the survey are typical of coastal areas on Kaua‘i.

Hawaiian gallinule were seen during the survey, and one resident (Mitch Haynie) reported seeing Hawaiian gallinule nests throughout the year near at Waioli Bridge. Hawaiian gallinule were also observed foraging near Wainiha Bridges 2 & 3. Nesting Hawaiian coot were observed at Wainiha Bridge 1. Residents near Wainiha Bridge 1 have seen all four listed waterbirds species (Hawaiian gallinule, Hawaiian coot, Hawaiian duck, and Hawaiian stilt) near the bridge. Hawaiian ducks flew over Wainiha Bridge 2 & 3 during the surveys. No listed waterbirds were observed at the Waipā or Waikoko Bridges.

Hawaiian gallinule, Hawaiian coot, and Hawaiian ducks could be present at any of the bridges at any time and could be breeding in or near the survey area. Breeding for these species is not restricted to a particular season (Table 4). Hawaiian stilt could also be present in any areas with shallow water. Most of the streambank slopes near the bridges are steep, though shallow water areas (preferred habitat for stilt) are present in sections. Thus, Hawaiian stilt may also occasionally be present.

Nēnē were only seen at one bridge survey area; a small flock of nēnē flew overhead at Waioli Bridge. Nēnē could also occasionally browse in the vegetation along the banks and in the ruderal vegetation.

Table 3. Birds Observed by SWCA in and near the Survey Area

Common Name	Scientific Name	Status*	MBTA
Black-crowned night heron	*Nycticorax nycticorax*	E	X
Cattle egret	*Bubulcus ibis*	NN	X
Common myna	*Acridotheres tristis*	NN	
Domestic chicken	*Gallus gallus*	NN	
Hawaiian coot	*Fulica alai*	E, End	X
Hawaiian duck	*Anas wyvilliana*	E, End	X
Hawaiian gallinule	*Gallinula galeata sandvicensis*	E, End	X
House finch	*Haemorhous mexicanus*	NN	X
Hwamei	*Garrulax canorus*	NN	
Japanese white-eye	*Zosterops japonicus*	NN	
Nēnē	*Branta sandvicensis*	E, End	X
Northern cardinal	*Cardinalis cardinalis*	NN	X
Nutmeg mannikin*	*Lonchura punctulata*	NN	
Pacific golden-plover	*Pluvialis fulva*	M	X
Spotted dove	*Streptopelia chinensis*	NN	
Zebra dove	*Geopelia striata*	NN	
	Total species	**16**	**9**

Notes:

Status: E = Endemic, NN = non-native established species, M = migrant; End = Endangered.

MBTA = protected by the Migratory Bird Treaty Act

Seabirds, particularly the endangered Hawaiian petrel, threatened Newell's shearwater, and proposed endangered band-rumped storm-petrel, may fly over the survey area at night while travelling to and from their upland nesting sites to the ocean. These species nest inland in the mountainous interior of Kaua‘i (Ainley et al. 1997; Mitchell et al. 2005). No suitable nesting sites for these species are present in the survey area.

Other migratory bird species that could occur in the survey area include the sanderling (*Calidris alba*), ruddy turnstone (*Arenaria interpres*), and wandering tattler (*Tringa incana*).

Table 4. Life History Information for the Four Listed Waterbirds Observed or Likely to be Present in the Survey Area

Common Name	Species	Breeding Season	Incubation	Fledgling	Incubation + Fledgling	Reference
Hawaiian duck	*Anas wyvilliana*	Year round, mostly from March to June	26–30 days	After 65 days	After 90 days	Engilis et al. (2002)
Hawaiian gallinule	*Gallinula chloropus sandvicensis*	Year-round, mostly from March to August	19–22 days	Several weeks	–	Mitchell et al. (2005), Bannor and Kiviat (2002)
Hawaiian coot	*Fulica alai*	Year-round, peaks in March and September	25 days	75 days (American coot)	100 days	Prat and Brisbin (2002), Brisbin et al. (2002), Mitchell et al. (2005)
Hawaiian stilt	*Himantopus mexicanus knudseni*	Mid-February through August	23–26 days	At least 27 days	50+ days	Robinson et al. (1999), USFWS (2011)

4.2.2. Hawaiian Hoary Bat

The endangered Hawaiian hoary bat is the only native terrestrial mammal species that is still extant within the Hawaiian Islands (USFWS 1998). Surveys for Hawaiian hoary bats were not conducted, but any areas of suitable habitat for roosting and foraging were noted during the survey.

Hawaiian hoary bats are insectivores and are regularly observed foraging over streams, reservoirs, and wetlands (U.S. Department of Agriculture 2009). Bats may be attracted to insects in riparian vegetation or emerging from water; therefore, portions of the survey area would be considered suitable bat foraging habitat.

Hawaiian hoary bats typically roost in dense canopy foliage or in the subcanopy when canopy is sparse, with open access for launching into flight (U.S. Department of Agriculture 2009). Hawaiian hoary bats have been observed roosting in coconut, mango, and ironwood trees and could roost in these tree species in the survey area. Trees commonly found along the banks of the survey area, such as hau and milo, also possess characteristics of roosting trees, and although not yet documented as a Hawaiian hoary bat roost trees, could be used as a day or night roost when bats are present.

4.2.3. Other Terrestrial Mammals

A dog (*Canis familiaris*) was observed during the survey, and cat (*Felis catus*) are also likely to enter the area due to the nearby residences. Other mammals that can be expected in the survey area include mouse (*Mus musculus*), and rat (*Rattus* spp.).

4.2.4. Insects and Other Invertebrates

Two species of terrestrial invertebrates were noted during the survey: the non-native giant African snail (*Achatina fulica*) and the native indigenous globe skimmer (*Pantala flavescens*).

4.3. Aquatic Fauna

4.3.1. Freshwater and Estuarine Communities

Although SWCA did not conduct instream surveys due to heavy rains, earlier surveys conducted within the streams are summarized by the Hawai‘i Division of Aquatic Resources (DAR) (Parham et al. 2008). Table 5 lists the stream species recorded in the Wainiha, Waioli, and Waipā watersheds by the Hawai‘i DAR Watershed Atlas (Parham et al. 2008). All five native species of ‘o‘opu, the two native ‘ōpae, and three native species of snails have been recorded in Wainiha Stream (see Table 5). Waioli Stream contains at least two ‘o‘opu species and the two native ‘ōpae. Waipā Stream contains at least one ‘o‘opu species and the two native ‘ōpae. Of the native species DAR lists as occurring in the three streams, the following are likely to occur in the survey area because they are estuarine: āholehole (*Kuhlia* spp.), ‘o‘opu akupa (*Eleotris sandwicensis*), ‘Ōpae ‘oeha‘a (*Macrobrachium grandimanus*), ‘o‘opu naniha (*Stenogobius hawaiiensis*), pipiwai (*Theodoxus cariosus*), and hapawai (*Theodoxus vespertinus*). Amphidromous species, which are noted in Table 5, may also migrate through the survey area.

No sampling results are provided for Waikoko Stream by Parham et al. 2008; however, during SWCA's surveys, āholehole (*Kuhlia* spp.) and tilapia (*Oreochromis* sp./ *Sarotherodon* sp.) were observed from the water's edge at the Waikoko estuary.

Table 5. Aquatic Stream Species Reported in Wainiha, Waioli, and Waipā Watersheds

Common Name	Scientific Name	Status	Wainiha	Waioli	Waipā
Amphibians					
American bullfrog	*Rana catesbeiana*	NN	X		
Cane toad	*Bufo marinus*	NN	X		
Japanese wrinkled frog	*Glandirana rugosa*	NN	X		
Crustaceans					
Amphipod	Amphipod sp.	E/I	X		X
‘Ōpae kala‘ole*	*Atyoida bisulcata*	E	X	X	X
‘Ōpae ‘oeha‘a*	*Macrobrachium grandimanus*	I	X	X	X
Ostracod	Ostracod sp.				X
Tahitian prawn	*Macrobrachium lar*	NN	X	X	
Fish					
Āholehole, Hawaiian flagtail	*Kuhlia* spp.	E/I	X	X	X
‘Ama‘ama, uouoa, mullet	*Mugil cephalus/Neomyxus leuciscus*	I	X		
Goby	*Gobiid* sp.		X	X	X
Guppy	*Poecilia reticulata*	NN	X		
‘O‘opu akupa*	*Eleotris sandwicensis*	E	X		
‘O‘opu alamo‘o*	*Lentipes concolor*	E	X		
‘O‘opu naniha*	*Stenogobius hawaiiensis*	E	X		
‘O‘opu nākea*	*Awaous stamineus*	E	X	X	X
‘O‘opu nōpili*	*Sicyopterus stimpsoni*	E	X	X	

Table 5. Aquatic Stream Species Reported in Wainiha, Waioli, and Waipā Watersheds

Common Name	Scientific Name	Status	Wainiha	Waioli	Waipā
Rainbow trout	*Oncorhynchus mykiss*	NN	X		
Swordtail	*Xiphophorus helleri*	NN	X	X	
Tilapia	*Oreochromis* sp./ *Sarotherodon* sp.	NN			
Insects					
Adytum Megalagrion damselfly	*Megalagrion adytum*	E	X		
Anopheles mosquito	*Anopheles nigerrimus*	NN	X		
Beachfly	*Procanace* sp.		X		
Beetle	Coleoptera sp.		X		
Blackfly	Simuliid sp.	NN	X		
Brinefly	Ephydrid sp.		X		
Caddisfly	Trichoptera sp.	NN	X		
Caddisfly	*Oxythira maya*	NN	X		
Crane fly	Tipulid sp.		X		X
Dragonfly	*Anax* sp.	I	X		
Fly	Diptera sp.		X		
Hawaiian aquatic midge	*Calospectra hawaiiensis*	E	X		
Hawaiian damselfly, pinao	*Megalagrion* sp.	E	X	X	X
Hawaiian damselfly	*Megalagrion eudytum*	E	X		
Hawaiian damselfly	*Megalagrion heterogamias*	E	X		
Hawaiian damselfly	*Megalagrion oresitrophum*	E	X		
Hawaiian damselfly	*Megalagrion vagabundum*	E	X		
Little sister sedge caddisfly	*Cheumatopsyche analis*	NN	X		
Mayfly	Ephemeroptera sp.	NN	X		
Microcaddisfly	Hydroptilidae sp.		X		
Midge	*Crictopus bicinctus*	NN	X		
Midge	*Orthocladius grimshawi*	E	X		
Night mosquito	*Aedes nocturnus*	NN	X		
Shorefly	*Scatella* sp.		X		
Springtail	Collembola sp.		X		
Torrential midge	*Telmatogeton hirtus*	E	X		
Mollusks					
Hīhīwai*	*Neritina granosa*	E	X		
Hapawai*	*Theodoxus vespertinus*	E	X		
Lymnaeidae	Lymnaeid sp.	NN	X		
Melanid snail	*Melanoides tuberculata*	NN		X	
Pipiwai*	*Theodoxus cariosus*	E	X		

Table 5. Aquatic Stream Species Reported in Wainiha, Waioli, and Waipā Watersheds

Common Name	Scientific Name	Status	Wainiha	Waioli	Waipā
Worms					
Asian tapeworm	*Bothriocephalus acheilognathi*	NN	X		
Hirudinean	Hirudinea sp.		X		X
Namalycastis	*Namalycastis* sp.				X
Oligochaete	Oligochaeta sp.		X		

Source: Parham et al. (2008)

* amphidromous species (i.e., travel to and from the sea as part of their life cycle).

Notes: E = Endemic, I = Indigenous, NN = non-native.

4.3.2. Marine Communities

The Wainiha and Hanalei Bays and shorelines in or adjacent to the survey area contain habitats that may support algae, coral, invertebrates, fish, sea turtles, and monk seals.

4.3.2.1. WAINIHA BAY

The Wainiha Bridge 1 and Wainiha Bridges 2 & 3 survey areas are approximately 300 m (1,000 feet) and 122 m (400 feet) upstream from the mouth of the Wainiha Stream, respectively. Most of Wainiha Bay is mapped as unknown habitat by NOAA. The shoreline intertidal area of Wainiha Bay just outside the mouth of the stream is classified as sand/unconsolidated sediment, and the shoreline intertidal along the southern portion is classified as hardbottom, uncolonized volcanic rock/boulders (Coyne et al. 2003). NOAA Nautical Charts report a coral reef on the northwestern portion of Wainiha Bay, roughly 171 m (560 feet) from the stream mouth (NOAA Nautical Charts 2002).

According to University of Hawaiʻi at Mānoa researchers, sharks and strong currents just outside the mouth of the Wainiha Stream have prevented many marine studies in that area (personal communication, Alan Friedlander, University of Hawaiʻi at Mānoa, April 2015). However, biologists from NOAA's Coral Reef Ecosystem Division did conduct a survey in Wainiha Bay in May 2013 in response to a potential coral disease, specifically focusing on *Montipora patula*. Although this survey was conducted more than 300 m (1,000 feet) from the shoreline, it did document a relatively high percentage of coral in the bay compared to other sites on Kauaʻi (personal communication, Bernardo Vargas-Angel, NOAA, May 3, 2015).

Hawaiian monk seal sightings have been reported at Wainiha Bay (personal communication, Tracy Mercer, NOAA, August 19, 2015). Between 2005 and 2014, there were six reported sightings of monk seals at Wainiha Beach. No monk seal pups are known to have been born at Wainiha Beach (Mercer 2015).

In the main Hawaiian Islands, the Hawaiian monk seal critical habitat includes six specific areas; these include marine habitat from the 200-m depth contour line (including the seafloor and all subsurface waters and marine habitat within 10 m of the seafloor) through the water's edge, and the terrestrial environment to 5 m (15 feet) inland from the shoreline between identified boundary points on the Islands of Kaʻula, Niʻihau, Kauaʻi, Oʻahu, Kahoʻolawe, Lanaʻi, Maui, Molokaʻi, and Hawaiʻi (NOAA 2015).

Two terrestrial and one marine essential feature have been identified for the Hawaiian monk seal critical habitat:

- Terrestrial areas and the adjacent shallow sheltered aquatic areas with characteristics preferred by Hawaiian monk seals for pupping and nursing.
- Marine areas from 0 to 200 m (0 to 656 feet) in depth that support adequate prey quality and quantity for juvenile and adult Hawaiian monk seal foraging.
- Significant areas used by Hawaiian monk seals for hauling out, resting, or molting.

The Wainiha Bridge 1 and Wainiha Bridges 2 & 3 survey areas are outside the Hawaiian monk seal critical habitat; however, the marine areas of Wainiha Bay (downstream of the survey area) are considered critical habitat.

The threatened green sea turtle and hawksbill sea turtle were not incidentally observed during the biological survey and have not been recorded by NOAA-Pacific Islands Fisheries Science Center as basking or nesting in Wainiha Bay (Parker et al. 2005); however, these animals may be found foraging in marine waters of Wainiha Bay, or potentially hauling out or basking on the beach.

4.3.2.2. HANALEI BAY

The benthic composition of Hanalei Bay, which Waipā, Waioli, and Waikoko Streams feed into, is classified as unknown by NOAA near the survey area (Coyne et al. 2003). The nearest coral reef, according to NOAA Nautical Charts, is approximately 780 feet (238 m) northwest of the Waikoko Bridge survey area (NOAA Nautical Charts 2002).

Hawaiian monk seal sightings have been reported at Waipā, and Waikoko. No sightings have been reported for Waioli (personal communication, Tracy Mercer, NOAA, August 19, 2015). According to the *Watershed Management Plan for Hanalei Bay Watershed*, Hawaiian monk seals have rarely been reported in Hanalei Bay (Sustainable Resources Group Intn’l, Inc. 2012). Portions of the Waikoko Bridge survey area fall within recently designated marine critical habitat for the Hawaiian monk seal. Terrestrial critical habitat is not designated along the Hanalei Bay shoreline.

The threatened green sea turtle and hawksbill sea turtle were not observed during the biological survey; however, these animals may be found foraging in marine waters of Hanalei Bay, or hauling out or basking on the beaches in the survey area. The green sea turtle has been recorded basking on the eastern side of Hanalei Bay, which is not in the immediate vicinity of the survey area (Sustainable Resources Group Intn’l, Inc. 2012). Both green sea turtles and hawksbill sea turtles have not been recorded nesting in Hanalei Bay, according to NOAA-Pacific Islands Fisheries Science Center (Parker et al. 2005).

4.4. Water Quality

HAR 11-54 classifies all ocean waters in the survey area (Hanalei Bay and Wainiha Bay) as Class AA Marine Waters and all streams in the survey area (Wainiha, Waikoko, Waipā, and Waioli) as Class 2 Inland Waters. Class AA Marine Waters are pristine waters that remain in their natural state with minimal pollution. Class 2 Inland Waters are protected for their use for recreational purposes, the support and propagation of aquatic life, agricultural and industrial water supplies, shipping, and navigation.

The Section 303(d) List is a list of waters that are determined to be impaired or threatened by the Hawai‘i DOH Clean Water Branch. This list includes the estuaries for Waikoko, Waioli, and Waipā Streams for nonattainment of various parameters, as follows:

- Turbidity, *Enterococci*, total nitrogen, nitrate-nitrite, ammonia, and total phosphorus at Waikoko.
- Turbidity, *Enterococci*, nitrate-nitrite, and ammonia at Waioli.
- Turbidity, *Enterococci*, ammonia, and total phosphorus at Waipā.

Although Wainiha Stream remains on the list, recent monitoring results indicate attainment for all parameters. Potential sources of contamination at all streams include eroding landscapes, streambank collapse, landslides, and agricultural runoff.

Comparisons with the HAR 11-54 WQS are provided; however, as described in section 3.4, the single data set collected by SWCA can only provide background information about the waterbody and is not sufficient for determining compliance with the WQS. Different WQS are provided for streams (salinity below 0.5 part per thousand [ppt]) and estuaries (salinity above 0.5 ppt) (Table 6). Most collected samples had low salinity (less than 0.5 ppt); however, samples from Waikoko and Waipā range from 4.96 to 35.72 ppt. All samples collected for this project were collected on October 2; therefore, dry season values (rather than wet season values) are used for comparison purposes.

Table 6. HAR 11-54 Water Quality Standards

Parameter	Stream WQS	Estuary WQS
Temperature (C)	Shall not vary more than 1 degree Celsius from ambient condition	Shall not vary more than 1 degree Celsius from ambient condition
DO (%)	Not less than 80% saturation	Not less than 75% saturation
Salinity (ppt)	Less than 0.5 ppt	Shall not vary more than 10% from ambient conditions
pH	5.5–8.0	7.0–8.6
Turbidity (nephelometric turbidity unit [NTU])	2.0	1.5
TSS (milligrams/liter [mg/l])	10	n/a

The results of the water samples are provided in Tables 7 and 8. Ambient conditions have not been determined for temperature, but all waterbodies are relatively consistent and within expected ranges. pH values are within the range of 5.5–8.0 for streams and 7.0–8.6 for estuaries. The percentage saturation of DO was exceeded at two sampling locations at Wainiha Bridge 1 and at one sampling location at Waipā Bridge. Based off the data set collected, turbidity exceedances were noted at Wainiha Bridges 1 and 3, Waikoko, and Waipā. TSS values were below the WQS at all locations except upstream at Wainiha Bridge 3. There are no WQS for TSS for estuaries; therefore, exceedances were not noted for water samples collected at Waikoko and Waipā. However, TSS levels were elevated at Waikoko and exceeded the WQS noted for streams.

Table 7. Basic Water Quality Results for Parameters Field Measured In Situ using a Handheld YSI 556 Multiparameter System Portable Meter

Bridge Name	Sample Location	Sample Depth (inches)	Time	Temperature (°C)	Salinity (ppt)	DO (%)	pH	Conductivity (mS/cm)	Tide Estimate (feet)
Wainiha Bridge 1	Downstream	6	9:10	22.68	0.32	38.1	6.05	0.661	1.8
	Downstream	24	9:11	22.65	0.31	26.7	6.30	0.637	1.8
	Upstream	6	9:15	22.54	0.28	24.1	6.35	0.574	1.9
Wainiha Bridge 2	Downstream	8	8:20	20.93	0.04	104.3	7.21	0.080	1.7
	Downstream	48	8:21	20.92	0.04	96.4	6.88	0.080	1.7
	Upstream	8	8:24	20.95	0.04	93.3	7.21	0.081	1.7
	Upstream	30	8:25	20.92	0.04	93.0	6.92	0.081	1.7
Wainiha Bridge 3	Downstream	12	8:10	20.92	0.04	95.1	5.85	0.081	1.6
	Downstream	60	8:11	20.87	0.04	91.9	6.17	0.800	1.7
	Upstream	12	8:15	20.93	0.04	91.1	6.91	0.810	1.7
	Upstream	48	8:16	20.88	0.04	92.0	6.39	0.920	1.7
Waikoko*	Downstream	6	9:39	28.12	35.72	98.2	8.16	54.200	2.0
	Upstream	6	9:45	27.68	32.4	102.2	8.04	48.190	2.0
Waipā*	Downstream	6	10:00	23.33	4.96	59.4	7.43	9.580	2.0
	Downstream	48	10:01	25.19	15.35	76.2	7.71	25.210	2.0
	Upstream	6	10:08	23.71	6.74	87.1	7.72	11.790	2.0
	Upstream	48	10:09	25.35	17.45	82.0	7.84	28.370	2.0
Waioli	Downstream	6	10:30	22.07	0.06	70.1	7.13	0.125	2.0
	Upstream	6	10:27	22.00	0.06	78.5	7.62	0.124	2.0
	Upstream	30	10:28	21.93	0.06	75.4	7.25	0.123	2.0

*Salinity was above 0.5 ppt, Estuary WQS were used for comparison.

Table 8. Turbidity and TSS Results

Bridge Name	Sample Location	Time	Turbidity (NTU)	TSS (mg/l)	Tide Estimate (feet)
Wainiha Bridge 1	Downstream	9:30	3.07	8.0	1.8
	Upstream	9:10	13.16	1.0	1.9
Wainiha Bridge 2	Downstream	8:50	0.86	2.0	1.7
	Upstream	8:45	0.36	2.0	1.7
Wainiha Bridge 3	Downstream	8:20	2.15	9.0	1.7
	Upstream	8:00	2.18	16.0	1.7
Waikoko*	Downstream	9:46	2.43	30.0†	2.0
	Upstream	9:45	3.94	12.0†	2.0
Waipā*	Downstream	10:15	1.8	4.0†	2.0
	Upstream	10:10	2.91	3.0†	2.0
Waioli	Downstream	10:35	0.99	3.0	2.0
	Upstream	10:45	0.45	3.0	2.0

* Because salinity was above 0.5 ppt, estuary WQS were used for comparison.

† TSS not listed under estuary WQS.

Additionally, water quality data from the Hawai‘i DOH Clean Water Branch were available for the Waikoko and Waipā estuaries. Data were collected from 2008 to 2014 for Waikoko and from 2012 to 2014 for Waipā. The geometric mean for all data is summarized in Table 9. These data also indicate elevated turbidity levels.

Table 9. Hawai‘i DOH Clean Water Branch Data for Waikoko and Waipā Estuaries

Parameter	Waikoko Estuary	Waipā Estuary
Temperature (C)	21.8	22.13
DO (%)	68.0	61.16
Salinity (ppt)	0.884	0.872
pH	7.48	7.49
Turbidity (NTU)	4.12	3.39

Source: Hawai‘i DOH (2015).

5. DISCUSSION AND RECOMMENDATIONS

5.1. Flora

The vegetation types and species identified during the survey are not unique. Most of the plant species seen are not native to Hawai‘i, and the six indigenous species observed are common throughout the Hawaiian Islands. No threatened or endangered plants were found, and no designated plant critical habitat occurs nearby. Therefore, the proposed bridge project is not expected to have a significant, adverse impact on botanical resources.

If landscaping occurs as part of the project, SWCA recommends that native Hawaiian plants be employed for landscaping to the maximum extent possible. Potential native species that may be appropriate for landscaping at the survey area include naupaka, koa, and pōhinahina (*Vitex rotundifolia*).

Additional information on selecting appropriate (non-invasive) plants for landscaping can be obtained from the following online sources:

- http://www.nativeplants.Hawaii.edu/
- http://www.plantpono.org/non-invasive-plants.php
- http://www.hear.org/alternativestoinvasives/pdfs/mcaac_hpwra_a2i_list.pdf
- http://www.hear.org/oisc/oahuearlydetectionproject/pdfs/oedposterwhatnottoplant.pdf

To avoid the unintentional introduction or transport of new terrestrial invasive species, all construction equipment and vehicles arriving from outside Kaua‘i should be washed and inspected before entering the project area. In addition, construction materials arriving from outside Kaua‘i should also be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful non-native species (plants, amphibians, reptiles, and insects). When possible, raw materials (gravel, rock, and soil) should be purchased from a local supplier on Kaua‘i to avoid introducing non-native species not present on the island. Inspection and cleaning activities should be conducted at a designated location.

5.2. Terrestrial Fauna

Waterbirds

The four endangered waterbirds could be present in the survey area at any time. Based on known distribution and habitat requirements, any of these species could also breed in or near the survey area. Breeding for Hawaiian ducks, Hawaiian coots, and Hawaiian gallinules is not restricted to a particular season. The breeding season for the Hawaiian stilt is between February and August (Robinson et al. 1999).

Habitat types used by the Hawaiian duck include natural and human-made lowland wetlands, flooded grasslands, river valleys, mountain streams, montane pools, forest swamplands, aquaculture ponds, and agricultural areas. On Kaua‘i, many ducks nest along montane streams, but use lowland areas for feeding and loafing (Engilis et al. 2002; Hawaii Audubon Society 2005; USFWS 2011).

Hawaiian coots prefer freshwater ponds or wetlands, brackish wetlands, and human-made impoundments. They forage in water less than 12 inches (30 centimeters) deep, and nest in open water with emergent aquatic vegetation or heavy stands of grass (Brisbin et al. 2002; Schwartz and Schwartz 1949; USFWS 2011).

Hawaiian gallinules favor freshwater areas with dense stands of emergent vegetation near open water, slightly emergent vegetation mats, and water depths of less than 3.3 feet (1 m). They nest on open ground, wet meadows, and on banks of waterways and in emergent vegetation over water. Their nesting areas typically have standing water less than 24 inches (60 cm) deep (Bannor and Kiviat 2002; USFWS 2011).

Endangered Hawaiian stilt could also be present in any areas with shallow water. Hawaiian stilts mostly use open wetland habitats with minimal vegetative cover and water depths of less than 9.4 inches (24 cm), as well as tidal mudflats (Robinson et al. 1999). Although this habitat is not common in the survey area, Hawaiian stilts may occasionally be present.

The following best management practices (BMPs) are recommended during construction to avoid impacts to listed waterbirds:

- In areas where vegetated streambanks would be disturbed, waterbird nest searches should be conducted by a qualified biologist before any work is conducted and after any subsequent delay in work of 3 or more days (during which birds may attempt nesting). The results of the pre-construction survey should be submitted to the USFWS.
- A biological monitor should be present during all construction activities to ensure birds and nests are not adversely impacted.
- If a nest with eggs or chicks/ducklings is discovered, work should cease within 100 feet (30 m) of the nest until the chicks/ducklings have fledged.
- Nests or broods found in the survey area before or during construction should be reported to the USFWS within 48 hours.
- If an endangered Hawaiian waterbird is present or flies into the area during ongoing activities, then all activities within 100 feet (30 m) of the bird should cease, and the bird should also not be approached. Work may continue after the bird leaves the area of its own accord.

<u>Nēnē</u>

Nēnē may also be present on occasion and could fly over the survey area. The nēnē is adapted to a terrestrial and largely non-migratory lifestyle in the Hawaiian Islands, with negligible dependence on freshwater habitat. Nēnē use various habitat types ranging from beach strand, shrubland, and grassland to lava rock (Banko 1988; Banko et al. 1999). Hydroseeding can attract nēnē to feed.

The following BMPs are recommended during construction to avoid impacts to nēnē:

- A qualified biologist should survey the area for nesting nēnē before construction (in coordination with the waterbird surveys), and after any subsequent delay in work of 3 or more days (during which birds may attempt nesting). The results of the pre-construction survey should be submitted to the USFWS.
- All regular on-site staff should be trained to identify nēnē, and they should know what appropriate steps to take if nēnē are present on-site. Training would not be necessary if a biological monitor is present for the duration of the construction.
- If a nēnē is found in the area during ongoing activities, then all activities within 100 feet (30 m) of the bird should cease, and the bird should also not be approached. If a nest is discovered, contact USFWS. If a nest is not discovered, work may continue after the bird leaves the area of its own accord.

<u>Seabirds</u>

Major threats to the endangered Hawaiian petrel, threatened Newell's shearwater, and proposed endangered band-rumped storm-petrel include the attraction of adults and newly fledged juveniles to bright lights while transiting between their nest sites and the ocean. Juvenile birds are particularly vulnerable to light attraction and are sometimes grounded when they become disoriented by lights (Mitchell et al. 2005). Many of these grounded birds are vulnerable to mammalian predators or being struck by vehicles. The following recommendations are provided to avoid and minimize light attraction of these seabirds to the survey area:

- Construction activity should be restricted to daylight hours as much as practicable during the seabird peak fallout period (September 15–December 15) to avoid the use of nighttime lighting that could attract seabirds.

- All outdoor lights should be shielded to prevent upward radiation. This has been shown to reduce the potential for seabird attraction (Reed et al. 1985; Telfer et al. 1987). A selection of acceptable seabird-friendly lights can be found online at the Kauai Seabird Habitat Conservation website (2013).
- Outside lights that are not needed for security and safety should be turned off from dusk through dawn during the fledgling fallout period (September 15–December 15).

Hawaiian Hoary Bats

Hawaiian hoary bats may forage or roost in the survey area. Direct impacts to bats would only occur if a juvenile bat that is too small to fly but too large to be carried by a parent was present in a tree that was cut down. Although the chances of adversely affecting Hawaiian hoary bats as a result of the proposed project are likely small, the following measures are recommended as conservative impact avoidance measures:

- Any fences that are erected as part of the project should have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. No fences in the survey area were observed with barbed wire during the survey; however, if fences are present, the top strand of barbed wire should be removed or replaced with barbless wire.
- No trees taller than 15 feet (4.6 m) should be trimmed or removed as a result of this project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees.

Implementation of these guidelines, which have been promulgated by the USFWS (1998), is expected to avoid all direct impacts to Hawaiian hoary bats.

5.3. Aquatic Fauna

5.3.1. Freshwater and Estuarine Communities

None of the species recorded in the lower or estuarine portions of the surveyed streams are state or federally listed threatened, endangered, proposed or candidate species. However, native fishes and aquatic invertebrates have been recorded in the stream, and the potential exists for project activities to impact these animals near and downstream of the construction activities. In-water construction, dewatering or diversion, siltation, and habitat alteration could all cause adverse impacts. The type and extent of these impacts depend on the final project design and plan.

Because the native amphidromous species travel to and from the sea as part of their life cycle, habitat alteration near the survey area should be minimized as much as possible; precautions should be taken not to impede upstream and downstream movement of these species. Appropriate recommendations to avoid and minimize impacts to aquatic resources will ultimately depend on final project designs and plans.

5.3.2. Marine Communities

Wainiha and Hanalei Bay and shorelines have the potential to support various marine communities, including algae, corals, invertebrates, fishes, sea turtles, and monk seals. The main threats to these species as a result of the project include increased loads of siltation, debris, contaminants, pollutants, and human interaction.

Wainiha Stream enters the bay across a sandy beach. The position of the stream mouth changes with changing sea and streamflow conditions. The intertidal and shallow sub-tidal portions of the Wainiha Bay shoreline are sand. This unconsolidated material is a mixture of marine carbonate sand and sediments carried to the beach by the stream. As long as generation or suspension of sediment due to project activity is kept to a minimum, no impacts to the habitat seaward of the estuary are likely.

The much smaller Waikoko, Waipā, and Waioli Streams all enter Hanalei Bay across sandy beaches. Compared to Wainiha Bay, Hanalei Bay is more protected from ocean conditions. Also, the streams are much smaller than Wainiha in terms of flow. Therefore, the impact of these steams on the marine communities in the bay is smaller than the impact of Wainiha Stream on Wainiha Bay.

<u>Hawaiian Monk Seal and Sea Turtles</u>

The survey area contains habitat that could support Hawaiian monk seal pupping, nursing, and haul out. It also contains coastal habitat that could support nesting and shallow water habitat that could support foraging of green sea turtles and hawksbill sea turtles. The project has the potential to increase human interaction with these animals. Measures expected to reduce or eliminate impacts to these listed species include the following:

- All regular on-site staff would be trained to identify the Hawaiian monk seal and sea turtles, and trained on what appropriate steps to take if these species are present on-site. Construction activities would not begin if a Hawaiian monk seal or sea turtle is in the construction area or within 150 feet (46 m) of the construction area. Construction can only begin after the animal voluntarily leaves the area. If a monk seal/pup pair is present, a minimum 300-foot (91-m) buffer would be observed. If listed marine species are noticed within 150 feet after work has already begun, that work may continue only if, in the best judgment of the project supervisor, that there is no way for the activity to adversely affect the animal(s).
- Any construction-related debris that may pose an entanglement threat to Hawaiian monk seals and sea turtles should be removed from the construction area at the end of each day and at the conclusion of the construction project.
- Workers should not attempt to feed, touch, ride, or otherwise intentionally interact with any listed species.
- Shielded lighting should be considered to reduce direct and ambient light to potential nearby beach habitat.

The following BMPs to protect marine water quality are recommended by the National Oceanic and Atmospheric Administration. The applicability of these BMPs to the proposed project will depend on the site-specific construction means and methods chosen.

- A contingency plan to control toxic materials should be developed.
- Appropriate materials to contain and clean potential spills should be stored at the work site and be readily available.
- All project-related materials and equipment placed in the water should be free of pollutants.
- The project manager and heavy equipment operators should perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations should be postponed or halted should a leak be detected, and they should not proceed until the leak is repaired and the equipment is cleaned.
- Fueling of land-based vehicles and equipment should take place at least 50 feet away from the water, preferably over an impervious surface. Fueling of vessels should be done at approved fueling facilities.

- Turbidity and siltation from project-related work should be minimized and contained through the appropriate use of erosion control practices, effective silt containment devices, and the curtailment of work during adverse weather and tidal/flow conditions.
- A plan should be developed to prevent debris and other wastes from entering or remaining in the marine environment during the project.

5.4. Water Quality

Short-term impacts from ground disturbance during the project's construction phase have the potential to impact water quality; however, implementation of BMPs at the site would greatly reduce or eliminate these impacts.

Pollutant discharge into waters is regulated under the Clean Water Act and implemented under HAR 11-55 Water Pollution Control. The proposed project could require the following certifications and permits (and associated mitigation) from the Hawaiʻi DOH Clean Water Branch:

- Section 401, Water Quality Certification: The certification asserts that the proposed project would not violate water quality standards.
- Section 402, National Pollutant Discharge Elimination System (NPDES): If ground disturbance exceeds 1 acre, an NPDES permits must be obtained for point source discharges that may result from construction. The permit must include submittal of a Notice of Intent for General Permit Coverage under HAR 11-55 Appendix C NPDES General Permit Authorizing Discharges of Storm Water Related to Construction Activities. Additional permits may be required.

The following general construction management BMPs should be incorporated to reduce impacts to hydrology, drainage, and water features under the proposed project:

- Clearing and grubbing would be held to the minimum necessary for grading, access, and equipment operation.
- Erosion and sediment control measures would be in place before initiating earth-moving activities. Functionality would be maintained throughout the construction period.
- Soil stockpiles would be located away at least 50 feet from concentrated runoff and water features, covered with plastic or other waterproof material, and surrounded by silt fences or other erosion control BMPs.
- Concrete wash-outs would be located 50 feet from storm drain inlets, open drainage areas, and waterbodies, and would be maintained as needed.
- Solid waste and construction and demolition debris would be properly managed.
- Hazardous materials would be properly stored and managed.
- Spill kits would be available on-site at locations where hazardous materials are used. Spill kits would be inspected regularly and supplies replaced as needed. Staff would be trained on spill prevention and cleanup.
- Vehicles and equipment would be cleaned or serviced in designated locations.
- Construction would be sequenced to minimize the exposure time of the cleared surface area.

- Control measures (e.g., silt fences, sand bag barriers, sediment traps, geotextile mats, and other measures intended for soil/sediment trapping) would be inspected regularly (at least once every 2 weeks) during dry periods, and would be repaired as necessary.
- Control measures (i.e., silt fences, sand bag barriers, sediment traps, geotextile mats, and other measures intended for soil/sediment trapping) would be inspected and repaired as needed within 24 hours after a rainfall event of 0.25 inch or greater over a 24-hour period. During periods of prolonged rainfall, a daily inspection would occur, unless extended heavy rainfall makes access impossible or hazardous.
- Inspection would be documented, and records for all inspections and repairs would be maintained on-site.
- Permanent soil stabilization measures (i.e., graveling or re-planting of vegetation) would be applied as soon as practical after final grading.
- Portable toilets for sanitary waste management would be serviced regularly.

6. LITERATURE CITED

Ainley, D.G., T.C. Telfer, and M.H. Reynolds. 1997. Townsend's and Newell's Shearwater (*Puffinus auricularis*). In *The Birds of North America, No. 297*, edited by A. Poole and F. Gill. Philadelphia, Pennsylvania: The Birds of North America, Inc.

Banko, P.C. 1988. Breeding biology and conservation of the Nēnē, Hawaiian goose (*Nesochen sandvicensis*). Ph.D. dissertation, University of Washington, Seattle.

Banko, P.C., J.M. Black, and W.E. Banko. 1999. Hawaiian Goose (Nēnē) (*Branta sandvicensis*). In *The Birds of North America, No. 434*, edited by A. Poole and F. Gill. Philadelphia, Pennsylvania: The Birds of North America, Inc.

Bannor, B.K. and E. Kiviat. 2002. Common Gallinule (*Gallinula galeata*). In *The Birds of North America Online, No. 685*, edited by A. Poole. Ithaca, New York: Cornell Laboratory of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/685/articles/introduction. Accessed September 28, 2015.

Brisbin, Jr., I. Lehr, and T.B. Mowbray. 2002. American Coot (*Fulica americana*), In *The Birds of North America Online, No. 697a*, edited by A. Poole. Ithaca, New York: Cornell Laboratory of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/697a/articles/introduction. Accessed September 28, 2015.

Coyne, M.S., T.A. Battista, M. Anderson, J. Waddell, W. Smith, P. Jokiel, M.S. Kendall1, and M.E. Monaco1. 2003. NOAA Technical Memorandum NOS NCCOS CCMA 152 (On-line). Benthic Habitats of the Main Hawaiian Islands.

Engilis, Jr., A., K.J. Uyehara, and J.G. Giffin. 2002. Hawaiian Duck (Anas wyvilliana). In *The Birds of North America Online, No. 649*, edited by A. Poole. Ithaca, New York: Cornell Laboratory of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/694/articles/introduction. Accessed September 28, 2015.

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens. 1972. *Soil Survey of the Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lana'i, State of Hawai'i.* U.S. Department of Agriculture, Soil Conservation Service.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.L. Chen, P.S. Chu, J.K. Eischeid, and D.M. Delparte. 2013. Online Rainfall Atlas of Hawai'i. Bull. Amer. Meteor. Soc. 94, 313–316, doi: 10.1175/BAMS-D-11-00228.1. Available at: http://rainfall.geography.hawaii.edu. Accessed August 20, 2015.

Hawai'i Audubon Society. 2005. *Hawaii's Birds, 6th Edition.* Waipahu, Hawai'i: Island Heritage.

Hawai'i State Department of Health (DOH). 2014. *2014 State of Hawai'i Water Quality Monitoring and Assessment Report*. Integrated Report to the U.S. Environmental Protection Agency and the U.S. Congress Pursuant to Sections 303(D) and 305(B), Clean Water Act (Public Law 97-117).

———. 2015. Water Quality Data – Microbiology. http://emdweb.doh.hawaii.gov/CleanWaterBranch/WaterQualityData/default.aspx.

Kaua'i Seabird Habitat Conservation Program. 2013. Avoidance and Minimization of Seabird Light Attraction. Available at: http://www.kauai-seabirdhcp.info/minimization/lights/. Accessed August 4, 2015.

Mercer, T. 2015. *Hawaiian Monk Seal Use of Wainiha Beach, Kauai*. Pacific Islands Fisheries Science Center, National Marine Fisheries Service.

Mitchell, C., C. Ogura, D.W. Meadows, A. Kane, L. Strommer, S. Fretz, L. Leonard, and A. McClung. 2005. *Hawaii's Comprehensive Wildlife Conservation Strategy*. Submitted to the National Advisory Acceptance Team, October 1, 2005. Honolulu, Hawai'i: Department of Land and Natural Resources.

National Oceanic and Atmospheric Administration (NOAA). 2015. Endangered and Threatened Species: Final Rulemaking To Revise Critical Habitat for Hawaiian Monk Seals. Final Rule effective September 21, 2015. *Federal Register* 80(162):50926–50988

National Oceanic and Atmospheric Administration (NOAA), National Weather Service. 2014. October 2014 Precipitation Summary, State of Hawai'i. Available at: http://www.prh.noaa.gov/hnl/hydro/pages/oct14sum.php. Accessed on August 20, 2015.

National Oceanic and Atmospheric Administration (NOAA) National Centers for Coastal Science. 2003. Benthic Habitats of the Main Hawaiian Islands. 2003 shapefile. Available at: http://ccma.nos.noaa.gov/products/biogeography/hawaii_cd/htm/descrip.aspx. Accessed on August 20, 2015.

———. 2014. Benthic Habitats of the Main Hawaiian Islands. 2014 shapefile. Available at: http://files.hawaii.gov/dbedt/op/gis/data/BenthicHabitat_meta.pdf. Accessed September 28, 2015.

National Oceanic and Atmospheric Administration (NOAA) Nautical Charts. 2002. Dataset containing coral reefs located in marine waters near the main Hawaiian Islands and recorded on the nautical charts. Available at: http://files.hawaii.gov/dbedt/op/gis/data/coralreefs_nc.txt. Accessed September 28, 2015.

Natural Resources Conservation Service (NRCS). 2012. Hydric Soils State Lists, Hydric Soils of Hawai'i. Available at: www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/16/nrcs143_023895.xls. Accessed April 5, 2014.

———. 2013. Web Soil Survey. Available at: http://websoilsurvey.nrcs.usda.gov/. Accessed October 2014.

Parham, J.E., G.R. Higashi, E.K. Lapp, D.G.K. Kuamoo, R.T. Nishimoto, S. Hau, J.M. Fitzsimons, D.A. Polhemus, and W.S. Devick. 2008. Atlas of Hawaiian Watersheds & Their Aquatic Resources. Copyrighted website published by the Hawaii Division of Aquatic Resources, Department of Land and Natural Resources. Available at: www.hawaiiwatershedatlas.com. Accessed on October 5, 2015.

Pratt, H.D., and I.L. Brisbin Jr. 2002. Hawaiian Coot (Fulica alai). In *The Birds of North America Online, No. 697b*, edited by A. Poole. Ithaca, New York: Cornell Lab of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/697b. Accessed September 28, 2015.

Reed, J.R., J.L. Sincock, and J.P. Hailman. 1985. Light attraction in endangered procellariiform birds: Reduction by shielding upward radiation. *The Auk* 102:377–383.

Robinson, J.A., J.M. Reed, J.P. Skorupa, and L.W. Oring. 1999. Black-necked Stilt (*Himantopus mexicanus*). In *The Birds of North America Online, No. 449*, edited by A. Poole. Ithaca, New York: Cornell Lab of Ornithology. Available at: http://bna.birds.cornell.edu/bna/species/449/articles/introduction. Accessed September 28, 2015.

Schwartz, C.W., and E.R. Schwartz. 1949. *A Reconnaissance of the Game Birds in Hawaii*. Hilo, Hawai‘i: Board of Commissioners of Agriculture and Forestry, Division of Fish and Game.

Staples, G.W. and D.R. Herbst. 2005. *A Tropical Garden Flora: Plants Cultivated in the Hawaiian Islands and Other Tropical Places*. Honolulu, Hawai‘i: Bishop Museum Press.

Sustainable Resources Group Intn’l, Inc. 2012. Watershed Management Plan for Hanalei Bay Watershed. Prepared for Hanalei Watershed Hui.

SWCA Environmental Consultants (SWCA). 2015. *Determination and Delineation of Wetlands and Other Waters of the U.S. for the Wainiha Bridges Project.* In preparation.

Telfer, T.C., J.L. Sincock, and G.V. Byrd. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. *Wildlife Society Bulletin* 15:406–413.

U.S. Department of Agriculture. 2009. *Bats of the U.S. Pacific Islands*. Biology Technical Note No. 20. Natural Resources Conservation Service, Pacific Islands Area.

U.S. Fish and Wildlife Service (USFWS). 1998. *Recovery Plan for the Hawaiian Hoary Bat (Lasiurus cinereus semotus).* Portland, Oregon: U.S. Fish and Wildlife Service, Region 1.

———. 2011. *Recovery Plan for Hawaiian Waterbirds, Second Revision*. Portland, Oregon.

Wagner, W.L., and D.R. Herbst. 2003. *Supplement to the Manual of the Flowering Plants of Hawai‘i.* Version 3.1 (12 Dec 2003).

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. *Manual of the Flowering Plants of Hawai‘i.* Volumes I and II. Revised edition. Honolulu: University of Hawai‘i Press.

Wagner, W.L., D.R. Herbst, N. Khan, and T. Flynn. 2012. *Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawai‘i and Hawai‘i’s Ferns and Fern Allies.* Version 1.3.

Appendix E
Draft Archaeological Inventory Survey Report for the Wainiha Bridges Project

Draft
Archaeological Inventory Survey Report for the Wainiha Bridges Project, Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha Ahupua‘a, Halele‘a District, Kaua‘i, Federal Highway Administration/ Central Federal Lands Highway Division (FHWA/CFLHD) contract DTFH68-14-D-00012/0007 TMKs: [4] 5-5 (por.), [4] 5-6 (por.), [4] 5-7 (por.), and [4] 5-8 (por.)

Prepared for
CH2M HILL
and on behalf of the
Federal Highway Administration (FHWA) Central Federal Lands Highway Division (CFLHD)

Prepared by
Richard T. Stark, Ph.D.,
Missy Kamai, B.A.,
William H. Folk, B.A,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: WAINIHA 11)

March 2016

O‘ahu Office
P.O. Box 1114
Kailua, Hawai‘i 96734
Ph.: (808) 262-9972
Fax: (808) 262-4950

www.culturalsurveys.com

Maui Office
1860 Main St.
Wailuku, Hawai‘i 96793
Ph.: (808) 242-9882
Fax: (808) 244-1994

Management Summary

Reference	Archaeological Inventory Survey Report for the Wainiha Bridges Project, Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa, Haleleʻa District, Kauaʻi, Federal Highway Administration/ Central Federal Lands Highway Division (FHWA/CFLHD) contract DTFH68-14-D-00012/0007, TMKs: [4] 5-5 (por.), [4] 5-6 (por.), [4] 5-7 (por.), and [4] 5-8 (por.) (Stark et al. 2015)
Date	March 2016
Project Number(s)	Federal Highway Administration Central Federal Lands Highway Division (FHWA/CFLHD) contract code: DTFH68-14-D-00012/0007 Cultural Surveys Hawaiʻi, Inc. (CSH) Job Code: WAINIHA 9
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological permit number 15-03, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per Hawaiʻi Administrative Rules (HAR) §13-13-282.
Agencies	FHWA/CFLHD, SHPD, State Department of Transportation (HDOT)
Project Proponent	CH2M HILL, Brett Weiland, 555 Tech Center Drive, Suite 212, Colorado Springs, CO 80919
Land Jurisdiction	HDOT
Land Owners	Multiple public and private land owners. Appendix D
Project Proponent	FHWA/CFLHD, HDOT
Project Funding	FHWA/CFLHD
Project Location	The project areas encompass the three Wainiha Bridges (Bridges 1, 2, and 3) and the surrounding areas of the bridges which include portions of Kūhiō Highway—part of Kauaʻi Belt Road, a National Register of Historic Places (NRHP) site, public lands, and private lands. Also included as part of the proposed project are three one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges) located at Waiʻoli, Waipā, and Waikoko Streams in the event temporary structures may be needed to accommodate loads during construction and two potential staging areas in Lumahaʻi Ahupuaʻa. The project areas exist within the following TMKs: Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; Waikoko Bridge: [4] 5-6-003:002, [4] 5-6-004:023, 999 por.; Wainiha Bridge 1: [4] 5-8-002:002 por., [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por.; Wainiha Bridges 2 and 3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por.; Waiʻoli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por.; Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.

Project Description	The Federal Highway Administration, Central Federal Lands Highway Division (FHWA) and the State of Hawaiʻi Department of Transportation (HDOT) propose the replacement of three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) on the north side of the island of Kauaʻi. The bridges are located between mile posts 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after the Wainiha Stream Bridge 2 suffered permanent damage and the Wainiha Stream Bridges 1 (the southernmost bridge) and 3 (the northernmost bridge) were determined to be structurally deficient. The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by HDOT. FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. Also included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges), located at Waiʻoli, Waipā, and Waikoko streams. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the project site without affecting the historic integrity of these bridges. The temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumahaʻi Ahupuaʻa are also included in the Area of Potential Effect.
Project Acreage	Project acreage includes Potential Staging Area 1: 0.12 hectares (0.296 acres), Potential Staging Area 2: 0.09 hectares (0.221 acres), Wainiha Stream Bridge 1: 0.64 hectares (1.603 acres), Wainiha Stream Bridges 2 and 3: 1.40 hectares (3.466 acres), Waiʻoli Stream Bridge: 0.51 hectares (1.256 acres), Waipā Stream Bridge: 0.59 hectares (1.449 acres), and Waikoko Stream Bridge: 0.29 hectares (0.715 acres) for a total of 3.65 hectares (9.006 acres).
Area of Potential Effect (APE)	The APE for the current project is defined as only the entire 3.65 hectares (9.006 acres) project area, including Potential Staging Area 1: 0.12 hectares (0.296 acres), Potential Staging Area 2: 0.09 hectares (0.221 acres), Wainiha Stream Bridge 1: 0.64 hectares (1.603 acres), Wainiha Stream Bridges 2 and 3: 1.40 hectares (3.466 acres), Waiʻoli Stream Bridge: 0.51 hectares (1.256 acres), Waipā Stream Bridge: 0.59 hectares (1.449 acres), and Waikoko Stream Bridge: 0.29 hectares (0.715 acres).

Historic Preservation Regulatory Context	This AIS investigation was designed to comply with both Federal and Hawaiʻi State environmental and historic preservation review legislation. Due to federal funding, this project is a federal undertaking, requiring compliance with Section 106 of the National Historic Preservation Act, the National Environmental Policy Act, and Section 4(f) of the Department of Transportation Act. The proposed project is also subject to Hawaiʻi State environmental and historic preservation review legislation (Hawaiʻi Revised Statutes [HRS] §343 and HRS §6E-8/HAR §13-275, respectively). In consultation with the SHPD, this AIS investigation fulfills the requirements of HAR §13-13-276 and the *Secretary of the Interior's Standards for Archaeology and Historic Preservation*. It was conducted to identify, document, and make National Register and Hawaiʻi Register of Historic Places (Hawaiʻi Register) eligibility recommendations[1] for any cultural resources/historic properties[2]. This report is also intended to support any project-related historic preservation consultation with stakeholders such as State and County agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable. At the request of CH2MHill, CSH completed an archaeological inventory survey investigation, per the requirements of HAR §13-13-276. This archaeological inventory survey report was prepared to facilitate the proposed project's historic preservation review and any other project-related historic preservation consultation.
Fieldwork Effort	CSH archaeologists Johnny Dudoit, B.A., Gerald Ida, B.A, Missy Kamai, B.A., William H. Folk, B.A., and principal investigator Hallett H. Hammatt, Ph.D., completed the archaeological inventory survey (AIS) fieldwork between 6 October 2014 and 9 October 2014 under archaeological permit number 15-03, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per HAR §13-13-282. Liborio and Hammatt (2015) provide the companion report to this document, a cultural consultation conducted by CSH for a cultural impact assessment (CIA). The pedestrian survey was conducted on 6 October 2014. Shovel testing within the proposed project area and the study areas was conducted on 7-8 October 2014. Recordation of cultural resources for this inventory survey was conducted on 9 October 2014. Overall, a total of 20 working days were required to complete fieldwork for this archaeological inventory survey.

Cultural Resources Identified	The Kauaʻi Belt Road, a National Register of Historic Places (NRHP) site (Reference # 03001048) and Hawaiʻi State Register of Historic Places site (State Inventory of Historic Places [SIHP] # 50-30-02-9396) within the APE boundary is comprised in part of the following: • SIHP # 50-30-03-2296, the Waiʻoli Bridge, • SIHP # 50-30-03-2297, the Waipā Bridge, • SIHP # 50-30-03-2298, the Waikoko Bridge, and • SIHP # 50-30-02-2299, a reinforced-concrete pipe culvert and supporting basalt and mortar revetments beneath Kūhiō Highway approaching the middle Wainiha bridge, Haena-bound. All cultural resources encountered within the project areas are historic and none of them is deemed traditional Hawaiian.
Significance Evaluations	The Kauaʻi Belt Road (NRHP # 03001048 and SIHP # 50-30-02-9396) is evaluated as historically significant under Criteria "A" and "C" of the National Register of Historic Places Registration Form. SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, is evaluated to be historically significant under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-6. The bridge crossing has also been previously evaluated (Fung Associates 2013:4) as a significant cultural resource eligible to the National Register and Hawaiʻi Register pursuant to 36 CFR 60.4 and HAR §13-198-8, under Criteria "A" and "C" SIHP # 50-30-03-2297, the Waipā Stream Bridge, is evaluated to be historically significant under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-6. The bridge crossing has also been previously evaluated (Fung Associates 2013:4) as a significant cultural resource eligible to the National Register and Hawaiʻi Register pursuant to 36 CFR 60.4 and HAR §13-198-8, under Criteria "A" and "C". SIHP # 50-30-03-2298, the Waikoko Stream Bridge, is evaluated to be historically significant under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-6. The bridge crossing has also been previously evaluated (Fung Associates 2013:4) as a significant cultural resource eligible to the National Register and Hawaiʻi Register pursuant to 36 CFR 60.4 and HAR §13-198-8, with high preservation value eligibility status under Criteria "A" and "C". SIHP # 50-30-02-2299, the reinforced-concrete pipe culvert and supporting basalt boulder and mortar revetments or headwalls at both ends beneath Kūhiō Highway approaching Bridge 2, heading westward toward Haena, is evaluated for significance under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-6 and significance criteria "A"and "C" of the National Register and Hawaiʻi Register pursuant to 36 CFR 60.4 and HAR §13-198-8. It appears this culvert dates to the early twentieth century, and conveys a feeling of association with the time of road construction and should be included as a contributing element of the Kauaʻi Belt Road historic property

Project Effect and Recommendations	In accordance with Federal regulations (36 CFR 800.5[b]), CSH's project-specific effect recommendation is "No adverse effect." Under Hawaiʻi State historic preservation administrative rules (HAR §13-13-275-7), the project's effect recommendation is "effect, with agreed upon mitigation commitments." CSH observed no evidence of pre-Contact Hawaiian culture, but provided documentation to assign four SIHP #s to contributing elements of the Kauaʻi Belt Road (SIHP # 50-30-02-9396) as follows: • SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, • SIHP # 50-30-03-2297, the Waipā Stream Bridge, • SIHP # 50-30-03-2298, the Waikoko Stream Bridge, and • SIHP # 50-30-02-2299, a reinforced-concrete pipe culvert with supporting basalt and mortar revetments at both ends beneath Kūhiō Highway in Wainiha. Archaeological monitoring is recommended during installation and removal of the temporary bridge bypasses at Waioli, Waipā and Waikoko, and during the removal of the thee existing temporary bridges in Wainiha and installation of the new permanent Wainiha bridges. These significance recommendations are included in this AISR for the review and concurrence of the SHPD. This AIS report plus future archaeological monitoring of the planned development within the project area is recommended as sufficient to satisfy the requirements to mitigate any adverse effect caused by the proposed development activities. The indicated archaeological monitoring program would begin with the preparation of an archaeological monitoring plan for the review and acceptance of the SHPD. Early consultation with the SHPD through submittal of the present study is recommended for their review and concurrence on the project's effect and mitigation recommendations.

[1]In historic preservation parlance, cultural resources are the physical remains and/or geographic locations that reflect the activity, heritage, and/or beliefs of ethnic groups, local communities, states, and/or nations. Generally, they are at least 50 years old (although there are exceptions) and include buildings and structures; groupings of buildings or structures (historic districts); certain objects; archaeological artifacts, features, sites, and/or deposits; groupings of archaeological sites (archaeological districts); and, in some instances, natural landscape features and/or geographic locations of cultural significance. Cultural resources, as defined under Federal historic preservation legislation (36 CFR 800.16), are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meet the National Register criteria. Determinations of eligibility are generally made by a federal agency official in consultation with the SHPD. Under Federal legislation, a project's (undertaking's) potential effect on cultural resources must be evaluated and potentially mitigated. Under Hawaiʻi State historic preservation legislation, cultural resources are defined as any cultural resources that are 50 years old, regardless of their historic/cultural significance under State law, and a project's effect and potential mitigation measures are evaluated based on the project's potential impact to "significant" cultural resources (those cultural resources assessed as significant under the five State of Hawaiʻi historic property significance criteria). Determinations of eligibility to the Hawaiʻi Register result when a State agency official's historic property "significance assessment" is approved by the SHPD, or when the SHPD itself makes an eligibility determination for a historic property.

[2]Cultural resource significance is evaluated and expressed as eligibility for listing on the National and/or Hawaiʻi Registers. To be considered eligible for listing on the National and/or Hawaiʻi Registers a cultural resource should possess integrity of location, design, setting, materials, workmanship, feeling, and/or association and meet one or more of the following broad cultural/historic significance criteria: "A" reflects major trends or events in the history of the state or nation; "B" is associated with the lives of persons significant in our past; "C" is an excellent example of a site type/work of a master; and "D" has yielded or may be likely to yield information important in prehistory or history.

Table of Contents

List of Figures

List of Tables

Section 1 Introduction

1.1 Project Background

At the request of CH2M HILL, Cultural Surveys Hawaiʻi, Inc. (CSH) has prepared this archaeological inventory survey (AIS) report for the Wainiha Bridges project, Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa, Haleleʻa District, Kauaʻi, Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD) contract DTFH68-14-D-00012/0007, Multiple TMKs. The proposed project is located along Kūhiō Highway (Route 560), between mile posts 6.4 and 6.7 near the mouth of Wainiha Stream. The project areas encompass the three Wainiha Bridges (Bridges 1, 2, and 3) and the surrounding areas of the bridges that include portions of Kūhiō Highway, public lands, and private lands. The project areas are depicted on a portion of a 1991 and 1996 U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), tax map plats (Figure 2 through Figure 9), and 2013 aerial photographs (Figure 10 through Figure 15).

The proposed project includes the replacement of three bridges on Kūhiō Highway on the north side of the island of Kauaʻi. The bridges are located between mile posts 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay (Figure 14 and Figure 15). The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge 2 suffered permanent damage and Bridges 1 (the southernmost bridge) and 3 (the northernmost bridge) were determined to be structurally deficient. The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by the State of Hawaiʻi Department of Transportation (HDOT). Also included as part of the proposed project are three one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges) located at Waiʻoli, Waipā, and Waikoko streams (Figure 1, Figure 10 through Figure 12) in the event temporary structures may be needed to accommodate loads during construction and two potential staging areas in Lumahaʻi Ahupuaʻa (Figure 1 and Figure 13). The project areas include approximately 3.65 hectares (9.006 acres); Potential Staging Area 1: 0.12 hectares (0.296 acres), Potential Staging Area 2: 0.09 hectares (0.221 acres), Wainiha Stream Bridge 1: 0.64 hectares (1.603 acres), Wainiha Stream Bridges 2 and 3: 1.40 hectares (3.466 acres), Waiʻoli Stream Bridge: 0.51 hectares (1.256 acres), Waipā Stream Bridge: 0.59 hectares (1.449 acres), and Waikoko Stream Bridge: 0.29 hectares (0.715 acres). The project APE includes any visual, auditory, and/or other environmental impacts beyond the actual footprint of the proposed project. The APE for the current project is defined as only the entire 3.36 hectare (8.30 acre) project area.

1.2 Historic Preservation Regulatory Context and Document Purpose

This AIS investigation was designed to be compliant with both Federal and Hawaiʻi State environmental and historic preservation review legislation. Due to federal funding, this project is a federal undertaking, requiring compliance with Section 106 of the National Historic Preservation Act, the National Environmental Policy Act, and Section 4(f) of the Department of Transportation Act. The proposed project is also subject to Hawaiʻi State environmental and historic preservation review legislation (Hawaiʻi Revised Statutes [HRS] §343 and HRS §6E-8/Hawaiʻi Administrative Rules [HAR] §13-275, respectively).

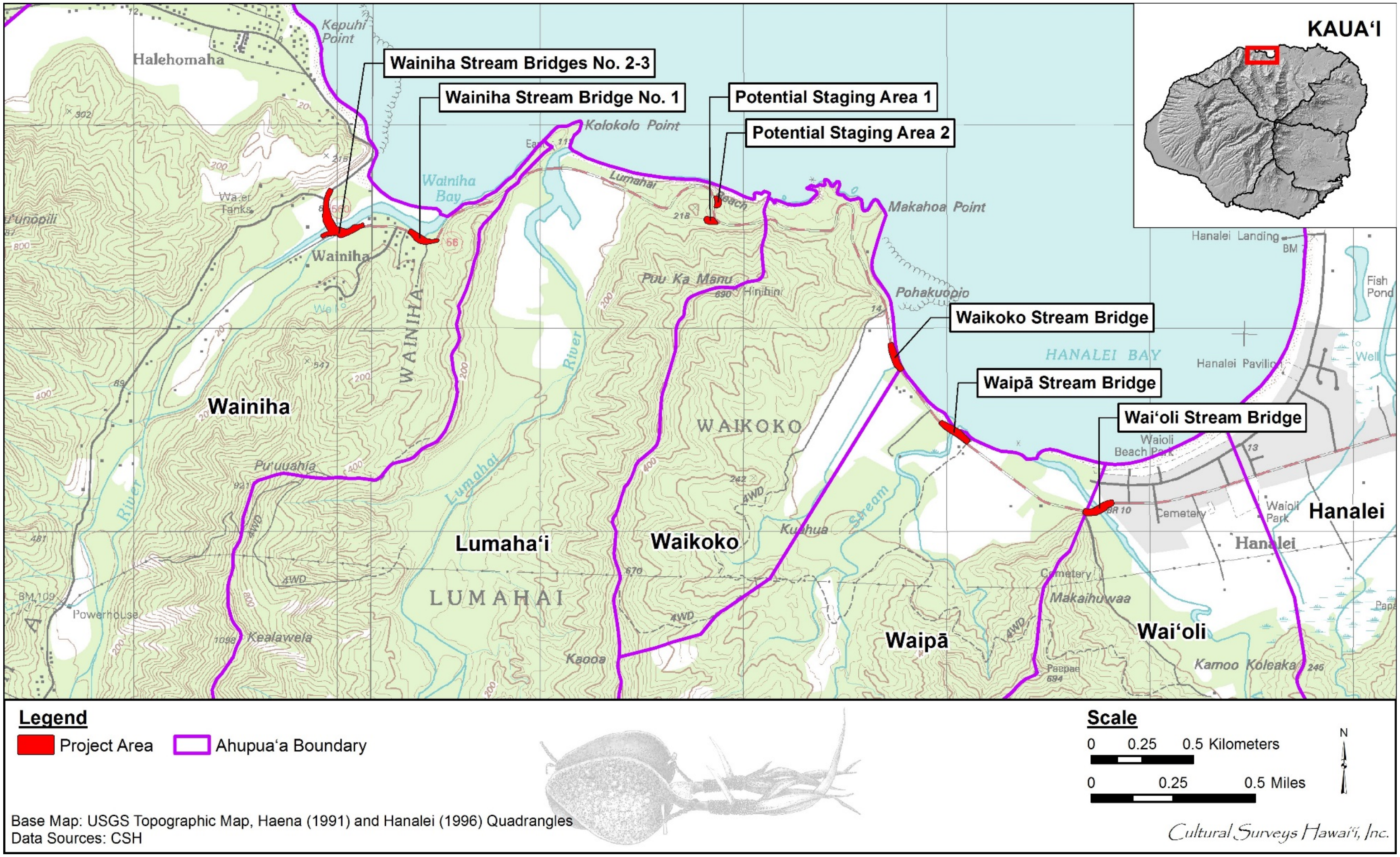


Figure 1. Portion of the 1991 Haena and 1996 Hanalei USGS 7.5-minute series topographic quadrangles showing the location of the project areas

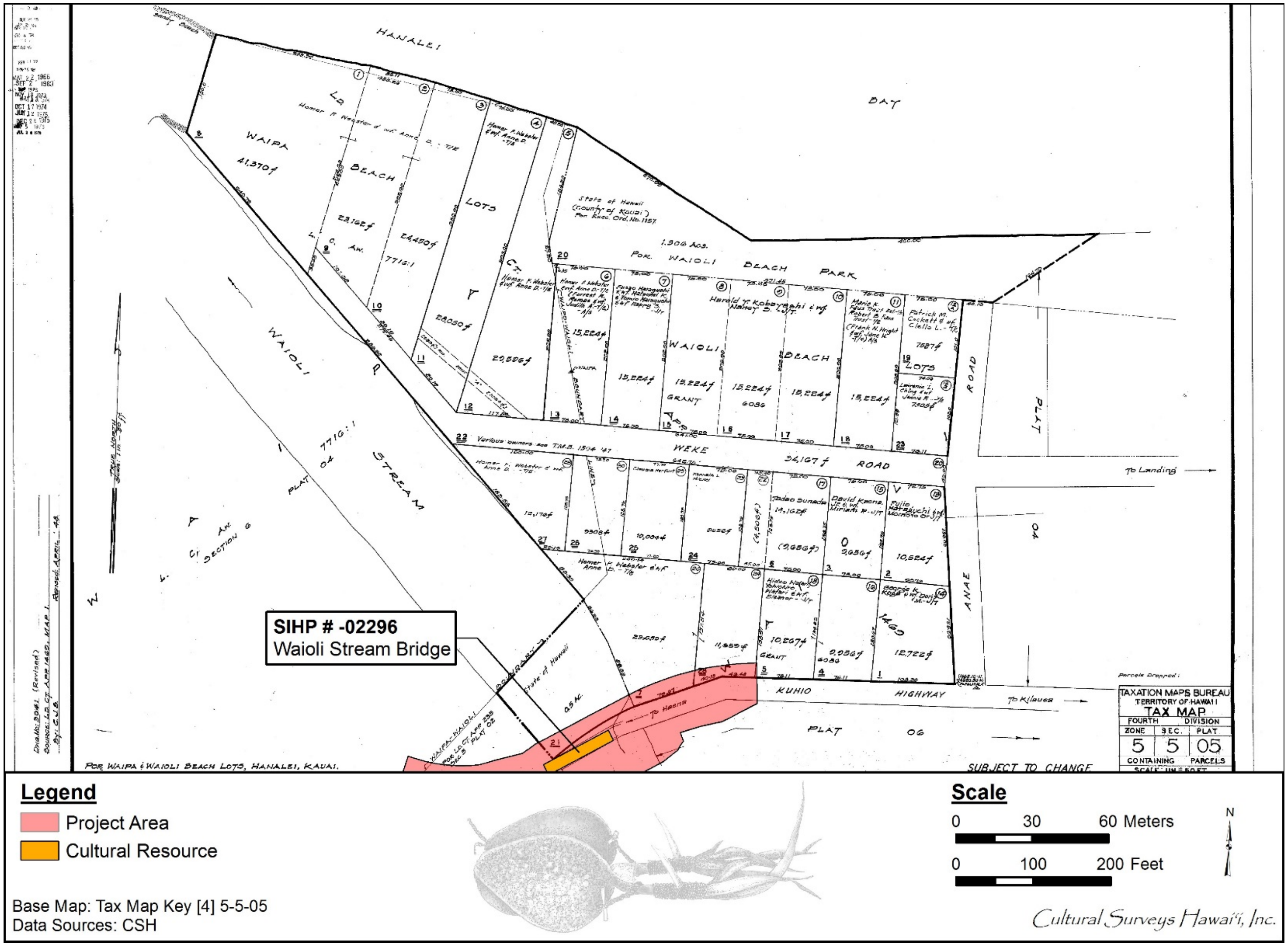


Figure 2. Tax Map Key (TMK) [4] 5-5-05, showing a portion of the Wai‘ole Stream Bridge project area (Hawai‘i TMK Service 1984)

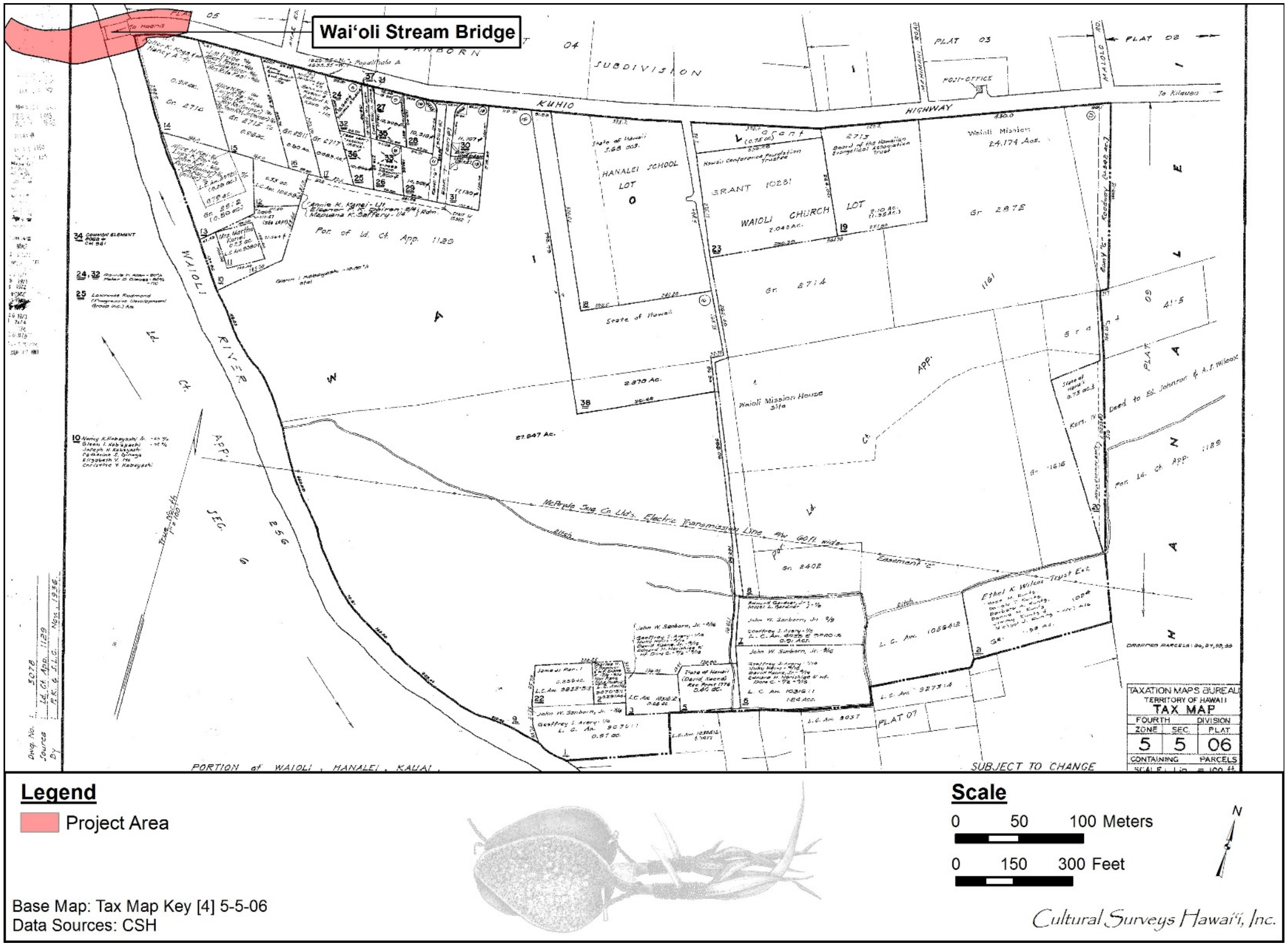


Figure 3. TMK: [4] 5-5-06, showing a portion of the Wai‘ole Stream Bridge project area (Hawai‘i TMK Service 1984)

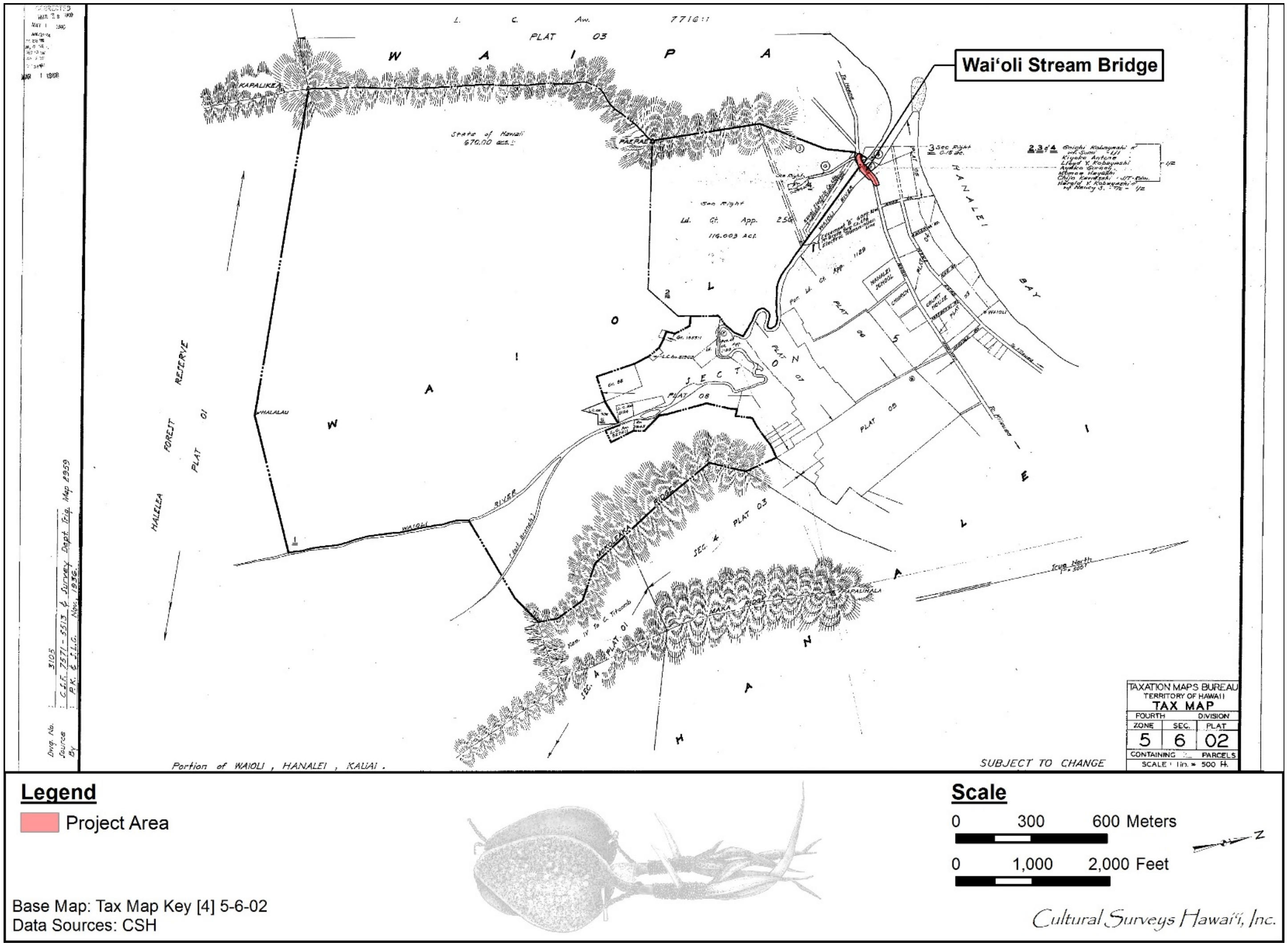


Figure 4. TMK: [4] 5-6-02, showing the Wai‘ole Stream Bridge project area (Hawai‘i TMK Service 1984)

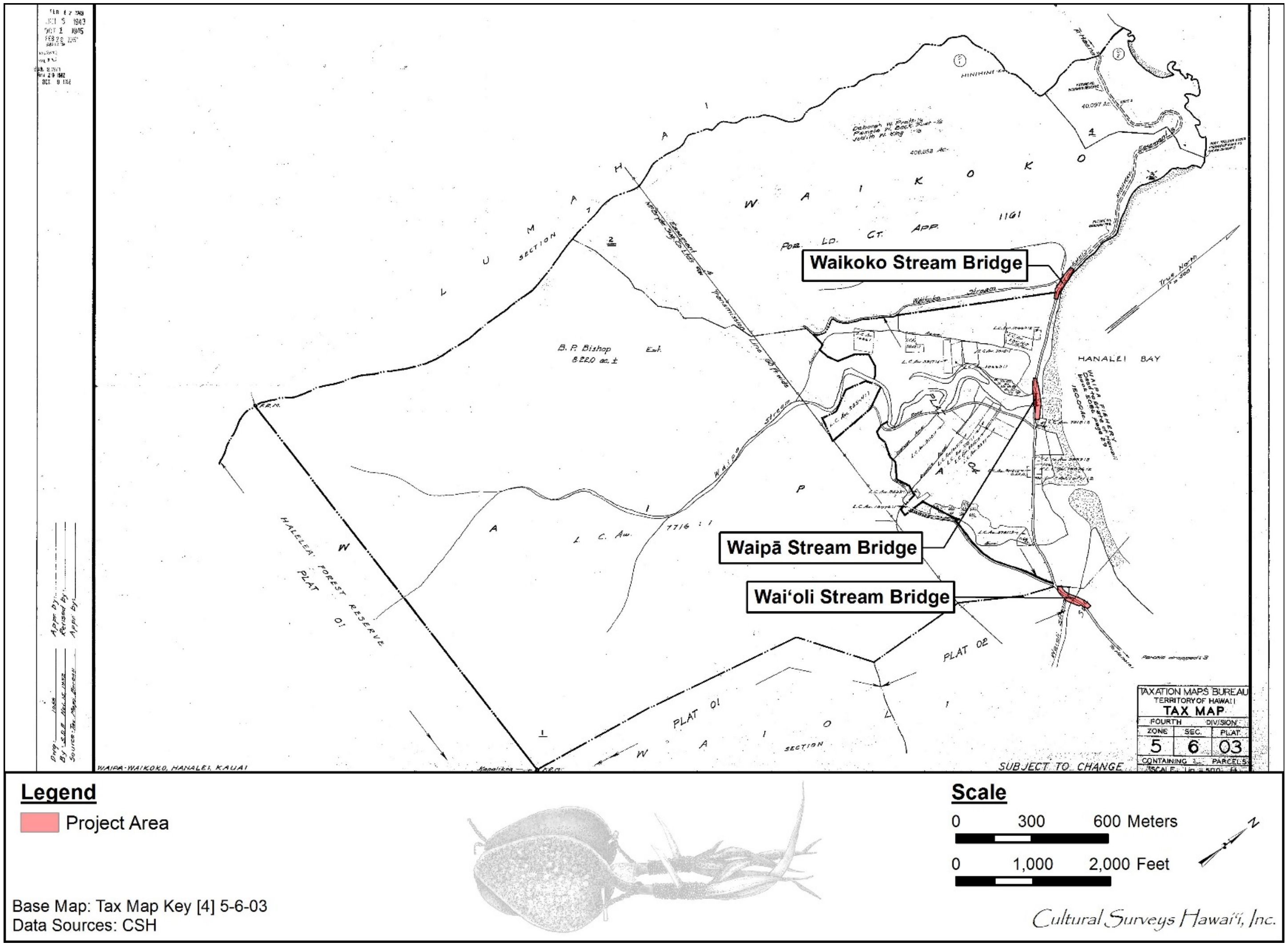


Figure 5. TMK: [4] 5-6-03, showing the Wai‘ole Stream Bridge, Waipā Stream Bridge, and Waikoko Stream Bridge project areas (Hawai‘i TMK Service 1984)

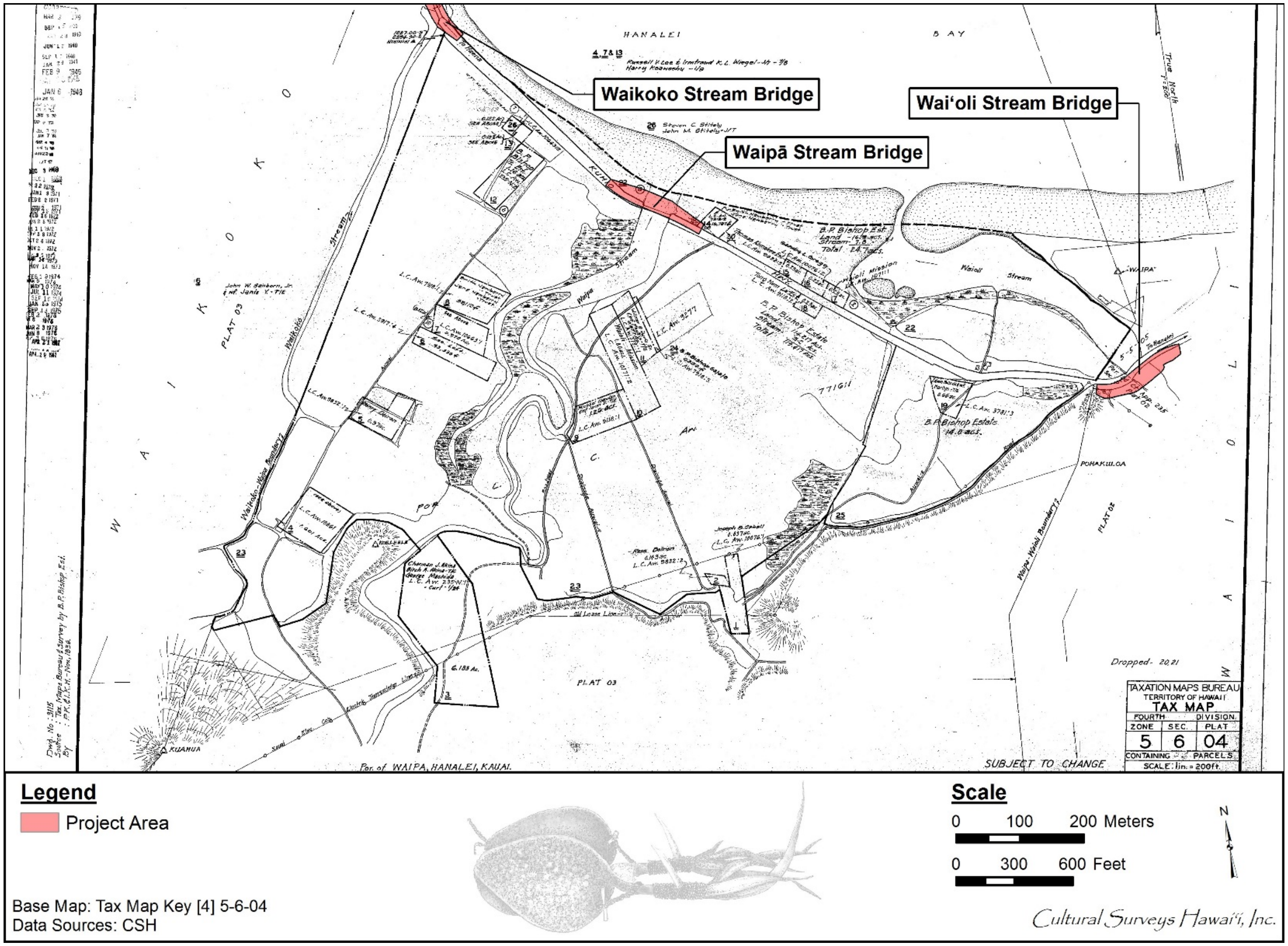


Figure 6. TMK: [4] 5-6-04, showing the Wai‘ole Stream Bridge, Waipā Stream Bridge, and Waikoko Stream Bridge project areas (Hawai‘i TMK Service 1984)

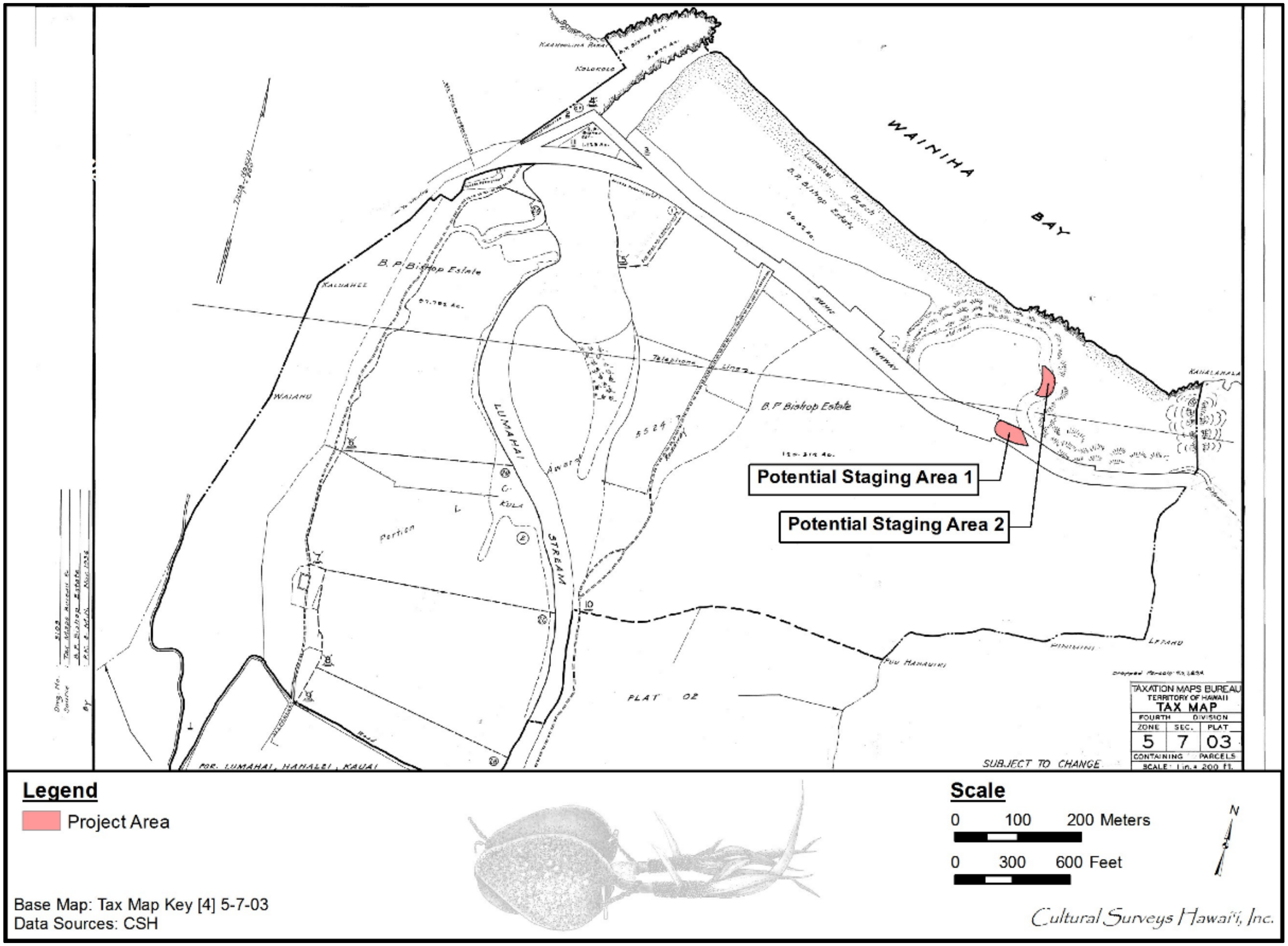


Figure 7. TMK: [4] 5-7-03, showing the project areas of Potential Staging Areas 1 and 2 (Hawai‘i TMK Service 1984)

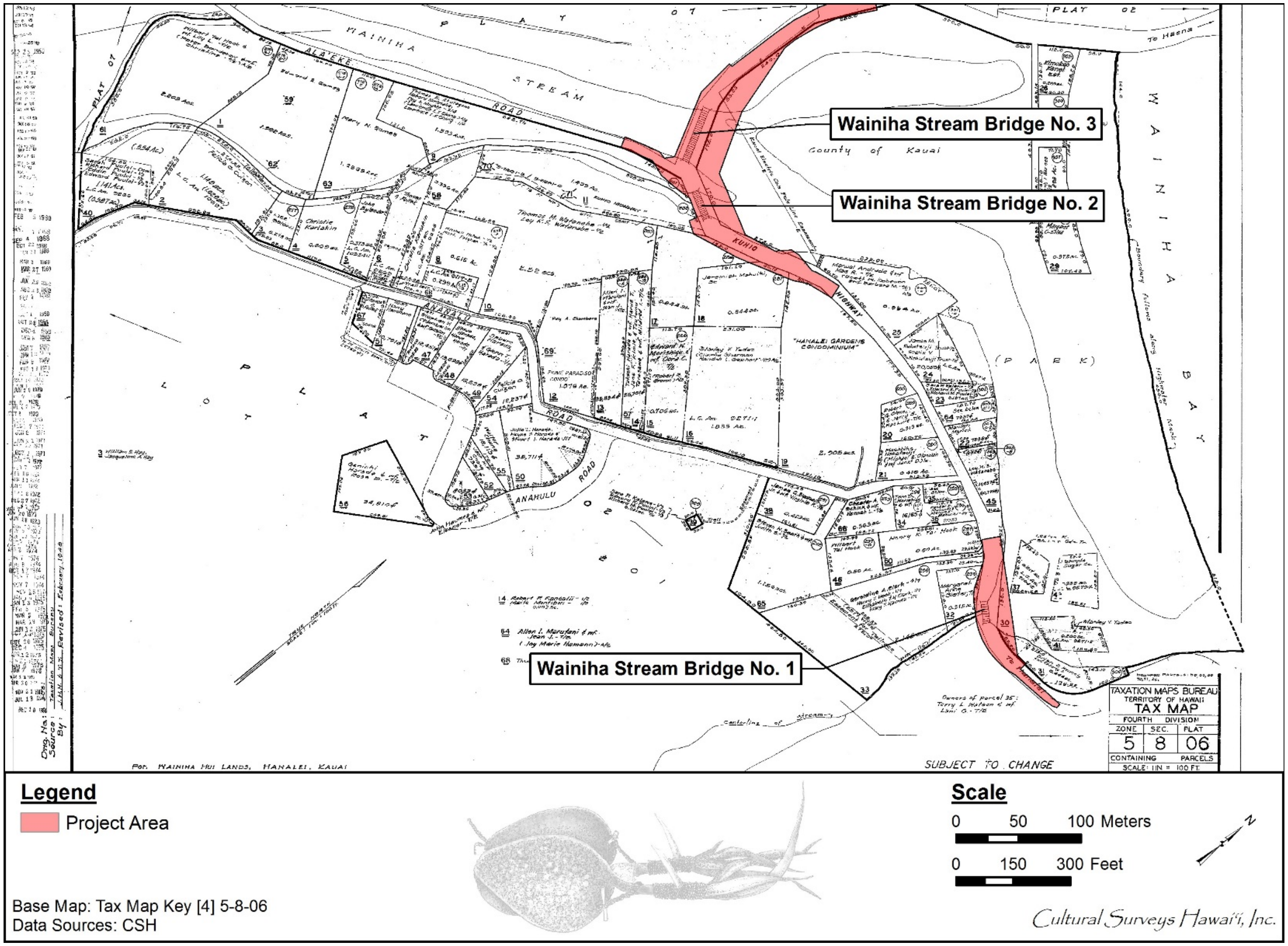


Figure 8. TMK: [4] 5-8-06, showing the Wainiha Stream Bridges 1, 2 and 3 project areas (Hawai‘i TMK Service 1984)

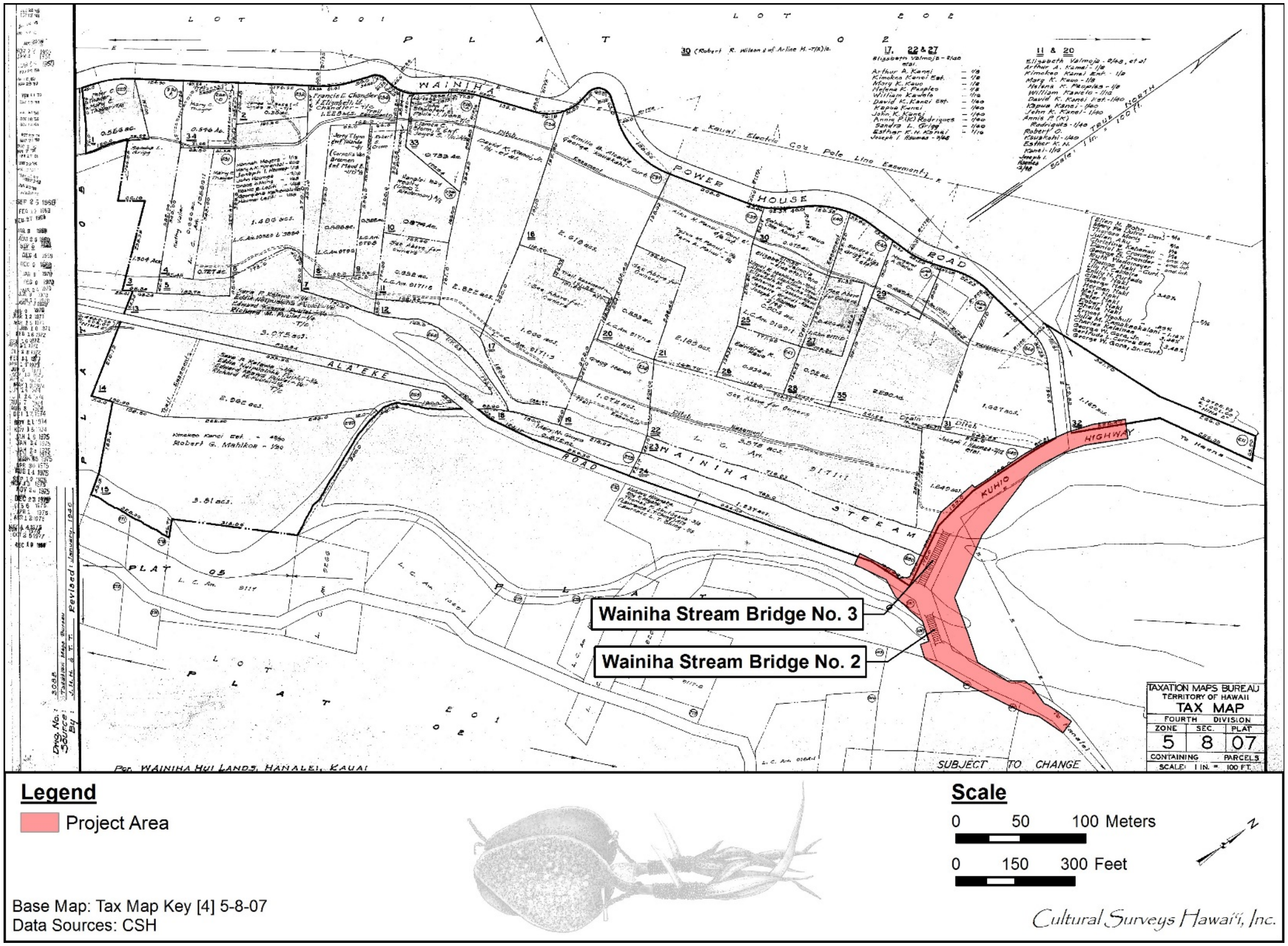


Figure 9. TMK: [4] 5-8-07, showing the Wainiha Stream Bridges 2 and 3 project area (Hawai‘i TMK Service 1984)

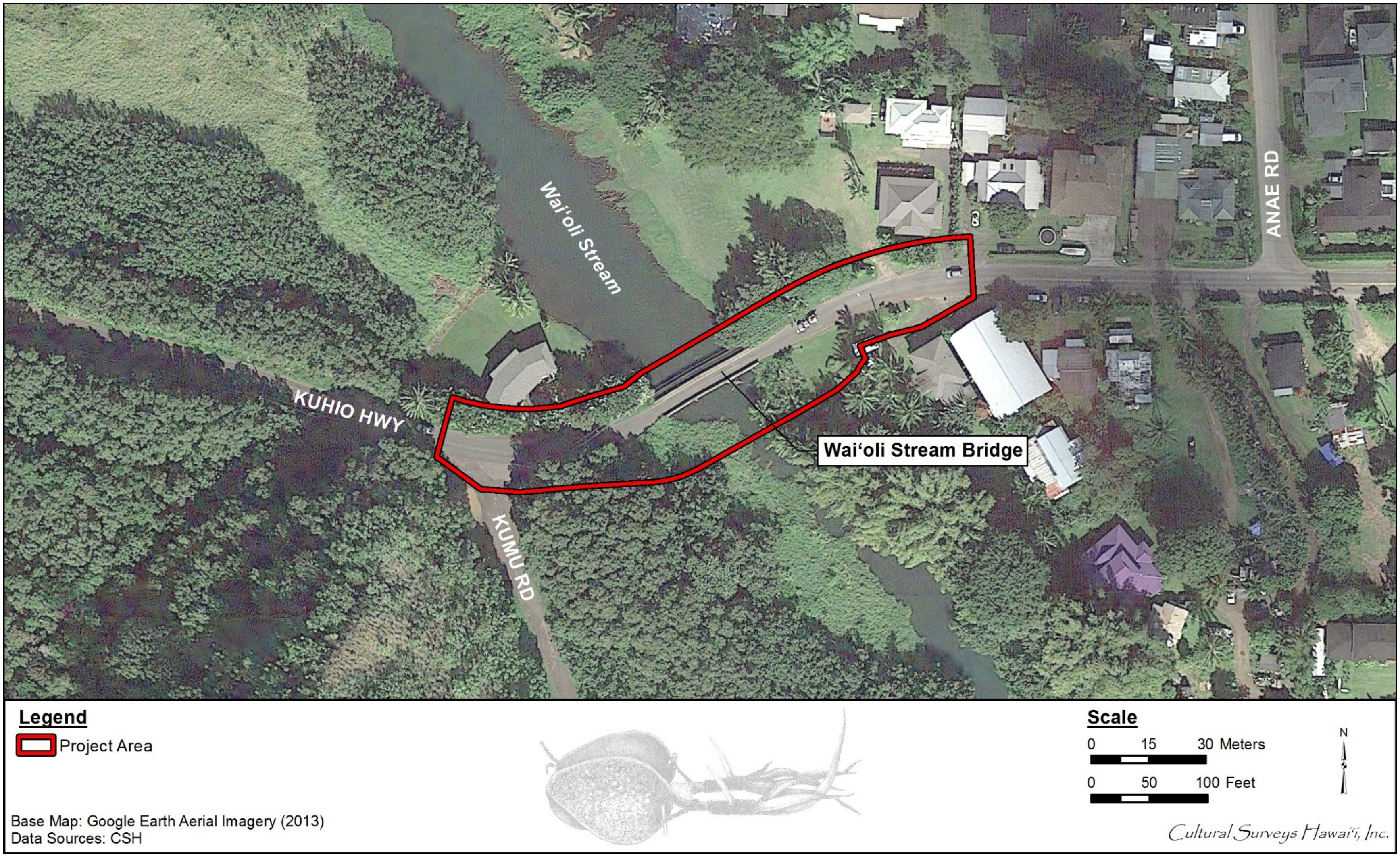


Figure 10. Aerial photograph (Google Earth 2013), showing the Waiʻole Stream Bridge project area

Figure 11. Aerial photograph (Google Earth 2013), showing the Waipā project area

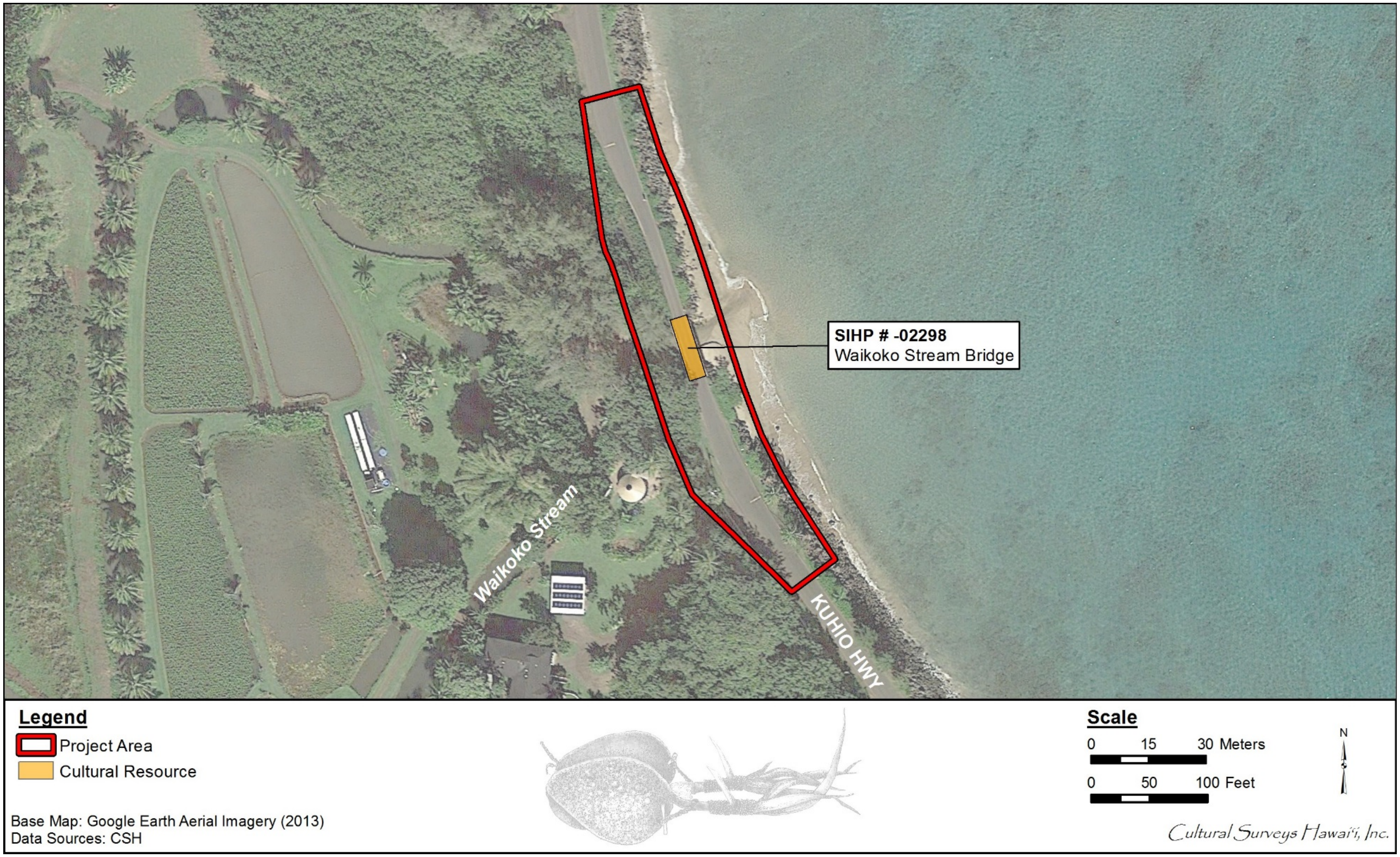


Figure 12. Aerial photograph (Google Earth 2013), showing the Waikoko project area

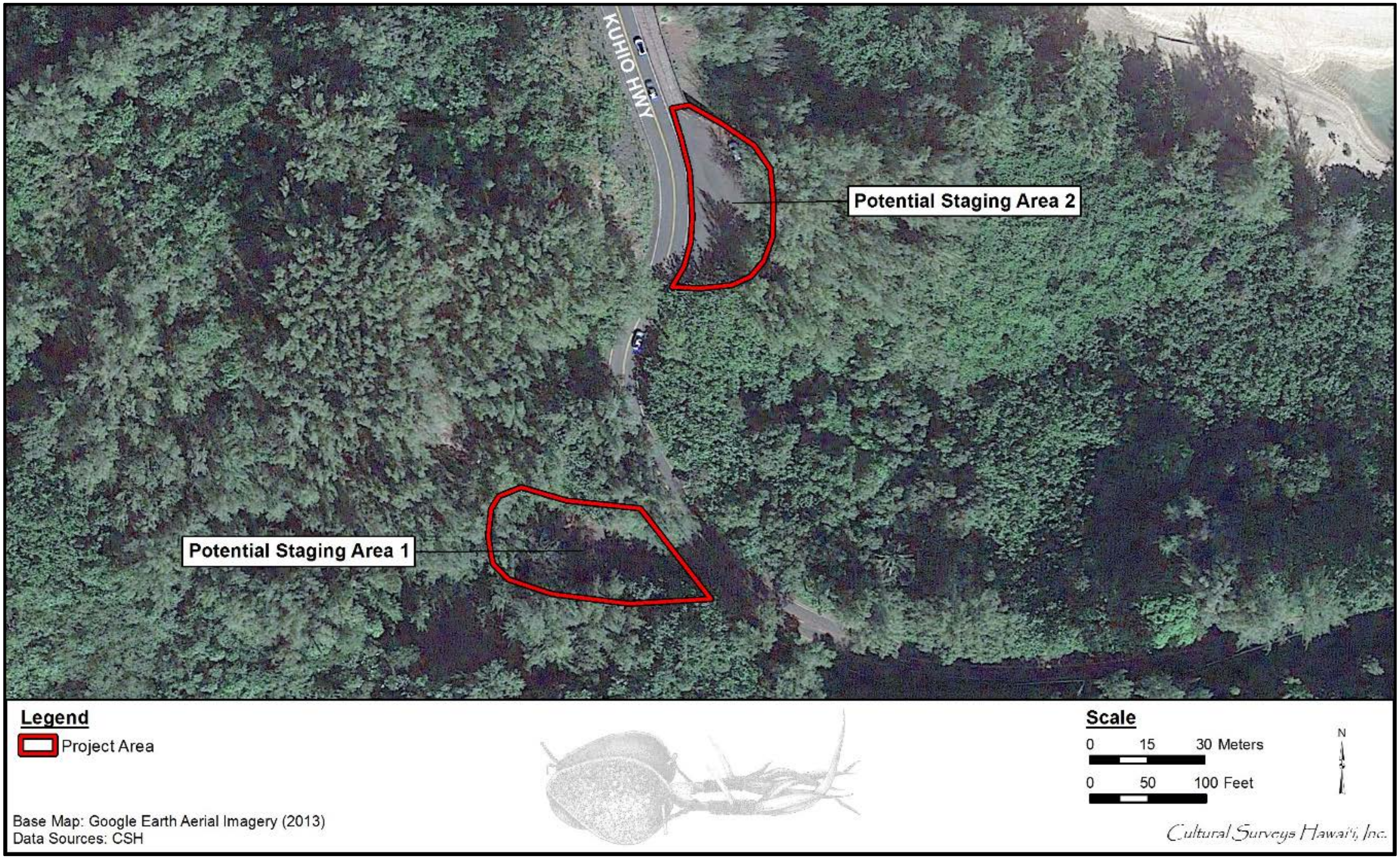


Figure 13. Aerial photograph (Google Earth 2013), showing the project areas of Potential Staging Areas 1 and 2

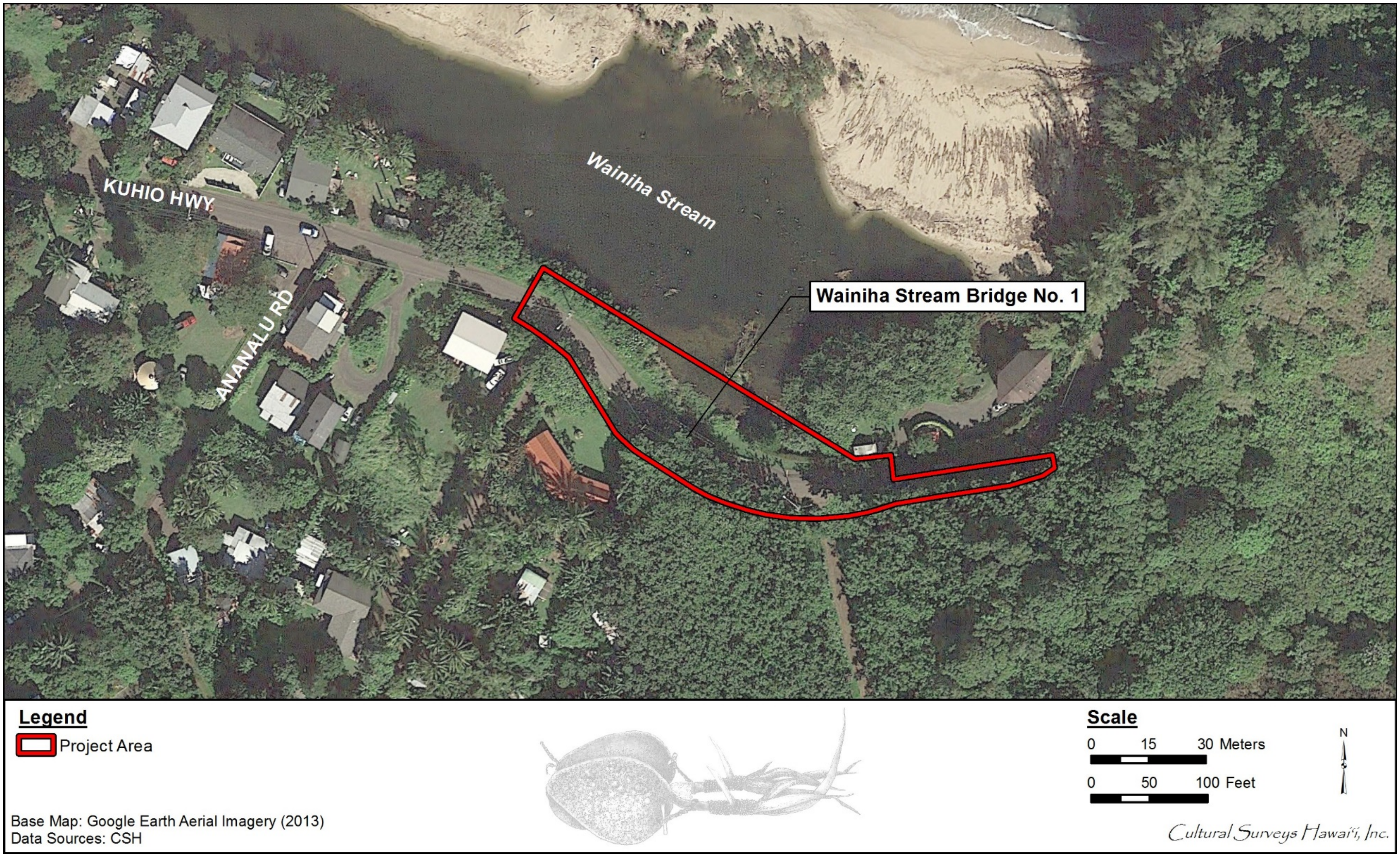


Figure 14. Aerial photograph (Google Earth 2013), showing the Wainiha Stream Bridge 1 project area

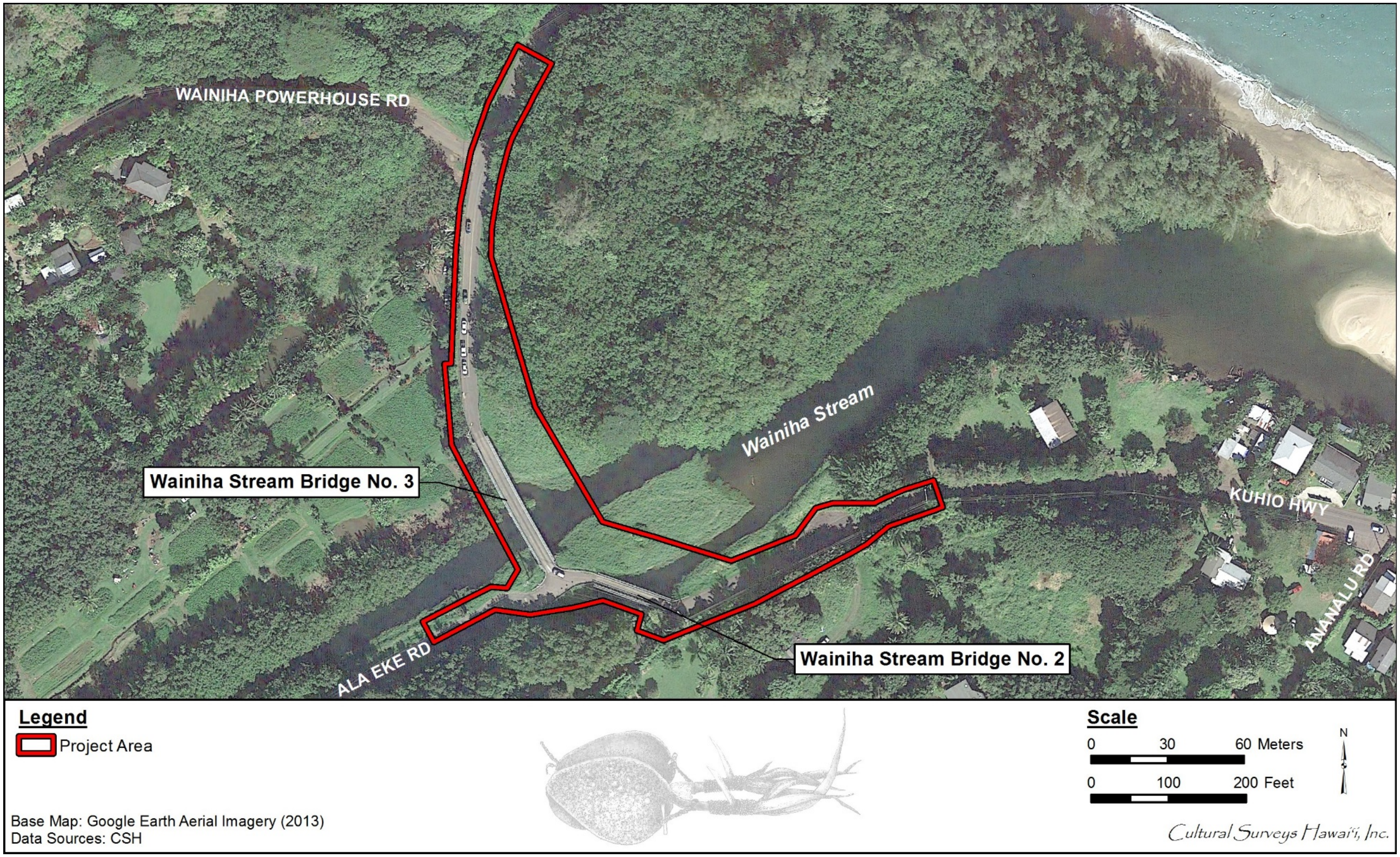


Figure 15. Aerial photograph (Google Earth 2013), showing the Wainiha Bridges 2 and 3 project area

In consultation with the SHPD, this AIS investigation was designed to fulfill the State requirements for an archaeological inventory survey per HAR §13-13-276. As well, all work pertaining to this AIS was consistent and conducted in accordance with the Department of the Interior's *Archaeological and Historic Preservation: Secretary of the Interior's Guidelines* (*Federal Register* 48[190]:44716ff and *Federal Register* 48[190]:44716ff; 29 September 1983). This archaeological investigation was conducted to identify, document, and make National Register of Historic Places (National Register) and Hawaiʻi Register of Historic Places (Hawaiʻi Register) eligibility recommendations for any cultural resources/historic properties. This report is also intended to support any project-related historic preservation consultation with stakeholders such as State and County agencies and interested Native Hawaiian Organizations (NHOs) and community groups, if applicable.

1.3 Scope of Work

The following archaeological inventory survey scope of work is designed to satisfy the Hawaiʻi state requirements for archaeological inventory surveys (HAR §13-276 and §13-275/284):

1. Historic and archaeological background research, including a search of historic maps, written records, Land Commission Award documents, and the reports from prior archaeological investigations. This research will focus on the specific project area's past land use, with general background on the pre-Contact and historic settlement patterns of the *ahupuaʻa* (traditional land division) and district. This background information will be used to compile a predictive model for the types and locations of historic properties that could be expected within the project area.
2. A complete (100 %) systematic pedestrian inspection of the project area to identify any potential surface historic properties. Surface historic properties will be recorded with an evaluation of age, function, interrelationships, and significance. Documentation will include photographs, scale drawings, and, if warranted, limited controlled excavation of select sites and/or features in addition to subsurface testing and core sampling to retrieve paleo environmental data. The fieldwork will comply with HAR §13-275 and 36 CFR Part 800 respectively.
3. As appropriate, consultation with knowledgeable individuals regarding the project area's history, past land use, and the function and age of the historic properties documented within the project area.
4. As appropriate, laboratory work to process and gather relevant environmental and/or archaeological information from collected samples.
5. Preparation of an inventory survey report, which will include the following:
   a) A project description;
   b) A section of a USGS topographic map showing the project area boundaries and the location of all recorded historic properties;
   c) Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
   d) Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, laboratory results, and significance, per the

requirements of HAR 13-276. Each historic property will be assigned a Hawaiʻi State Inventory of Historic Places (SIHP) number;

e) If appropriate, a section concerning cultural consultations (per the requirements of HAR §13-276-5[g] and HAR §13-275/284-8[a] [2]).
f) A summary of historic property categories, integrity, and significance based upon the Hawaiʻi Register of Historic Places and Hawaiʻi state historic property significance criteria;
g) A project effect recommendation;
h) Treatment recommendations to mitigate the project's adverse effect on any historic properties identified in the project area that are assessed as significant.

This scope of work includes full coordination with the State Historic Preservation Division/Department of Land and Natural Resources (SHPD) and Kauaʻi County relating to archaeological matters. Part of the SHPD mandated scope of work for an archaeological inventory survey includes specific documentation of located historic properties. This documentation includes recording their geographic location with a GPS on project area maps and written descriptions and may include, as appropriate, sampling, section drawings and profiles, plan views, and photographs. For traditional Hawaiian deposits, this can include analysis of recovered artifacts and midden. It often also includes radiocarbon dating of samples from cultural contexts. If historic-era deposits are located, then analysis of associated historic artifacts is often required.

1.3.1 Consultation

The Wainiha Bridges project is a HDOT and FHWA/CFLHD partnership project. No cultural resources have been assessed as having traditional cultural significance (HAR §13-275-6 Criterion "e") within the project area. Presently, National Historic Preservation Act Section 106 consultation with community, agency, and Native Hawaiian Organizations is being conducted by FHWA and by CSH to provide a cultural impact assessment (CIA) addressing HRS 343 (Liborio and Hammatt 2015):

> We begin our consultation efforts with utilizing our previous contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kamaʻāina* (native born), cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior's NHO list), and community groups. We also contact agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response on the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts…CSH seeks *kōkua* (assistance) and guidance on identifying past and current traditional cultural practices of the study area. Those aspects include: general history of the *ahupuaʻa*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*kaʻao* and *moʻolelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area. [Liborio and Hammatt 2015:15]

1.3.2 Definitions of Cultural Resources and Cultural resources

As discussed in the following paragraphs, there are important distinctions between the Federal and Hawai‘i State definitions of cultural resources. To eliminate any confusion these different definitions might cause, CSH has opted in this document to use the more generic term “cultural resources” as defined below in its discussion of the cultural remains within the current project area.

In historic preservation parlance, cultural resources are the physical remains and/or geographic locations that reflect the activity, heritage, and/or beliefs of ethnic groups, local communities, states, and/or nations. Generally, they are at least 50 years old (although there are exceptions) and include buildings and structures; groupings of buildings or structures (historic districts); certain objects; archaeological artifacts, features, sites, and/or deposits; groupings of archaeological sites (archaeological districts); and in some instances, natural landscape features and/or geographic locations of cultural significance.

Cultural resources, as defined under Federal historic preservation legislation (36 CFR 800.16), are any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization that meet the National Register criteria. Determinations of eligibility are generally made by a federal agency official in consultation with the SHPD. Under Federal legislation, a project’s (undertaking’s) potential effect on cultural resources must be evaluated and potentially mitigated. Under Hawai‘i State historic preservation legislation, cultural resources are defined as any cultural resources that are 50 years old, regardless of their historic/cultural significance under State law, and a project’s effect and potential mitigation measures are evaluated based on the project’s potential impact to “significant” cultural resources (those cultural resources assessed as significant based on the five State of Hawai‘i historic property significance criteria).

1.4 Environmental Setting

1.4.1 Natural Environment

The project sites, the study areas and the potential staging areas are located in five *ahupua‘a* on the north side of Kaua‘i: Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha (see Figure 1). Kūhiō Highway traverses many types of terrain including the large stream of Wai‘oli, stretches of coastal sands in the *ahupua‘a* of Waipā, Waikoko, Lumaha‘i, and Wainiha, along precipitous cliffs on the boundaries of Waikoko and Lumaha‘i and Wainiha and Hā‘ena. Modern vegetation is extremely diverse, including *hala* trees (*Pandanus tectorius*), *naupaka* (*Scaevola taccada*), *koa* (*Acacia koa*), melastoma (*Melastoma malabathricum*), bamboo (*Bambuseae*), yellow foxtail (*Setaria geniculata*), *hau* (*Hibiscus tiliaceus*), lantana (*Lantana camara*), false staghorn fern (*Gleichenia linearis*), lace fern (*Sphenomeris chusana*), spathoglottis (*Spathoglottis* sp.), paspalum (*Paspalum* sp.), *puhala* (*Pandanus odoratissimus*), rhodomyrtus (*Rhodomyrtus tomentosa*), silver oak (*Greviliea robusta*), guava (*Psidium guajava*), Java plum (*Syzygium cumini*), and scrubby *‘ōhi‘a lehua* (*Metrosideros collina*). The nearest temperature tracking station, located in Kīlauea (317 feet [ft] elevation) records an average (mean) minimum of 66 degrees Fahrenheit to an average maximum of 84 degrees Fahrenheit (Armstrong 1983). Given the project sites’ and study areas’ proximity to the coast, the average temperature ranges may be a few degrees higher. Rainfall averages around 80 inches per year (Juvik and Juvik 1998:56). Earle (1978) describes the Haleleʻa District surrounding the project area in terms of the natural topography and stream catchments as they relate to *ahupuaʻa:*

> Halelea is divided into nine *ahupuaʻa*, the boundaries of which were determined by topographic features. The four largest *ahupuaʻa*—Wainiha, Lumahai, Hanalei, and Kalihiwai—are each based on the catchment basin of a single large stream. The catchment areas of these streams are separated from each other by the dramatic ridges which form the political boundaries between ahupuaʻa . . . these boundaries deviate from the dominant, natural divisions so as to divide sections of critical resources between ahupuaʻa. The five smaller ahupuaʻa—Haʻena, Waikoko, Waipā, Waiʻoli, and Kalihikai—are based on the catchment areas of one or more smaller, permanent streams. [Earle 1978:25]

Reef structure and a related sand bar at the mouth of the Waiʻoli Stream creates a small estuary, naturally backing water *mauka* (inland, toward the mountains) of the Waiʻoli Stream Bridge. The surf break off the sand spit at the mouth of the Waiʻoli Stream is known as "Grandpaʻs." Manolau is the name of the inhabited first terrace *mauka* of Grandpa's and the steep ridgeline of Makaihuwaʻa Ridge marks the boundary of Waiʻole and Waikoko. Headed westerly along Kūhiō Highway toward the Waipā and Waikoko stream bridges, one enters Waipā Ahupuaʻa, just seaward of Makaihuwaʻa Ridge, and passes over the western portion of the Hanalei Plain at elevations of 6 meters (m) (20 ft), or less, above sea level, to the border with Waikoko Ahupuaʻa to the west. Figure 16 and Figure 17 indicate the soils series present within the project areas. Timothy K. Earle (1978) provides the following summation of Waipā Ahupuaʻa:

> The *ahupuaʻa* of Waipā is relatively small (6.8 square kilometers) but it includes several good areas for irrigated agriculture. Waipā has a coastal strip on Hanalei Bay, but no coral reefs. The boundaries extend inland to include the catchment area of the Waipā stream. This stream travels through a narrow valley until, 0.8 kilometers (km) from the sea, it enters a flat alluvial plain about 1.2 km across. The westerly 0.2 km of this plain is divided off as part of the *ahupuaʻa* of Waikoko. In addition to the dominant stream called Kīwaʻa which empties into the same alluvial flat. Discharge from this second stream has made the central and eastern parts of the flatland quite marshy . . . [Earle 1978:33]

The Waikoko Stream Bridge crossing exists immediately *mauka* of the Pohakuopio reefs, also known as the surf break "Waikokos" at the foot of Pohakuopio Ridge. The portions of the project area identified as Staging Areas 1 and 2 exist as switchback pull-out areas along Kūhiō Highway on Pohakuopio Ridge, a *makai* (seaward) extension of Puʻu Ka Manu, "the bird hill," or Puʻu Hinihini at an elevation of 210 m (690 ft) above sea level. The broad expanse of Lumahaʻi Beach exists downslope *makai* and to the west of these staging areas, punctuated by Kolokolo Point, where the mouth of the Lumahaʻi River creates an estuary similar to that of Waiʻoli. Timothy K. Earle (1978) provides the following overview for Lumahaʻi Ahupuaʻa:

> Lumahaʻi is a large *ahupuaʻa* (36.9 square kilometers) including the catchment area of the major stream, Lumahaʻi. Like Wainiha, the Lumahaʻi Stream starts in a deep valley thrusted into the central mountains of Kauaʻi. The upper part of the stream is joined by numerous tributaries, which rush down the steep valley slopes. About

> 1.5 kilometers (km) from the sea, the stream enters a compact alluvial plain bounded on either side by the valley ridges and on the sea by low sand dunes. The coast is 1.2 km long with no significant reefs. [Earle 1978:32]

Continuing westward on Kūhiō Highway, crossing Kolokolo Point to Wainiha Valley and the portion of the project area at Wainiha Stream Bridge 1 and Wainiha Stream Bridges 2 and 3. These portions of the project area cross the mouth of the Wainiha River at the Wainiha Beach Park, where a substantial sand bar extends across the river mouth to create a small estuary similar to those found at Waiʻoli and Lumahaʻi. Although there is some rock outcrop (rRO) where Waipā meets Waiʻoli Ahupuaʻa, the majority of the soil within this portion of the project area consists of Hihimanu silty clay loam with occasional slopes of 40 to 70% (HMMF) (Foote et al. 1972). Soils underlying the highway are as diverse as the landscapes it traverses. Beginning in Waiʻoli, the soils are identified as Mokuleia series and distinct variants stretch through Waiʻoli and along the entire plain of Waipā into Waikoko, only interrupted once by the volcanic ridge of Makaihuwaʻa that borders the highway just west of Waiʻoli Stream. The soils of this area are typical of the Hihimanu series. This soil underlies the highway until just after the Lumahaʻi Lookout where it again descends into the coastal flats and the associated Mokuleia sands. Beyond the Lumahaʻi Bridge, the highway ascends into soils identified as Rough Broken Lands (rRR) that extend to just west of Wainiha. According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), Mokuleia soils are described as follows:

> . . . well-drained soils along the coastal plains on the islands of Oahu and Kauai. These soils formed in recent alluvium deposited over coral sand. They are shallow and nearly level. Elevations range from nearly sea level to 100 feet. The annual rainfall amounts to 15 to 40 inches on Oahu and 50 to 100 inches on Kauai. The mean annual soil temperature is 74° F. Mokuleia soils are geographically associated with Hanalei, Jaucas, and Keaau soils. The soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of *kiawe*, *klu*, *koa haole*, and Bermuda grass in the drier areas and napier grass, guava, and *joee* in the wetter areas. [Foote et al. 1972:95]

Hihimanu soils are described as follows:

> . . . well-drained soils on uplands on the island of Kauai. These soils developed in material weathered from basic igneous rock and colluvium at the base of slopes. They are very steep. Elevations range from 100 to 2,000 feet. The annual rainfall amounts to 70 to 120 inches. The mean annual soil temperature is 69° F. Hihimanu soils are geographically associated with Hanalei and Hanamaulu soils. These soils are used for water supply, pasture, wildlife habitat, and woodland. The natural vegetation consists of *koa*, melastoma, yellow foxtail, lantana, false staghornfern, paspalum, *hala*, guava, *ohia*, and associated shrubs and grasses. [Foote et al. 1972:40]

Rough Broken Lands (rRR) are described as follows:

> . . . consists of very steep land broken by numerous intermittent drainage channels. In most places it is not stony. It occurs in gulches and on mountainsides on all the Islands except Oahu. The slope is 40 to 70 percent. Elevations range from nearly

> sea level to about 8,000 feet. The local relief is generally between 25 and 500 feet. Runoff is rapid, and geologic erosion is active. The annual rainfall amounts to 25 to more than 200 inches. These soils are variable. They are 20 to more than 60 inches deep over weathered rock. In most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common . . . This land type is used primarily for watershed and wildlife habitat. In places it is used also for pasture and woodland. The dominant natural vegetation in the drier areas consists of guava, lantana, Natal redtop, bermuda grass, *koa haole*, and molasses grass. *Ohia, kukui, koa*, and ferns are dominant in the wetter areas. Puakeawe, *aalii*, and sweet vernal grass are common at the higher elevations. [Foote et al. 1972:119]

Soil types in the project areas are shown in Figure 16 and Figure 17.

1.4.2 Built Environment

The overall project area includes project sites, potential staging areas, and environmental study areas in Waiʻoli, Waipā, Waikoko and Wainiha. All these locales are sections of Kūhiō Highway (Route 560, also a National Register of Historic Places [NRHP] and Hawaiʻi Register of Historic Places [HRHP] site known as the Kauaʻi Belt Road), a stretch of highway from the vicinity of the Hanalei Valley overlook in the east to Kēʻē in the west.

> Kuhio Highway is the only link to the main urban facilities of Kauai for residents westward beyond the project area on the north shore. Residents, the community and businesses depend entirely on the highway for access for the transportation of goods, visitors, travel to and from schools, stores, the airport, hospitals and places of work. [Hawaiʻi Department of Transportation 2011:3]

Kūhiō Highway enters Waipā Ahupuaʻa on the east just seaward of Makaihuwaʻa Ridge (just west of Waiʻoli Stream) and passes over the western portion of the Hanalei Plain at elevation below 20 ft to the border with Waikoko Ahupuaʻa (to the west). On the eastern banks of the Waipā Stream crossing, *mauka* of Kūhiō Highway, the Waipā Foundation has built its facilities for a non-profit organization working to restore Waipā as a Native Hawaiian learning and community center (Figure 18). At the Wainiha River crossing is the Wainiha Beach Park and a small community of single family residences, vacation rentals, and the Wainiha General Store, a small family-owned grocery store (Figure 19). Generally speaking, the entire project area exists in a relatively undeveloped and serene portion of the north shore of Kauaiʻi, between the extensive preserves of Kamehameha School, HonoʻOnapali Natural Reserve, the Alakaʻi Wilderness Preserve and the Halelea Forest Reserve.

> After crossing Waipā Bridge, the road follows the beach along the west shore of Hanalei Bay. The road then winds up and around the mountain ridge as it proceeds to Lumahaʻi Valley. As it winds over the ridge, the road reaches an elevation of nearly 16’ above sea level. Descending into Lumahaʻi Valley, the road again follows the beach before crossing Lumahaʻi Bridge and leaving the valley. Another mountain ridge is traversed before entering Wainiha Valley, where the road crosses the three Wainiha Bridges and passes through the small village of Wainiha. [Fung Associates 2013:10]

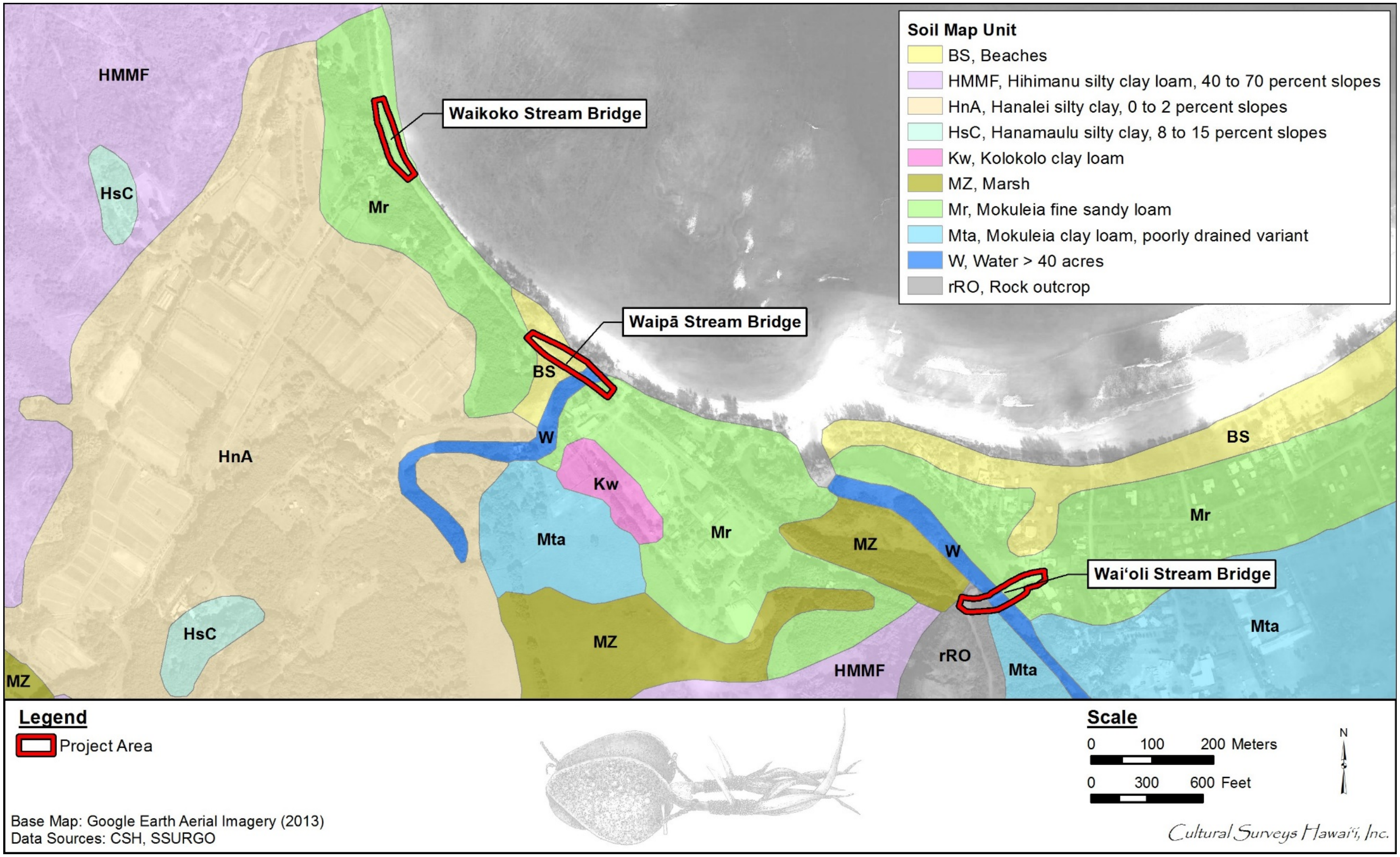


Figure 16. Aerial photograph (Google Earth 2013), showing a portion of the Wainiha Bridges project areas, with overlay of soil series (soil boundaries from Foote et al. 1972, data source SSURGO 2001)

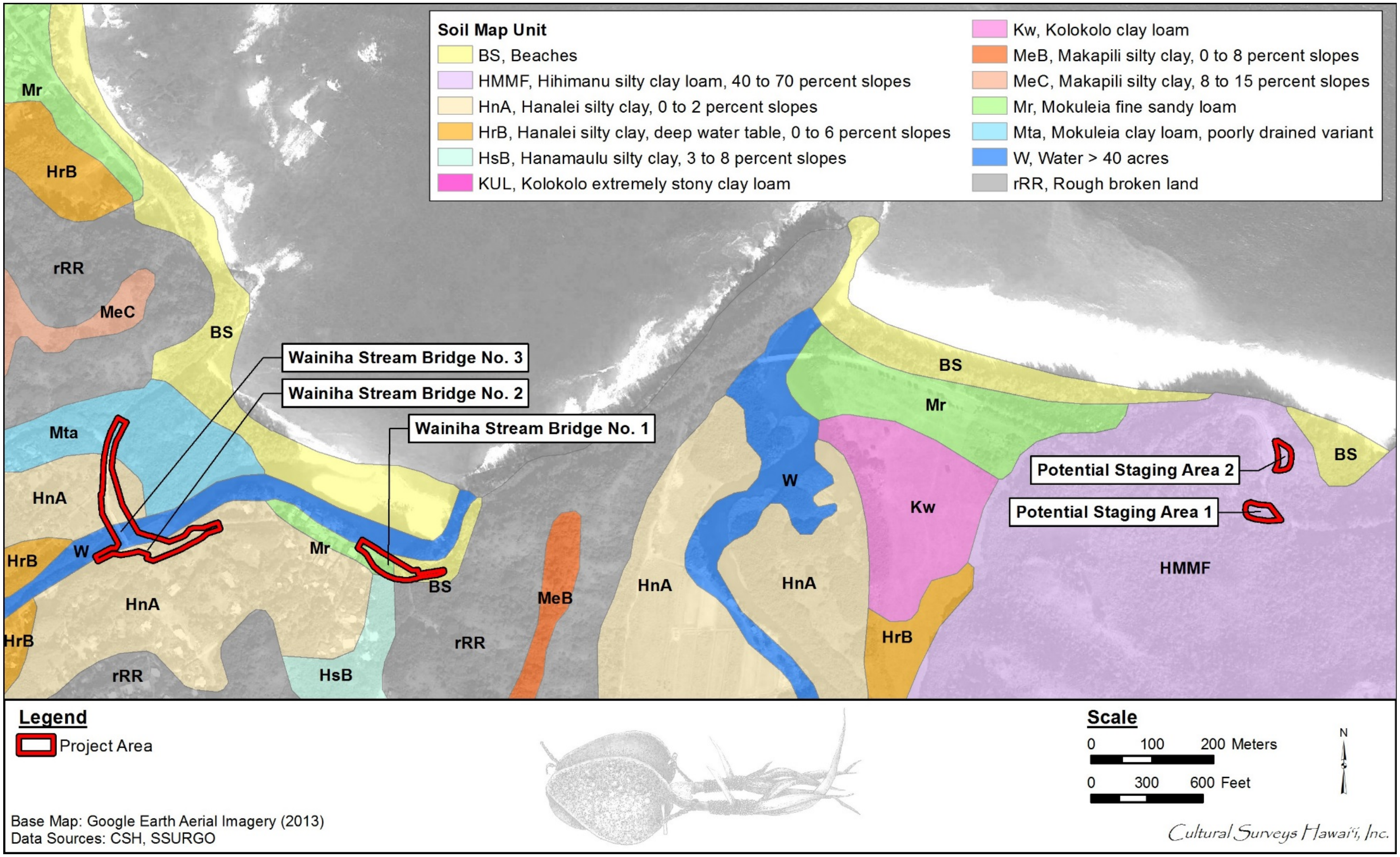


Figure 17. Aerial photograph (Google Earth 2013), showing a portion of the Wainiha Bridges project areas, with overlay of soil series (soil boundaries from Foote et al. 1972, data source SSURGO 2001).

Figure 18. Entrance to the Waipā Foundation and a portion of Kūhiō Highway, view to west immediately east of the Waipā Stream Bridge

Figure 19. The Wainiha General Store and a portion of Kūhiō Highway, view to west at the western terminus of the Wainiha Stream Bridge 1 portion of the project area

Section 2 Methods

This section details the methods used by CSH personnel during fieldwork and the preparation of this document. CSH completed the archaeological inventory survey (AIS) fieldwork, in compliance with HAR §13-276 and under archaeological permit number 15-03, issued by the Hawaiʻi State Historic Preservation Division (SHPD) per HAR §13-13-282.

2.1 Field Methods

2.1.1 Pedestrian Survey

With the exceptions of the streams, a 100% pedestrian survey of the project site and study area and the potential staging areas was undertaken for the purpose of cultural resources identification and documentation (Figure 20 through Figure 22). The following methods were used to complete the pedestrian inspection of the current project area:

1. The boundary of the project area was identified and maintained during the course of the pedestrian survey using a Garmin GPSMap 60CSx handheld GPS unit with the project area data uploaded and visible on the map screen;
2. The pedestrian survey of the study area was accomplished through systematic transects at 2 to 5 m (6.5 to 16 ft) intervals, paralleling the long axis of the project site areas, the environmental study areas, and the potential staging areas.

Any historic properties identified within the project area were documented with:

1. A detailed written description and evaluation of function, interrelationships, and significance;
2. Digital photographs;
3. Drawings and site profiles to scale using standard tape-and-compass mapping procedures; and
4. Cultural resources were located using a Garmin GPSMap 60CSx handheld GPS unit and/or Trimble Pro XH mapping grade GPS unit with a real-time differential correction. This unit provided sub-meter horizontal accuracy in the field. GPS field data was post-processed, yielding horizontal accuracy between 0.5 and 0.3 m. GPS location information was converted into GIS shape files using Trimble’s Pathfinder Office software, version 2.80, and graphically displayed using ESRI’s ArcGIS 9.1.

2.1.2 Shovel Testing

All shovel tests (ST) measured at least 0.5 m by 0.5 m and were excavated and documented according to the following methods (Figure 23):

1. The location of each ST was plotted on the plan view map;
2. Excavation occurred according to stratigraphy, with sediments from each identified stratum; and
3. Recording of soil stratigraphy was made by scale drawing of at least one profile per ST, as well as soil descriptions for each unit using standard USDA Soil terminology.

2.2 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawaiʻi, the Hawaiʻi State Archives, the Mission Houses Museum Library, the Hawaiʻi Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawaiʻi State Archives and the Bishop Museum Archives; Kauaʻi Historical Society; the Kauai Museum; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ʻAina database (Waihona ʻAina 2000) and OHA's Papakilo Database (OHA 2014). This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of cultural resources in the project area.

Figure 20. CSH archaeologist conducting pedestrian survey of a portion of the project area

Figure 21. Potential Staging Area 1 within the project area

Figure 22. Potential Staging Area 2 within the project area

Figure 23. CSH archaeologist conducting Shovel Test 4 within the project area

Section 3 Background Research

3.1 Overview

The Island of Kaua‘i, affectionately described as "*Kaua‘i nui moku lehua pane‘e lua i ke kai*" (Great Kaua‘i of the lehua groves which seem to move two-by-two to the shore), is the oldest of the larger main Hawaiian Islands (Maly and Maly 2003:5). Historically, it was divided into several districts and political units which in ancient times were subject to various chiefs—sometimes independently, and at other times, in unity with the other districts; these early *moku o loko* or districts included Halele‘a, Kona, Ko‘olau, Nāpali, and Puna (Maly and Maly 2003:5). The lands of the Halele‘a-Nāpali districts were highly valued by the *maka‘āinana* (commoner) because of the streams and fresh water resources that could be diverted into extensive *lo‘i kalo* (taro pond field systems). The wealth of these lands was further enhanced by the sheltered bays and rich fisheries fronting them (Maly and Maly 2003:6).

The project sites, environmental study areas, and potential staging areas are located in the traditional *ahupua‘a* of Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha in the ancient district of Halele‘a (see Figure 1), one of five ancient districts on Kaua‘i (King 1935:228). This report examines legends and myths in the Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha Ahupua‘a for information regarding traditional Hawaiian customs and practices. Legendary accounts for these five *ahupua‘a* are included from the eastern *ahupua‘a* of Wai‘oli to the western *ahupua‘a* of Wainiha. For the purpose of this study, Waipā and Waikoko Ahupua‘a are treated together because of their size and the relatively modest recorded traditions.

3.2 Traditional and Historical Background

With extensively cultivated *kalo* (taro) regions and fishing areas that provided an abundant food supply, the North Shore of Kaua'i was well populated in ancient times. Traditionally, Hawaiians relied on their well-developed navigational skills and would have traveled along the coast by canoe. The Hawaiian population living in the north shore valleys may have also traveled along an ancient foot trail that connected communities between Hanalei and Ha‘ena (Fung Associates 2013:11).

3.2.1 Traditional and Legendary Accounts of Wai‘oli

Ka-nē-loa Seeks a Bride, the Kapa of Wai‘oli

A romantic narrative of unknown origin called "Wai‘oli" is retold by Frederick B. Wichman in *Kauai Tales* (1985:44–60). This legend tells of the god Ka-nē-loa coming to Kaua‘i and landing at Manolau/Monolau, a place where Wai‘oli Stream enters the ocean and where canoes would be moored, to seek a bride. This visit brings the rainbow to Kaua‘i. The legend describes the making of different colored tapa associated with specific place names in Wai‘oli. Specific reference is made to a number of things used for tapa making including *noni*, *‘alani wai*, *‘ōlena*, *mamaki*, *‘uki‘uki* berries, sea urchins, *hala*, *kalili*, burned sugarcane, coconut milk, and *maile*.Wai‘oli was a center of tapa arts. Charles Wilkes, Commander of the United States exploring expedition who attended Rev. William Alexander's church in Wai‘oli in 1840 remarked,

> They were all much struck with the dress of the native women, its unusual neatness and becoming appearance. It seemed remarkable that so many of them should be

> clothed in foreign manufacture, and that apparently of an expensive kind; but on closer examination, the dressed proved to be *tapas*, printed in imitation of merino shalls, ribands . . . [Riznik 1987:10]

Laka and the Heiau of Nakikoniawaiaau (SIHP # 50-30-03-145) in Waiʻoli

Thomas Thrum in his 1907 Annual describes the *heiau* of Nakikoniawaiaau (SIHP # 50-30-03-145) in Waiʻoli uka as "An open paved space, not large, dedicated to Laka, to which offerings at the annual festivities were brought" (Thrum 1907:43).

Lonoikamakahiki

Kamakau and Fornander tell of Lono-i-ka-makahiki, a son of Keawe-nui-a-ʻUmi who goes crazy and wanders for a long time on Kauaʻi and when he regains sanity, his faithful attendant sings a song reminding him of the places they wandered, especially on Kauaʻi, and one of the lines recalls "Ka ua hoʻopala ʻohiʻa o Waiʻoli—The rain that ripened the mountain apples of Waiʻoli" (Fornander 1919:4(2):358–359; Kamakau 1961:52)

Fornander's account of Keawe-nui-a-ʻUmi, who lived sometime in the sixteenth century, in the "Story of Lonoikamakahiki" gives the same interpretation (Fornander 1917-1918:4(2):358–359).

Menehune Lighthouse at Makaihuwaʻa

Makaihuwaʻa Ridge, the steep prominence overlooking the Waipā and Waikoko Stream Bridges includes three excavated pits on its ridgeline, a nearby village where tapa was traditionally produced, a taro *loʻi* and *heiau* (non-Christian place of worship) at its base. These significant cultural properties are discussed briefly below and further in Section 3.5. The Menehune Lighthouse at Makaihuwaʻa is a reference to excavated pits in the steep ridgeline face on the western margin of Waiʻoli, just *mauka* of Kūhiō Highway (Wheeler et al. 2013b). The possibility that these excavated pits are connected with traditional and legendary accounts of this location is explored more in Section 3.5.

Manolau/Monolau where Waiʻoli Stream enters the ocean was inhabited and is a place where tapa was traditionally produced. Kupakoili Heiau, once at the northwest base of Makaihuwaʻa Ridge, is also likely related to this traditional village and a canoe mooring in the estuary created by the sand bar at the mouth of the Waipā Stream. It is at Manolau/Monolau that canoes were moored and, in the Waiʻoli story, tapa is beaten. It seems probable the area where Waiʻoli Stream enters the ocean was a preferred landing and staging area and that, at least at times, fires would burn on Makaihuwaʻa Ridge to guide canoes into this estuary.

Makaihuwaʻa is translated, *maka-ihu-waʻa*, eye (prominence or mark)-nose-canoe, perhaps a reference to the signal fires discussed by Wichman (1998) in Appendix A, or even referring to phosphorescent glowing water at night. It is possible that from the ridgeline one could view phosphorescent algae glow seen in the water at night. Or it may be that the name references the vision one may have had when paddling near shore looking at the nose of one's canoe and seeing these reflections of glowing signal fires or of the phosphorescent algae in the water. That is, the lights in the water were seen at the nose of the canoe because the canoe was breaking the water and agitating the algae, causing it to glow. Regarding Makaihuwaʻa Ridge, Wichman (1998:113) relates the following:

> Makaihuwaʻa, ʻeyes for the canoe prow,ʼ is a ridge rising from the Waiʻoli River. Menehune fishermen complained that on dark nights they could not find their way back to land when fishing on the deep ocean. Their chief devised a plan. He ordered his men to dig out a platform halfway up the ridge and place large torches there. On a dark night the light from these torches could easily be seen from outside the bay. In this way the first lighthouse in Hawaiʻi was built. [Wichman 1998:113]

The original source for this account is cited as Joseph A. Akina's "The Story of the Menehune People" from 1904 (translated by Frances Frazier). A longer account is provided in Wichman's (1985:35–42) "Ma-Ka-Ihu-Waʻa" chapter of *Kauai Tales* (presented in full in present Appendix A). This account provides details that fishermen operating out of Hanalei Bay scattered from Hāʻena to Kīlauea. An undercurrent of the story is that *menehune* (legendary small people) proverbially had to complete their work at night which would require *menehune* fishermen getting back to shore in the pre-dawn in order to "feed all the Menehune at their daily feast that finished just before daybreak" (Wichman 1985:36). In the Wichman (1985) account it is the concern of a *menehune* chief for the welfare of his people that leads him to ponder a solution to the *menehune* fishermens' problem. As he moves about at night, his attendants carry torches and *lamakū* (*kukui* nuts strung on a midrib; signal fires). He gets the idea to use such *kukui* nut torches as an aid to navigation and in the pre-dawn set "a line of *lamakū* burning and sputtering along the beach." The experiment helped a little but the light could not be seen from far off shore. The leader of the fishermen (described as owl-like) said, "The idea is good. The lights are good. But they need to be higher." (Wichman 1985:40). Thus:

> The chief . . . climbed up the ridge. When he could look out over the treetops and the clouds swirled just above his head, the chief . . . [said] ʻHere we must dig out a platform from the edge of the ridge, large enough to place all the *lamakū* we need to light our fishermen home again.ʼ The Menehune went about the chore with their usual good sense, sound engineering, and the knowledge that many hands working together make any chore easier and quicker. A small platform dug out of the side of a hill was a simple chore compared to many others they had done in years past . . . One group dug away the dirt and formed the platform. Another group formed a line reaching to the river beds of Waipaʻa and Waikoko and passed smooth stones hand to hand to the work site. Before half the night was gone the platform was finished and paved with stones. All that time the torchbearers were busy trying to keep their torches lit . . . the rain sometimes fell so hard that the flames sputtered and danced away so far they became lost and went out. The chief sat father up the ridge where he could see the work, and his voice shouting instructions could be heard. ʻBuild a roof over the platformʼ he yelled into the stormy night. ʻIt must be higher in front than in back. It must protect the torches from the rain. It must also be high enough so the roof won't catch on fire.ʼ No sooner said than the work started. One group cut logs for uprights and the roof frame. Another group went for banana leaves which, laid down carefully, made a waterproof cover. Soon a flat roof with no walls had been built over the platform. The *lamakū* were set in place and lit. For the rest of the night the flames sputtered and danced and poured a beacon of light into the dark and stormy night. [Wichman 1985:41–42]

As a result of the development of the effective aid to navigation, the fishermen have a great catch, the chief is adored, and Haleleʻa is a house of joy.

Moʻo Accounts

The hill Ka-moʻo-kōlea-ka was once a dangerous *moʻo* (dragon) who lured the unwary to their deaths with a show of friendliness (Wichman 1985:49).

ʻŌlelo Noʻeau (Sayings and Proverbs)

When Kamehameha dreamed of conquest of Kauaʻi, he mentioned the southernmost boundary of Waiʻoli, Namolokama, as one of the places he wished to enjoy:

> *E holo a inu i ka wai o Wailua, a hume i ka wai o Nāmolokama, aʻai i ka ʻanae ʻau of Kawaimakua i Hāʻena, a lei hoʻi i ka pahapaha o Polihale, a laila, hoʻi mai a Oʻahu, ʻoia ka ʻāina e noho ai*
>
> Let [us] go and drink the water of Wailua, wear a loincloth in the water of Nāmolokama, eat the mullet that swim in Kawaimakua at Hāʻena, wreathe [ourselves] with the seaweed of Polihale, then return to Oʻahu, the land to dwell upon. [Pukui and Elbert 1986:271]

Another saying is, "*ʻUʻina ka wai o Nāmolokama*" (The water of Nāmolokama falls with a rumble) because Nāmolokama Falls, Kauaʻi is famous in chants and songs (Pukui 1983,:313:Proverb 2860).

Rain Names of Waiʻoli

The rain that ripened the mountain apples of Waiʻoli (*Ka ua hoʻopala ʻohiʻa o Waiʻoli*) is referred to in the Lonoikamakahiki traditions (Fornander 1919:4(2):358–359; Kamakau 1961:52). Wichman's (1985:49) account of "Waioli" associates Lani-huli, with the yellow rain called Ua-lena. Wichman (1998:113) relates that the wind associated with the massif Nāmolokama is "Ua-lani-pili," "rain of the near heavens."

Wind Names of Waiʻoli

Accounts of the "Legend of Kuapakaʻa" name the wind of Waiʻoli as "Waiamau" (*He waiamau ko Waiʻoli*) (Fornander 1917-1918:5(1):96–97). Wichman (1998:113) relates that the wind associated with the massif Nāmolokama is "Ua-lani-pili," "rain of the near heavens."

3.2.2 Traditional and Legendary Accounts of Waipā and Waikoko

Waipā Ahupuaʻa is located on the north shore of the island of Kauaʻi between the *ahupuaʻa* of Waiʻoli (east) and Waikoko (west). The relationship between these *ahupuaʻa* is shown on Figure 1. Place names mentioned in this section are compiled from a few sources (Land Commission Awards [LCA]; Pukui et al. 1974; Wichman 1985):

Waipā and Waikoko Place Names

Awaa	*ʻIli* (land section; subdivision of an *ahupuaʻa*) of Waipā (LCA 10663:1)
Haaheo	*ʻIli* of Waipā (LCA 10076:2; 10171)
Haako	*ʻIli* of Waipā (LCA 9832)
Halaloa	*ʻIli* of Waipā (LCA 235-N:1)

Halulu	Wichman (1985:114) cites this as a place in Waipā named after a fabulous bird.
Hanalei Bay	USGS map, coastal frontage of Waipā and eastern Waikoko; literally "crescent bay" (Pukui et al. 1974:40–41); Wichman (1985:108) traces the name to "wreath making" and "*lei* valley" relating "The wreaths are the rainbows that appear in the upper valley from the constant rain showers."
Kahalahala	Wichman (1985:115) cites this as a beach near Makahoa Point named after the "young stage of the *kāhala* (*Seriola dumerilii*) fish."
Kahihiilu	*ʻIli* of Waipā (LCA 7918:3)
Kahulaʻana	Wichman (1985:116) cites this as "a cliff-point at the seashore where one must swim around to the beach on the other side of the cliff" near Makahoa Point.
Kaluanono	*ʻIli* of Waipā (LCA 10171)
Kamani	USGS map, 1,002-ft high peak on west boundary of Waipā with Lumahaʻi
Kaooa	USGS map, area on east boundary ridge where Waikoko, Waipā, and Lumahaʻi come together
Kapailu	USGS map, area on west boundary of Waipā with Lumahaʻi at approximately 2,000 ft elevation
Kapalikea	USGS map, approximately 1,000-ft high peak, east boundary of Waipā and Waiʻoli
Kapuhae	*ʻIli* of Waipā (LCA 7918:2)
Kawahine	*ʻIli* of Waipā (LCA 7918:1)
Kīwaʻa	Wichman (1985:114) cites this as a place in Waipā named after a fabulous bird.
Kolopua	USGS map, 1,270-ft high peak on west boundary of Waipā with Lumahaʻi
Kuahua	USGS map, flats back from coast shared by Waikoko and Waipā
Kuhihiilu	*ʻIli* of Waipā (LCA 7918:3)
Mahina Kēhau	USGS map, approximately 1,600-ft high peak on west boundary with Lumahaʻi
Makahoa Point	Point, Hanalei Bay; ridge and *heiau* near Kaunalewa Kauaʻi; literally, "friendly point" (Pukui et al. 1974:140)
Makaihuwaʻa	USGS map, coastal ridge on east boundary of Waipā with Waiʻoli
Māmalahoa Peak	USGS maps, 3,745-ft high peak where Lumahaʻi, Waipā, and Waiʻoli come together; peak, Hanalei District, Kauaʻi (Pukui et al. 1974:144); perhaps named after a wife of the god, Kāne (Wichman 1985:113)

Papahoiki	*ʻIli* of Waipā (LCA 10661)
Puʻaʻanui	*ʻIli* of Waipā (LCA 235-N:2)
Puʻu Ka Manu	USGS map, 690-ft high hill on east boundary with Waikoko; literally, “the bird hill” (Pukui et al. 1974:198)
Waiakaaka	*Moʻo* (narrow strip of land, smaller than an *ʻili*) of Waipā (LCA 3917:4)
Waipā	Land division and stream; literally, “touched water” (Pukui et al. 1974:227); Wichman (1998:114) relates the meaning “to request to the gods in prayer”
Waiokihi	USGS map, 947-ft high peak on east boundary of Waipā with Waiʻoli
Waioli	*ʻIli* of Waipā (LCA 10663:2)
Waipaʻa	Given by Wichman (1985:114) as a variant of Waipā, “dammed-up water” referring to the frequent building up of a sand bar at the stream mouth

Damming of the Waters of Waipā

Wichman (1998) refers to a tradition behind the periodic damming of the waters of Waipā by a sand bar at the coast:

> This, according to legend, was caused by a chief named Lauhaka. His mother left her husband, Kalākānehina, the ruling chief of Waimea, during the time of the kona kingdom because of his cruelty. Lauhaka was raised in the mountains by his uncle, a bird catcher. Learning that two bird catchers were catching the forbidden *ʻuaʻu*, the dark-rumped petrel, Kalākānehina sent some warriors to kill them. Lauhaka stationed himself on the steep path where only one man at a time could come toward him. As Lauhaka killed the soldiers the bodies fell into the stream and dammed up the river. [Wichman 1998:114]

Wichman (1998) also connects the naming of Waikoko to this story:

> When Lauhaka was damming up the neighboring stream, the blood from the soldiers flowed into this stream and colored it red. In Ancient times, however, an aquatic plant grew in this stream that dyed the water red, but these plants disappeared when rice began to be grown here. [Wichman 1998:115]

Fabulous birds: Halulu and Kīwaʻa

Wichman (1998) relates traditions of fabulous birds (both particularly associated with the Legend of Aukele) associated with two places at Waipā, Halulu, and Kīwaʻa:

> Halulu was the bird that the great god Kāne sent to the four directions of chaos to announce that he was about to create the world. *Halulu* was also the man-eating bird that could take on human form when he wished . . . Kīwaʻa was Halulu’s sister . . . The *Kīwaʻa* is also the pilot bird that leads a navigator through the surf to the canoe shed at the landing place. [Wichman 1998:114]

ʻŌlohe

Wichman (1998) retells a tale of brigands associated with Makahoa Point and an adjacent beach Kahalahala:

> Ka-puʻaʻa-pilau and two friends lived here, robbers well trained in the art of lua (bone-breaking). They were *ʻōlohe* (robbers who removed all the hair from their head and body and kept their skin well-oiled and slippery). An *ʻōlohe* inherited a fearsome reputation, usually well deserved. One of his friends watched from the ridge. If several travelers came together, the lookout called out, 'High tide!' and they were not attacked. However, if a single traveler, well-laden with goods came along, the look-out called, 'Low tide!' and the traveler was attacked, killed, and his body placed in a hole in the tongue of lava at the foot of Makahoa Ridge. In time, the body was taken out to sea by the waves and brought ashore onto the sands. The *konohiki* of Wainiha was disturbed that so many bodies were coming ashore and sent a man to spy on the situation. This man saw and heard what was happening and reported back to his chief. The chief and his warriors successfully killed the three robbers, and their bodies were thrown into the pit where they had disposed of their own victims. [Wichman 1998:115–116]

Moʻo Accounts

Wichman (1998) tells a traditional tale of Ka-hulaʻana—"a cliff point at the seashore where one must swim around to the beach on the other side of the cliff" which is probably related to the following Hiʻiaka account:

> When Hiʻiaka and Wahine-ʻōmaʻo came, Hoʻohila, the *moʻo* who guarded the cave sent large waves to see what Hiʻiaka would do. Wahine-ʻōmaʻo scooped up a handful of sand and flung it into the *moʻo*'s eyes. Hoʻohila retreated into her cave, her spell forgotten. The waved died down and Hiʻiaka and her friend continued on their way. [Wichman 1998:115–116]

This path washed out anytime there was a storm, which meant a traveler had to return home to wait until the path had been repaired or swim around it in dangerous waters.

ʻŌlelo Noʻeau:

Pukui et al. (1974:227) explains the name "Waipā" as meaning "touched water" but no explanation of derivation is given. Pukui et al. (1974:223) explain the name "Waikoko" as meaning "blood water" but again no explanation of derivation is given. Waipā is the name of a wind and location on Kauaʻi. Pukui (1983) explains that *Waipā* is a reference to one who cannot refrain from touching or pawing and relates the saying:

> *Hoʻopāpā i Waipā ka Lūpua.* The Lūpua wind touches at Waipā. [Pukui 1983:118]

Legend of Pakaʻa

Given by his mother "a finely polished calabash containing the bones of his grandmother Loa, who in her life had controlled the winds of every district from Hawaii on the east of Kaula on the west of the group . . . [and taught] how to open the calabash and call the name of whatever wind he desires" (Beckwith 1970:86). Pakaʻa passed this lore on to his son, Kuapakaʻa, who had occasion to use it when the chief Keawenuiaumi came to Molokaʻi in search of Pakaʻa (Dye 2004:6). In order to bring about a storm that will drive Keawenuiaumi's canoes ashore, Pakaʻa tells Kuapakaʻa to call for the winds of Kauaʻi and Niʻihau:

. . . He luha ko Hanalei
He waiamau ko Waioli
He puunahele ko Waipa
He haukolo ko Lumahai
He lupua ko Wainiha . . .

[Translation]
. . . The luha is of Hanalei
The waiamau is of Waioli
The puunahele is of Waipa
The haukolo is of Lumahai
The lupua is of Wainiha . . . [Fornander 1918:96–97]

Lono-i-ka-makahiki

Although not mentioned specifically, Waipā was likely visited by Lono-i-ka-makahiki while he wandered through the wilderness of Kauaʻi with his companion, Kapa-ʻihi-a-hilina, out of his mind with grief for having killed his wife, Ka-iki-lani-kohe-panaiʻo (Dye 2004:7). Kapa-ʻihi-a-hilina composed a chant of affection for the chief, recounting their wanderings in the wilderness of Kauaʻi:

. . . He kaʻupu e Lono e,	A friend [was I] O Lono,
He kanaka au no ka ua iki,	A server was I in the light rain,
Ina hoʻi ha he hoa au no ka ua iki la paʻia,	I was your companion in the light rain of the forest,
He hoa i ka nahele lauhala loloa,	A companion in the long-leafed panadanus groves,
Mai Kilauea a Kahili la,	[That extend] from Kilauea to Kalihi,
O ka hala i ʻaina kepa ʻia e ka manu	The pandanus [whose fruit] is pecked by the birds,
O Poʻoku i Hanalei la.	[The pandanus] of Poʻoku in Hanalei.
Hala ia mao a ka ua e ka hoa e,	There we were till the rain ceased falling,
He hoa i ka makani lauwili Poʻaihele,	O my companion, My companion in the hurrying whirlwind,
Mauka o Hanalei iki a Hanalei nui,	In the uplands of lesser Hanalei, of greater Hanalei,
Mauka mai hoʻi kekahi ua,	[In] the rain that came from the uplands,
Makai mai hoʻi kekahi ua,	Rain that came from the lowlands,
Ma naʻe mai hoʻi kekahi ua,	Rain that came from the east,
Malalo mai hoʻi kekahi ua,	Rain that came from the south,
Maluna iho hoʻi kekahi ua,	Rain that came from the above,
Malalo aʻe hoʻi kekahi ua,	Rain that came from below,
Ma ka lae hala o Puʻupaoa,	Along the cape of Puʻupaoa, over-grown with pandanus,
Ilaila ka ua kike hala,	There was the rain that pelted the

	pandanus fruit,
Hoʻowalea ike one ʻai a ke kinaʻu,	Drenching the sand where the sand eels fed,
He kiaʻu ʻai hala o Mahamoku,	The eels that ate the pandanus of Mahamoku,
Ka ua hoʻopala ʻohiʻa o Waiʻoli . . .	The rain that ripened the mountain apples of Waiʻoli . . .

[Kamakau 1992:48–51]

3.2.3 Traditional and Legendary Accounts of Lumahaʻi

Wichman (1998:116) notes a difference of opinion on the spelling and pronunciation of this *ahupuaʻa* citing the opinion of Lyle A. Dickey that the name is "Lumahai" (without a glottal stop) and that it is "so named for a medicinal plant and also a string figure (cat's cradle)." Pukui et al. (1974:136) offer no explanation for the name "Lumahaʻi."

Kaʻalele of the red rocks

Rice (1923) gives the following account:

> One day as the Menehunes were bathing at Lumahaʻi, one of them caught a large *ulua*. The fish tried to escape, but the little man struggled bravely, and finally killed it. The man was so badly wounded, however, that his blood flowed over the spot and turned the earth and stones red. This place is still called Ka-ʻa-le-le, from the name of the wounded man. [Rice 1923:44–45]

Wichman (1998:117) indicates the "Rocks called *Kaʻalele*, ʻmessenger,ʼ" near the river mouth are noted for their redness.

Ka-hala-o-Māpuana "Pandanus of Māpuana"

Wichman (1998) retells the story *Ka-hala-o-Māpuana* "Pandanus of Māpuana":

> *Ka-hala-o-Māpuana*, ʻPandanus of Māpuana,ʼ was a grove of pandanus trees beside the beach. One tree, the transformed body of Māpuana, bore red fruit instead of the usual yellow and was famed for its fragrance. Māpuana was the youngest sister of ʻAiwohikupua. They came to Kauaʻi from Tahiti during the time of Kaʻililauokekoa. Their older sisters were Maile-haʻi-wale, ʻeasily broken maile,ʼ Maile-kaluhea, ʻfragrant maile,ʼ Maile-lau-liʻi, ʻsmall-leafed maile,ʼ and Maile-lepa-kaha, ʻmaile of the striped flag marker.ʼ ʻAiwohikupua tried to win Lāʻieikawai as his wife with the aid of his sisters, but when they chose to become her guardians and refused to let her marry him, he deserted them on Hawaiʻi. After Lāʻieikawai married a Kauaʻi chieftain, the sisters returned to Kauaʻi with her. [Wichman 1998:121]

Ka-ʻī-li-o-pā-ʻia Heiau

Rice (1923) gives the following account:

> On the plain above the Lumahai River the Menehunes made their homes for a time. There one of the small men began to build a *heiau* which he called Ka-ʻī-li-o-pā-ʻia. As he was working, the big owl of Kāne came and sat on the stones. This bird was large enough to carry off a man, and, naturally, it frightened away the little

> workman. He returned next day, only to see the huge bird flying over the spot croaking. He also saw the great monster dog Kū-‘ilio-loa, My-Long-Dog, running about the *heiau*. These evil omens caused the Menehune to believe that the *heiau* was polluted, so he gave up his work. [Rice 1923:44–45]

Regarding the construction of this *heiau*, Wichman (1998) tells of an omen which is interpreted as a fear that the people of the *ahupua‘a* might be punished by a chief for some real or imaginary offense by imposing a tax so heavy as to be almost impossible to pay:

> The *heiau* that a Menehune named Mā‘ihi-lau-koa began soon after the Menehune arrived at Lumaha‘i. First he marked the edges of the *heiau* with stakes of *hau* wood. Then he began to construct rock walls around a platform of coral. Before the work could be finished, a huge owl named Pueo-nui-o-Kāne, also known as Ka-‘ā-‘aia-nu‘u-nui-a-Kāne, flew overhead. This was a fearful omen and gave rise to a saying: *Papapau kākou he ‘ā‘aia kō ka hale* The Legendary bird strikes at everyone. [Wichman 1998:120]

Kealahula Point

Rice (1923) gives the following account:

> At the point of Kealahula, at Lumaha‘i, these wonderful men made a small hill on the seashore, by cutting off part of the point. You can still see the bare place on the ridge, where the earth was sliced off. At the base of this small hill the Menehunes placed a large stone, which they used as a jumping-off place. The hill is called Ma-ka-ihu-wa‘a, the Landing Place of the Canoes. [Rice 1923:44–45]

Rice (1923) also provides an account of Hi‘iaka and her companions traveling from Hanalei past a place called Ke-ala-hula at Lumaha‘i:

> Coming to Kealahula [Lumaha‘i] they saw Ho‘ohila combing her hair. She, too, tried to delay their journey by making the sea break over the cliff. Wahine-omao threw sand into the eyes of the *akua*, and this difficulty was overcome. [Rice 1923:10]

Ke-alelo-o-Pilikua “tongue of Pilikua”

Wichman (1998) indicates,

> *Ke-alelo-o-Pilikua*, ‘tongue of Pilikua,’ is the lava leaf on the west bank of the [Lumaha‘i] river mouth jutting into the sea. Pilikua was a giant noted both for his size and his loud voice. He would stop every traveler to relate the beauties of Kaua‘i before letting them continue. But the people of Lumaha‘i, able to hear every word and unable to leave, got so tired of hearing the same things over and over again that they killed the giant and threw his body in the ocean. The birds and fish consumed all of his body except the tongue, which had grown so tough it could not be eaten, and so it remains to this day. [Wichman 1998:117–119]

Ke-hau-o-Mā‘ihi “hau tree belonging to Mā‘ihi”

Wichman (1998) connects Ke-hau-o-Mā‘ihi with a *menehune heiau*:

> *Ke-hau-o-Mā‘ihi*, ‘*hau* tree belonging to Mā‘ihi’ or ‘coolness of Mā‘ihi’ was a grove of *hau* trees. This grove is all that is left of the *heiau* that a Menehune named Mā‘ihi-lau-koa began soon after the Menehune arrived at Lumaha‘i. First he marked the edges of the *heiau* with stakes of *hau* wood . . . The *hau* stakes sprouted and became a grove of trees that cast a cool shade, welcoming weary travelers on hot days. [Wichman 1998:120–121]

Ma‘ina-kēhau Rock

Rice (1923) gives the following account:

> During their stay at Lumahai one of the Menehunes who was skilled in stone carving tried to escape by climbing up the cliffs toward Wai‘ale‘ale. The *konohiki* sent his men to capture him. They overtook him at about the middle of the cliff, and the usual punishment was meted out to him—his body was turned into stone in the form of a man with a gray body and a white head. The path the pursuers followed zigzags up the steep *pali* to the stone, which is called *Ma-i-na-ke-ha-u*, the Man-Out-of-Breath. [Rice 1923:44–45]

Wichman (1998) relates the following account of the same feature:

> *Waipi‘o‘ina-kēhau* is a boulder high in the cliffs. A Menehune stone carver was tired of his job. When he could not get his chief to let him change to something else, he decided to leave and started for the mountains. The *konohiki* Weli sent his men to bring him back. They overtook him at about the middle of the cliff and he was turned to stone. It is a huge boulder in the form of a man with a gray body and a white head. The name, which may be translated as ‘sickening of the dews,’ has come to figuratively mean ‘man out of breath.’ [Wichman 1998:119]

Nā ‘ulu o Weli “breadfruit trees of Weli”

Weli, a bow-legged, deep-voiced *menehune konohiki*, king’s sheriff or executor, is remembered as an agriculturalist. On the plain of Lumaha‘i he planted breadfruit trees, which are there to this day. They were called *Nā-ulu-a-Weli*, after the *menehune*. Pukui et al. (1974:136) note “Breadfruit trees here are said to have been planted by a Menehune named Weli”:

> The grove *Nā ‘ulu o Weli*, ‘breadfruit trees of Weli,’ was planted by Weli, the first Menehune *konohiki* of the *ahupua‘a*, described as bow-legged and deep voiced. The hole in which the shoot was planted was dug by *Oha-ka-leo*, ‘loving is the voice,’ who instructed the tree so well on how to grow that it became famous for its huge fruit, which contained lots of meat. The branches also grew close to the ground and gave rise to a saying: *Nā ‘ulu o Weli pūnohu mai ana*. ‘The breadfruit trees of Weli spread out their low branches like clouds.’ [Wichman 1998:121]

Pā-na‘ana‘a Rock

Rice (1923) gives the following account of Pā-na‘ana‘a Rock:

> The small explorers soon found their way to the head of Lumaha‘i Valley, whence they crossed over to Wainiha. There they found an immense rock, one side of which was gray and the other black. This they hewed out into the shape of a *poi* board and

> placed near the falls of the Lumaha‘i River. To this day, the *wī*, or fresh-water shell-fish, come out on the gray side in the daytime, and on the black side at night. Even now, no woman can successfully fish there unless she wears a certain *lei* of shredded *ti* leaves or breaks off two *lehua* branches, crying to the Kupua as she throws one to the *mauka* side, or toward the mountains, and one to the *makai* side, or toward the sea, ‘*Pa-na-a-na-a*, give us luck!’ If a man fishes there, he first throws two small stones into the water, asking for success. [Rice 1923:44–45]

Wichman (1998) relates the following account of the same feature:

> *Pā-na‘ana‘a*, ‘protruding dish,’ is a large, flat below a waterfall in the river. The rock was moved here by the Menehune from Wainiha. It was hewed out in the shape of a *poi* board and placed near the falls of the river. Half of the rock was gray and the other half black. To this day, the *wī* (freshwater shellfish) come out on the gray side in the daytime and on the black at night. No woman can successfully fish there unless she ears a certain *lei* of shredded *kī* leaves or breaks off two *‘ōhia lehua* branches, crying to the *kupua* as she throws one to the *mauka* side and one to the *makai*: ‘*Eia he mohai a he alana na‘u* (*e ha‘i i ka inoa), ia ‘oe e ka ho‘olu‘e a ho‘olaupa‘i wī o uka nei la, e noa ho‘i iau ka mana nui, mana iki o ke kahawai nei, a ho‘i au me ka ho‘opilikia ole ia, me ka nui ho‘i ka‘u wī ke ho‘i, i ole ho‘i au e hilahila i ka ‘ōlelo ia mai he lawa‘a paoa e*.’ ‘Here is an offering from (she must give her name) to bring forth an abundance of *wī*, from the small *mana* and the large *mana* of this stream, grant that I do not get into difficulty and that the *wī* will not be shy.’ When a man comes to fish for *wī* , he must take two stones and throw one on the *mauka* side of the stream and one on the *makai* side. He also must break off two branches of *lehua* while saying:
>
> *E noa ia‘u ke kahawai nei e nā Menehune, Kini, Lau a lau ka ‘oukou kokua ia‘u, i nui ka‘u wī e ho‘i ai i hau‘oli ko kauhale a pa‘a no ho‘i ka waha o ka po‘e waha‘a a leoleo‘a ho‘omahuakala ia‘u*.
>
> ‘Free me this stream, O Menehune, bring happiness to my house and confound those sharp-tongued, loud people who do not believe me.’ If the rules are followed the *wī* are abundant and easily caught.
>
> The next nocturnal enterprise of these little men was to span the river with a bridge of flat stones, but freshets have since removed all traces of this work. [Wichman 1998:119]

Winds and shells of Lumaha‘i

Accounts of the “Legend of Kuapaka‘a” name the wind of Lumahai as “Haukolo” (Fornander 1917-1918:5(1):96–97). Wichman (1998) reports that at Lumaha‘i:

> A special wind was *Kalena ka makani lawe pua hala‘ai a ke kīna‘u*, ‘*Kalena* is the wind that strews the pandanus fruit eaten by *kīna‘u* eels.’ The *kīna‘u*, a small white eel, ate the *hala* fruit and in turn were eaten themselves. [Wichman 1998:117]

Pūpū o Lumaha‘i

Pukui (1983) mentions the importance of a particular type of sea shell found at Lumaha‘i:

> Waimeʻa Oʻahu and Lumahaʻi Kauaʻi were the two places where the shells that were made into hat bands were found. Those on Oʻahu were predominantly white and those on Kauaʻi, brown. Not now seen. [Pukui 1983:191]

3.2.4 Traditional and Legendary Accounts of Wainiha

Hiʻiaka Traditions

When Hiʻiaka arrives at Hāʻena in search of Lohiʻau she meets Malae-haʻa-koa, a lame fisherman whom she greets:

O Malae-haʻa-koa, Lawaʻiʻa o ka pali.	I hail thee Malae-haʻa-koa, thou fisherman of the cliffs.
Keiki lawaia oe a Wainiha.	As a youth you fished at Wainiha.

[Emerson 1915:110]

Perhaps fishing from the cliffs was a well-known practice at Wainiha, as indicated by this chanted line:

I malenalena i Wainiha i kaʻu makau.	Peace, waves, for my hook at Wainiha is less than clear.

[Emerson 1915:110]

Menehune Accounts

Perhaps the most popular mention of Wainiha in the folklore of Hawaiʻi is as the home of the legendary *menehune* and *mū* people. Described as shy and small in stature, some say they were the original inhabitants of Kauaʻi, driven to the interior of the island by the arrival and flourishing of the Hawaiians. A census of Wainiha taken by the *konohiki* of the *ahupuaʻa* during the time of Kaumualiʻi lists (in part) 65 men of Lāʻau as *menehune* (Lydgate 1913:126). J.H. Kaiwi, Thrum's informant for the "Story of the Race of Menehunes," says his grandparents became familiar with the *menehune* while spending time collecting sandalwood in an area called Waineki in the Alakaʻi Swamp, overlooking Wainiha (Thrum 1923:219).

The upper reaches of the valley were also where the bird catchers or *poʻe hahai manu* practiced their skill at collecting the colorful feathers of forest birds which adorned capes, helmets, *lei(s)* and other objects usually associated with the *aliʻi* class. In "A maiden from the Mu," Pukui (1951:67–75) relates the tribulations of Kiamanu, a bird catcher of Wainiha who marries a *mū* girl. Wainiha bird catchers also figure in the tales of "Kanaloa-huluhulu" and "Lau-haka" by Wichman (1985:114–124). Many of these stories mention a well-traveled trail from Waimea on the southwest coast of the island, up through Kōkeʻe and across the Alakaʻi Swamp, finally dropping down into Wainiha. In historic times, politician and outdoorsman Eric Knudsen (1946:202) traversed the island along this ancient trail on an annual basis. Knudsen describes an 1895 passage from Hanalei to Hāʻena as following little more than a trail (Fung Associates 2013:12).

Pele, Hiʻiaka, and Malaehaʻakoa

Wainiha is briefly mentioned in the epic myth of Pele and Hiʻiaka as the place where Malaehaʻakoa, the lame fisherman and seer, was raised. When Hiʻiaka arrived on Kauaʻi during her mission to bring Pele's lover Lohiʻau back to the island of Hawaiʻi, it was Malaehaʻakoa who met her at Hāʻena and eventually told her of Lohiʻau's death (Emerson 1978:109–131). Hiʻiaka:

> . . . met Malaehaʻakoa at Naue as he was fishing. He was crippled and unable to walk. He recognized Hiʻiaka and prepared a feast for her. The fisherman and his wife led the dancing and chanting of a long song recounting Pele's story, much to Hiʻiaka's delight, and in return she restored his ability to walk. [Wichman 1998:124]

Kalauheʻe

Wichman (1998) retells an account associated with the place known as Kaʻaluheʻe ("sagging one") (known also as Kalauheʻe, "slippery leaf"), a tributary stream on the east side of the Wainiha River:

> On its banks, a lonely young woman beat her *kapa*. She was disfigured with birthmarks and people teased her by saying she was really a *loli* (seaslug). One day, as she beat her *kapa*, a *heʻe mākoko* (deep ocean octopus) swam up the stream and settled on a rock near her. She was so lonely that she began to talk to the octopus. After many days the *heʻe* revealed that he was a demi-god who could assume the form of a man. He assumed his human form and his face too, was marked as hers. Loli fell in love. She left her *tapa* soaking too long in the stream while they dallied. Her scandalized parents tried to separate the lovers, but Loli jumped off the nearby cliff. She was changed into a *heʻe mākoko* to be united forever with her lover. [Wichman 1998:123]

Kaʻumaka (Kaūmaka)

Another storied place at Wainiha is Kaʻumaka (also known as Kaūmaka). Wichman (1998) describes two accounts both involving a pair of fishermen and a shark's eye(s):

> Kaʻumaka-a-Mano's grandfather had united the island into one kingdom and his father Mano-kalani-pō, had been able to enlarge the cultivated lands. Hunting for the man-eating shark along Nāpali was popular. Kaʻumakaamano went shark fishing, and that episode became the basis of the tales told of this point that bears his name.
>
> Two brothers, Waʻawaʻa-iki-naʻauao and Waʻawaʻa-iki-naʻaupō, were fishing. The older, who didn't want to clean fish, said that all fish with two eyes belonged to the younger brother, while he, the older, owned all the fish with only one eye. A shark with only one eye (the other was blind and bulged out like a nipple, hence Kaūmaka, 'nipple,' a variation on the name) was caught by the younger brother, who immediately turned the line over to his older brother. The shark towed Waʻawaʻaikinaʻauao out to sea where, with great difficulty, he escaped from the shark and returned to land.
>
> Another story of this point concerns two male *kupua* named Kaʻu-maka, 'my eye,' and Kaʻu-weke 'my weke fish.' They were fishing at this cape, but all the small fish had disappeared. They saw a shark and Kaʻumaka jumped into the water and fought with it. Kaʻumaka was very strong and killed the shark. Kaʻuweke was able

> to catch *weke* (goatfish) from the headland once the shark was gone. The two feasted that evening. Kaʻuweke on his favorite fish and Kaʻumaka enjoying dining on the shark's eyes. [Wichman 1998:123]

In the Legend of Kuapakaʻa, Kuapakaʻa chants the names of the winds of Kauaʻi and Lūpua is given as the wind of Wainiha (Fornander 1918-1919:96). Literary sources give an incomplete picture of the aboriginal settlement of Wainiha, but a degree of insight may be gained from their examination. Lydgate (1913), as mentioned before, reported on a census taken by the *konohiki* of Wainiha during KaumualiʻI's time. Kaumualiʻi was the reigning chief of Kauaʻi from 1794-1825 (Kamakau 1961:169, 265). At this time "upward of 2,000 souls" resided in the valley in the villages of (listed *makai* to *mauka*) Naue, Pāʻieʻie, Maunaloa, Paliʻeleʻele, Maunahina, Pōhakuloa, Opaikea, Hōmaikalani, and Lāʻau. Lydgate (1913) goes on:

> Laau, the hamlet farthest *mauka* in the depths of the mountains, where the valley contracts to a narrow gorge, with a brawling stream running white in the bottom . . . All along up the river, wherever the encroaching *pali*s on either side leave the least available space, the land has been terraced and walled up to make '*loʻis*.' And so the whole valley is a slowly ascending stairway of steps, broad in tread and low in the rise, all the way to Laau, where the last available space was won, if not by dwarfs, at least by someone who understood this kind of agricultural engineering. These artificial lands have long since reverted to the wilderness from which they came, and it is only by chance that the traveler stumbles upon them, beating his way through the jungle. But they bear witness to a large population . . . [Lydgate 1913:126]

Bennett (1931:136), during his survey of Kauaʻi in 1928-1929, observed the remains of many terraced house sites and irrigated fields at Maunahina Ridge (Site 153), about 4½ miles from the sea. Interestingly, Maunahina is said to be the location of the ancient trail (Wichman 1985:114) which leads out of Wainiha, up to Kilohana at the north edge of the Alakaʻi Swamp, through Kōkeʻe and down to Waimea on the southwest side of the island. Undoubtedly, the trail was used to take advantage of the resources of Alakaʻi and as a shorter (however, more difficult) overland alternative route to Waimea. The use of this trail tempers the perception of Wainiha as simply a high-walled valley, open only at the shoreline, and perhaps was at least part of the incentive for habitation and development in the valley's upper reaches.

3.3 The Māhele and the Kuleana Act

In the mid-1800s (1845 and 1846), through the Organic Act, Kamehameha III decreed a division of lands called the Māhele which introduced private property into Hawaiian society (Chinen 1958). In 1848, lands were divided into three portions: crown lands, government lands, and lands set aside for the chiefs. Individual plots, called *kuleana* (Native Hawaiian land rights) awards, were granted within these divided lands to native inhabitants who lived on and farmed these plots and came forward to claim them. The population during this time period is unknown. A population distribution map by Coulter (1931) (Figure 24) indicates estimates for the population of Kauaʻi ca. 1853, "was concentrated chiefly on the lower flood plains and delta plains of rivers where wet land taro was raised on the rich alluvial soil" (Coulter 1931:14). Table 1 summarizes the LCAs in the Haleleʻa District. Figure 25 and Figure 26 illustrate the locations of LCAs in the project areas. A list of *konohiki* (land manager) in Haleleʻa district (Earle 1973:274–277) includes

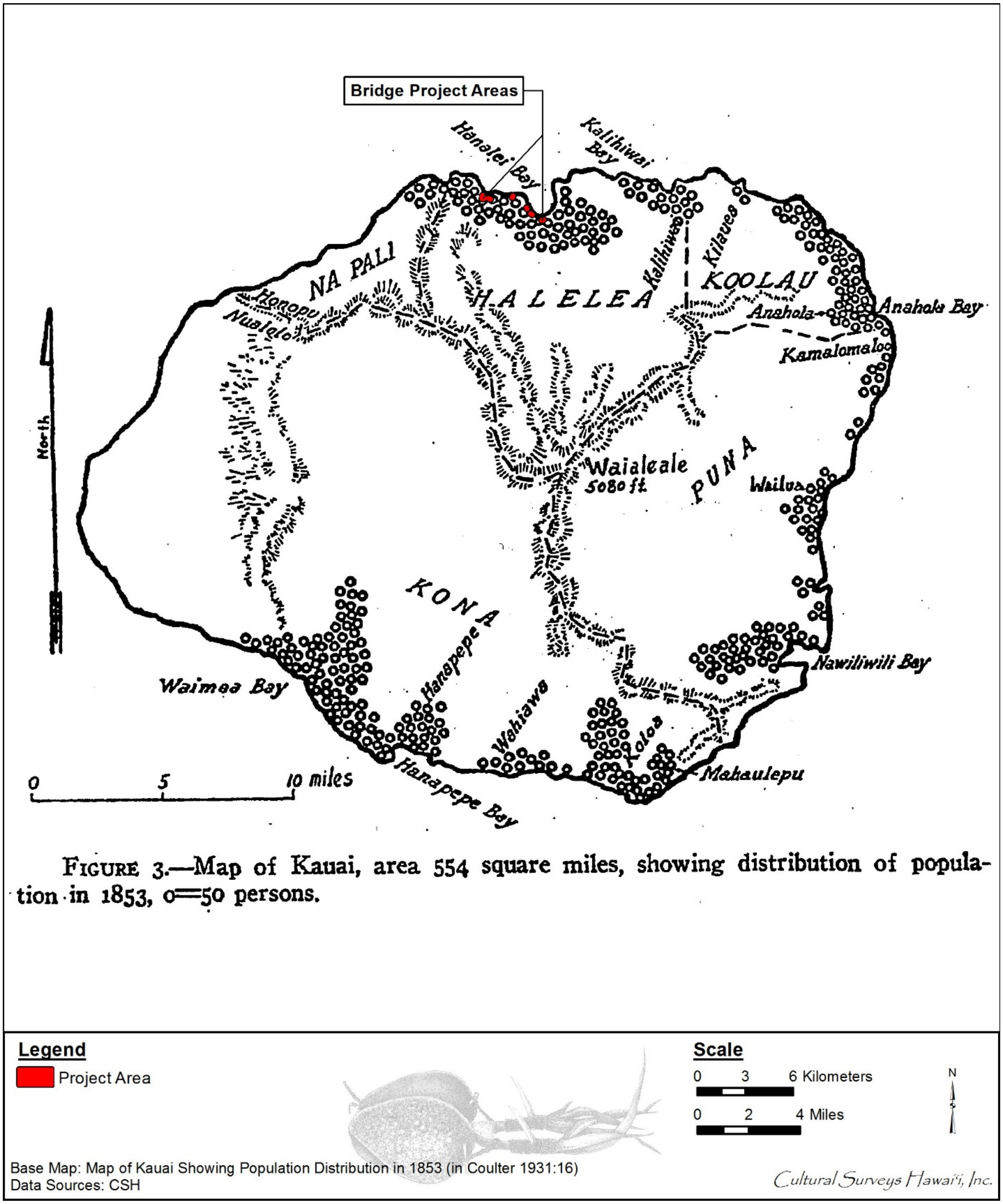


Figure 24. Map showing population estimate for Kaua'i in 1853 (Coulter 1931:16)

- James Kanehoe the son of John Young, foreign advisor to Kamehameha I, Kanehoa accompanied Liholiho to England and was his translator. He was *konohiki* of Waipā at about 1839.
- Koukou *konohiki* under Kanehoa in the 1840s; and
- Kamokuhina *konohiki* at the time of LCAs.

Maly and Maly (2003) provide information regarding Māhele ʻĀina of Waipā Ahupuaʻa:

> DISPOSITION OF LANDS: THE MĀHELE ʻĀINA AND DEVELOPMENT OF FEE-SIMPLE PROPERTY AND FISHERY RIGHTS (CA. 1846-1855) By the middle 1840s, the Hawaiian system of land tenure was undergoing radical alteration, and the Hawaiian system of land and fishery rights being defined and codified. The laws set the foundation for implementing the Māhele ʻĀina of 1848, which granted fee-simple ownership rights to the *hoaʻāina* (common people of the land, native tenants). The records of the Māhele are of great importance, as they identify families associated with lands; describe practices on the land; and some, also identify fishery resources. During the Māhele at least 251 claims were registered for *kuleana* (by native tenants) and *ahupuaʻa* (by *aliʻi* or *konohiki*) in the Haleleʻa District; of those claims, 194 were awarded. Thus, 57 applicants either withdrew their claims (many died in the process), or had their claims rejected as not being justified (Hawaii State Archives (HAS) Interior Department digitized records of claims in the collection of Kumu Pono Associates LLC and Hawaii Board of Commissioners Indices of Awards 1929). Only two claims were located for land in the Nāpali District. One being made by Hawele, for a parcel at Wailaulau (not awarded), the *ahupuaʻa* name not being given; and the other, being one-half of the ahupuaʻa of Hanakoa, awarded to Mokuohai (Buke Mahele 1848:76); who was also a resident landlord in the Kēʻē vicinity. [Maly and Maly 2003:6, 8, 18, 20, and 27–28]

Of the lands in the Haleleʻa District, the following list identifies the *ahupuaʻa*, number of claims made; and number of awards issued in each *ahupuaʻa*:

Table 1. Summary of LCAs in the Haleleʻa District

Ahupuaʻa	**Number of Claims**	**Number of Award**	***Aliʻi* Claimant**
Haʻena	34	25	A. Paki
Hanalei	75	57	Kamehameha III/ Government
Kalihikai	15	14	A. Kealiiahonui
Lumahaʻi	2	1	L. Konia
Waikoko	2	1	M. Kekauonohi
Wainiha	43	33	M. Kekauonohi
Waiʻoli	66	51	Kamehameha III/ Government
Waipā	14	12	R. Keʻelikōlani and J.Y. Kanehoa

Researching the claims and testimonies that were given in the mid-1800s can sometimes assist in forming a settlement pattern for the region at that time and possibly earlier. Thus, it is through records for Land Commission Awards generated during the Māhele that specific documentation of traditional life in Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha Ahupua‘a comes to light. Fisheries, as well as land uses, are described in the Māhele ‘Āina of M. Kekuanaoa; to Keoni Ana:

> I, M. Kekuanaoa, make known the prohibited fish of the lands of V. Kamamalu, and Ruta Keelikolani, on the island of Kauai . . . R. Keelikolani Apana 5: Waipa Hee. [Hawai‘i State Archives Interior Department–Lands Document]

3.3.1 Boundary Commission Testimonies (ca. 1873-1882)

Following the Māhele, there arose a need to define the boundaries and rights of *ahupua‘a* awarded or sold to large private owners (Waihona ‘Aina 2000). As a result, a Commission of Boundaries was formed, and testimonies from elder native residents taken. A thorough review of all records of the Boundary Commission was made as a part of this study. Narratives describing boundaries of the lands of Lumaha‘i, Wai‘oli, Waipā (Waipaa), and Hanalei are included as Appendix B. These narratives include testimonies describing land features, *wahi pana* (storied places), and the original notes of survey for the named lands. In the period leading up to, or as a part of the proceedings, maps were also produced in conformance with the testimonies and Certificate of Boundaries.

3.3.2 The Māhele and the Kuleana Act of Wai‘oli

From the LCA testimony it seems that by 1850 the people in the district had a tradition of shared resources, and functioned as part of the larger district entity rather than maintaining a separate *ahupua‘a* status. Even though neighboring *ahupua‘a* would have had their own resources, LCAs show some persons had agricultural land in Wai‘oli but lived elsewhere, and some people living in Wai‘oli had agricultural land elsewhere. During early historic times Wai‘oli served as a nucleus of not only the new western culture and religion, but also as a resource garden for imported cultigens in the vicinity of the Wai‘oli Mission.

The Land Commission Awards describe at least 154 taro *lo‘i* along the Wai‘oli Stream, the *‘auwai* (ditch) systems, and Waikonono Stream, another small stream leading eventually down to the floodplain on the Nāpali side of Wai‘oli Stream. There are 26 claims for house lots in Wai‘oli with 12 persons claiming they live in Hanalei (LCAs 4109, 9139, 9261, 9274, 9275, 9276, 9278, 9280, 10593, 10594, 10915, and 11059) but have their *lo‘i* in Wai‘oli. Another claimant has a house lot in Wai‘oli but the rest of his land is in Hā‘ena (LCA 7949). Various other claimants mention they live in Wai‘oli but do not claim a house lot. There are claims for 27 *kula* (pasture) in Wai‘oli. There are no specified crops listed for any of the *kula*, but based on traditional *kula* lands, there would be sweet potatoes, yams, bananas, and sugarcane. One claimant mentions a *muliwai* (brackish water pond behind the sand dunes used for fishing; LCA 3781), and two mention a fishpond (LCAs 4109, 10309). The Land Commission Awards also include one for the Wai‘oli Mission, where claim is for a framed schoolhouse, pasture land and cultivated grounds, a 4-acre taro patch, a Native Church on 1/2 acre, and pasture land on the narrow strip on the western side of the Wai‘oli River.

Wai‘oli, with 3,350 acres has 154 claims for *lo‘i*, which works out to .046 *lo‘i* per acre for the entire *ahupua‘a* or probably 1.5 per acre on the 100 acres of floodplain. *Lo‘i* represent 74% of possessions claimed, *kula* 13%, house lots 12.6%, and other less than 1%. A scant 14% of the awardees claimed to have held the land prior to 1824. A quarter of the claimants received their land during the time Davida Papohaku, *konohiki* (land overseer) of Waiʻoli from 1834-1837. Davida Papohaku or David Stonewall was one of the five members who came with Rev. Whitney to help organize the Waiʻoli Mission and it was his duty to correct and help Mr. Alexander translate his sermons into Hawaiian. He came with 75 of his own retainers and they formed the little village of thatched huts known as Kalema or Bethlehem (Damon 1931:325). Perhaps these claimants' families came with Papohaku to the Hanalei area and were part of his train. Another fifth of the claimants received their land from Daniela Oleloa, a *konohiki* in the 1840s. Oleloa did not have a very high genealogy but he held four lands prior to the Mahele (Kameʻeleihiwa 1992:280). There are 88 names mentioned in the LCAs as neighboring land cultivators or house lot holders and some of these persons such as Emelia received grants to the land but have no LCA listed for them. Others like Lewi and Kalili are shown in the LCA index as receiving land, but no maps show them as having title to the land (at least by 1912). We might assume they have died, perhaps intestate, or perhaps they have passed the land to someone else. In any case, someone else is shown occupying the land they claimed. Table 2 summarizes the LCAs along the highway in and around the environmental study area of Waiʻoli for the current proposed project.

Table 2. Land Commission Awards along Kūhiō Highway in Waiʻoli, from East to West

LCA # TMK or maps	**Awardee**	***Ahupuaʻa* and *ʻIli***	**Land Use**	**Landscape Features**	**Amount**
387 Lydgate 1912 map	ABCFM SIHP # 50-30-03-9300	Waiʻoli	Waiʻoli Mission residence, church schoolhouse, pasture land, and cultivated land	On the narrow strip of land on the western side of the Waiʻoli River	9.79 acres
10305	Nahau, D.	Waiʻoli	House lot	Government road, jail house	2 acres 3 roods 2 rods
3781 5-5 Lydgate 1912	Opio	Waiʻoli Manuakepa	House lot	road	2 acres 15 rods
9833B 5-5 Lydgate 1912	Pepee	Waiʻoli, Kapanoa, Kuloko, Nanipoa, Nanihoa	house lot	Government road, *muliwai*	2 acres 17 rods
4075 5-5 Lydgate 1912 map	Koi and Kapela	Waoili Kapuoa	House lot	Government road, *muliwai*	1 rood 1 rod
10663:2 5-6-04	Puaiki	Waiʻoli	Five *loʻi* in Waiʻoli	Five *loʻi*	Unknown

3.3.3 The Māhele and the Kuleana Act of Waipā and Waikoko

Waipā Ahupuaʻa was awarded to Ruta Keʻelikōlani, great-granddaughter of Kamehameha I, during the Māhele, LCA 7716:1, TMK: [4] 5-6-004, which became part of the Bishop Estate. It was one of 12 lands she retained, the majority of which were located on the islands of Hawaiʻi and Maui (Dye 2004:8). Eleven individuals were awarded lands in Waipā Ahupuaʻa (Figure 25). Table 3 summarizes the LCAs along the highway in and around the study area of Waipā for the current project. There were only two names mentioned in the Waikoko Ahupuaʻa but only one was awarded. LCA 11216 was given to M. Kekauʻōnohi, great-granddaughter of Kekaulike, King of Maui, and granddaughter of Kamehameha the Great. No land use or landscape features were given.

3.3.4 The Māhele and the Kuleana Act of Wainiha

Wainiha is part of a larger LCA (#11216.5) of M. Kekauʻōnohi. A study of all the claims and their supporting testimony for Wainiha shows a well-developed land system was in place. The overall settlement pattern, dating to the mid-1800s, exhibited habitation near the coast and agricultural undertakings in the well-watered interior areas. During his island-wide survey of Kauaʻi in 1928-1929, Bennett (1931:136) observed the remains of many terraced house sites and irrigated fields at Maunahina Ridge (Site 153), about 7.2 km (4.5 miles) from the sea. Maunahina is said to be the location of the ancient trail (Wichman 1985:114), as mentioned above, which leads out of Wainiha, up to Kilohana at the north edge of the Alakaʻi Swamp, through Kōkeʻe and down to Waimea on the southwest side of the island, used to take advantage of the resources of the Alakaʻi and as an overland alternative route to Waimea. Earle's (1978:58–67, 126) analysis of the Land Commission Awards of 1850 shows that by that time, sites far inland were already abandoned and active use of the valley extended only about 2.4 km inland from the sea. At Wainiha, Earle's field survey identified six separate irrigation systems. Table 5 summarizes the LCAs along the highway in and around the proposed project area of Wainiha, also illustrated in Figure 25.

3.3.5 The Māhele and the Kuleana Act of Lumahaʻi

Basic *kuleana* documentation specifies that the entire *ahupuaʻa* was awarded to L. Konia Wahine (Table 4, Figure 25, Figure 26). No individual *kuleana* are indicated by the Māhele data. In addition to the irrigated fields of *kalo*, it can be assumed that all the common Hawaiian agricultural crops were raised in Wainiha. Handy and Handy (1972) state the following:

> There were, of course, house sites all through the valley on ground not suitable for irrigation. On such land sweet potatoes were planted. Bananas flourished: in 1931 *maiʻa Poloapola* (Borabora banana, *musa pehi*) was found in gulches. This Tahitian banana, which bears its fruit on an upright stalk, is said by local Hawaiians to be indigenous to Wainiha. *ʻAwa* of several varieties was growing there also, and undoubtedly the economic staples *wauke* and *olona* were planted. Specimens of yams were collected in 1931. [Handy and Handy 1972:420]

The *Foreign Testimony* (1850) presented before the Land Commission indicates Hawaiians were also raising more recently introduced crops such as oranges and coffee. The cultivation of rice came to Wainiha like many other *kalo*-growing areas in Hawaiʻi, during the late 1800s (Figure 27). Immigrant Chinese rice growers took over former *loʻi* devoted to *kalo* and founded a major cash crop industry catering to Hawaiʻi's growing Asian population (Coulter and Chun 1937:21).

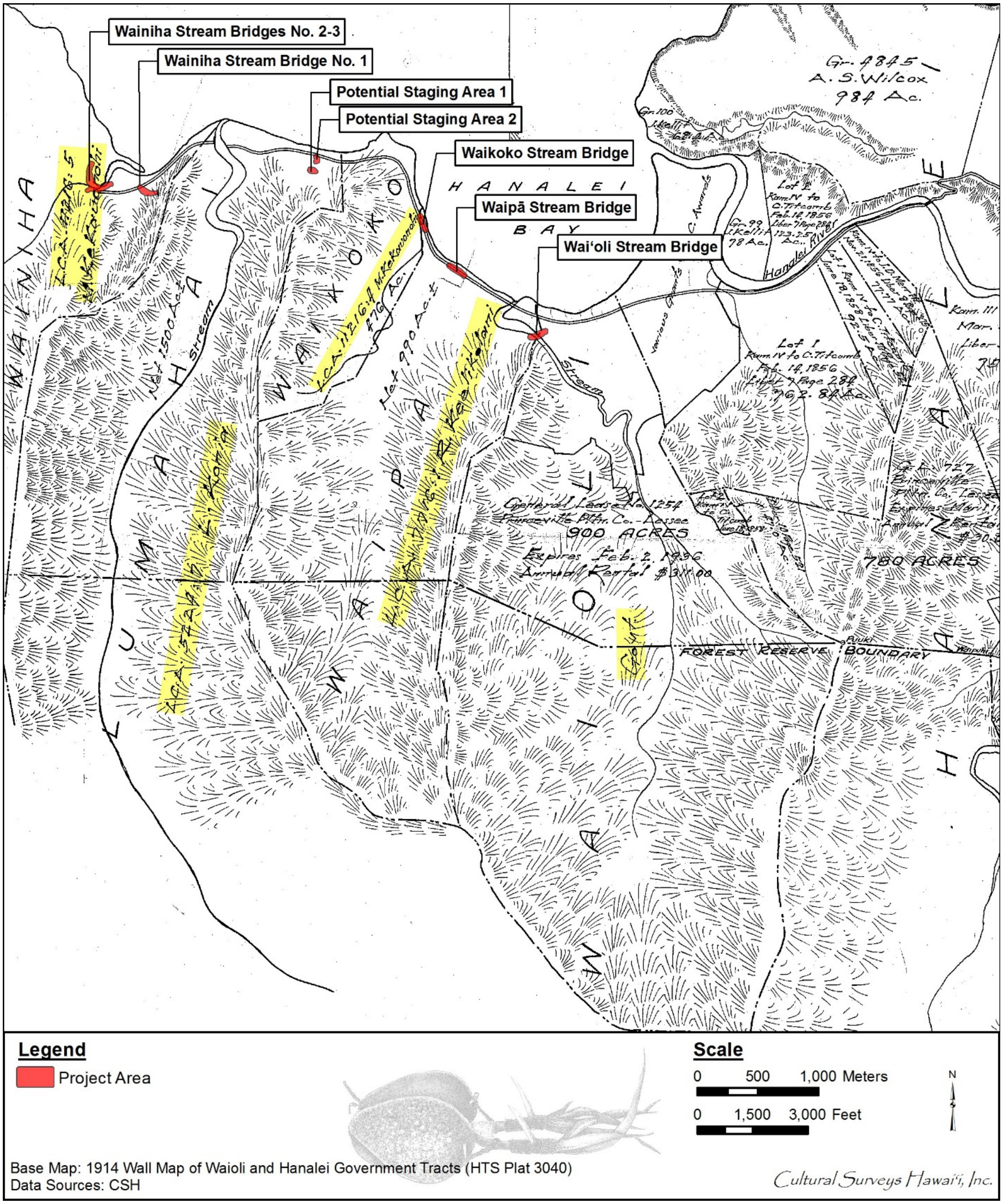


Figure 25. 1914 Wall map of Waiʻoli and Hanalei showing LCAs

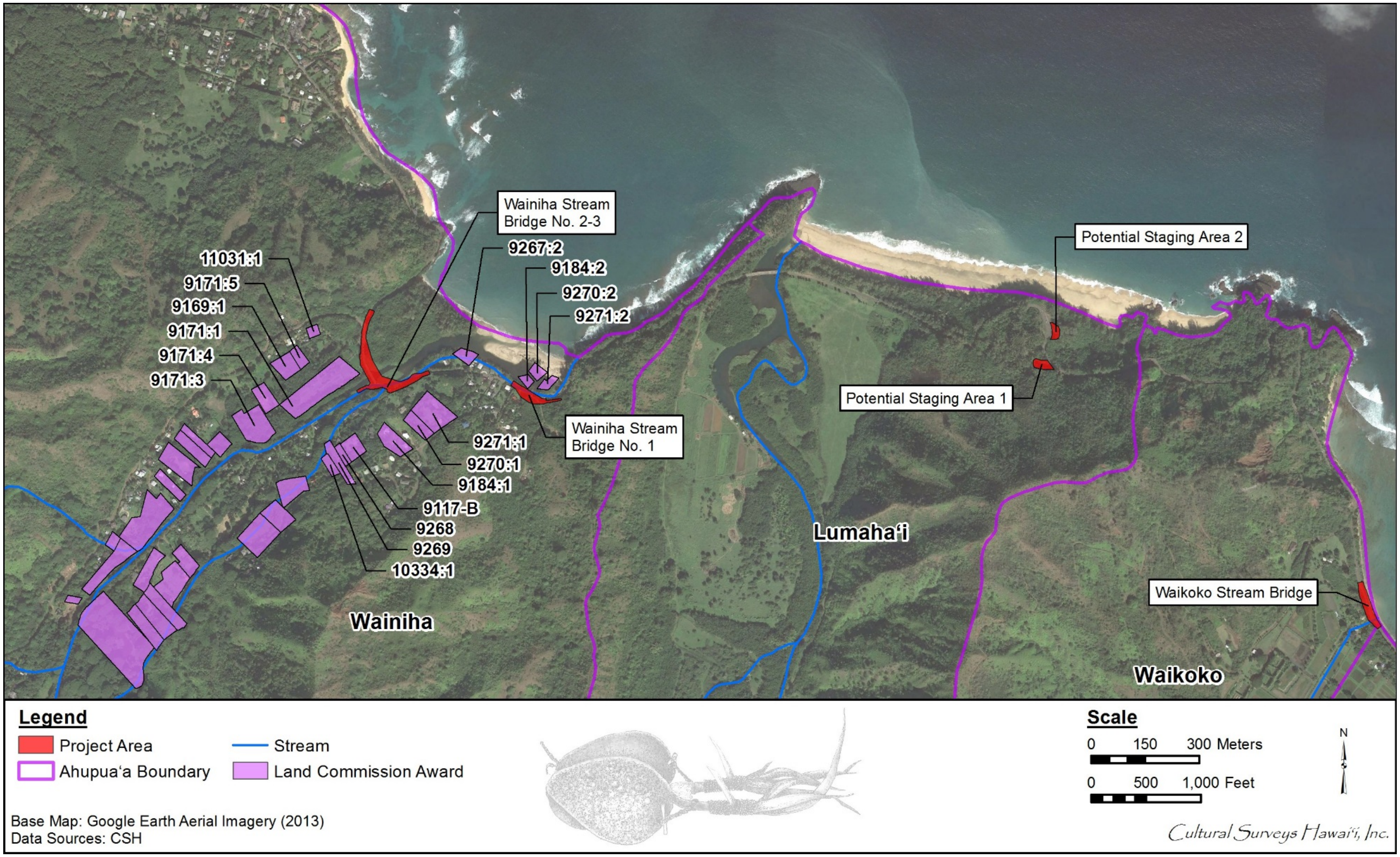


Figure 26. Aerial photograph with *ahupua‘a* and LCA boundaries in the vicinity of the project areas (Google Earth 2013)

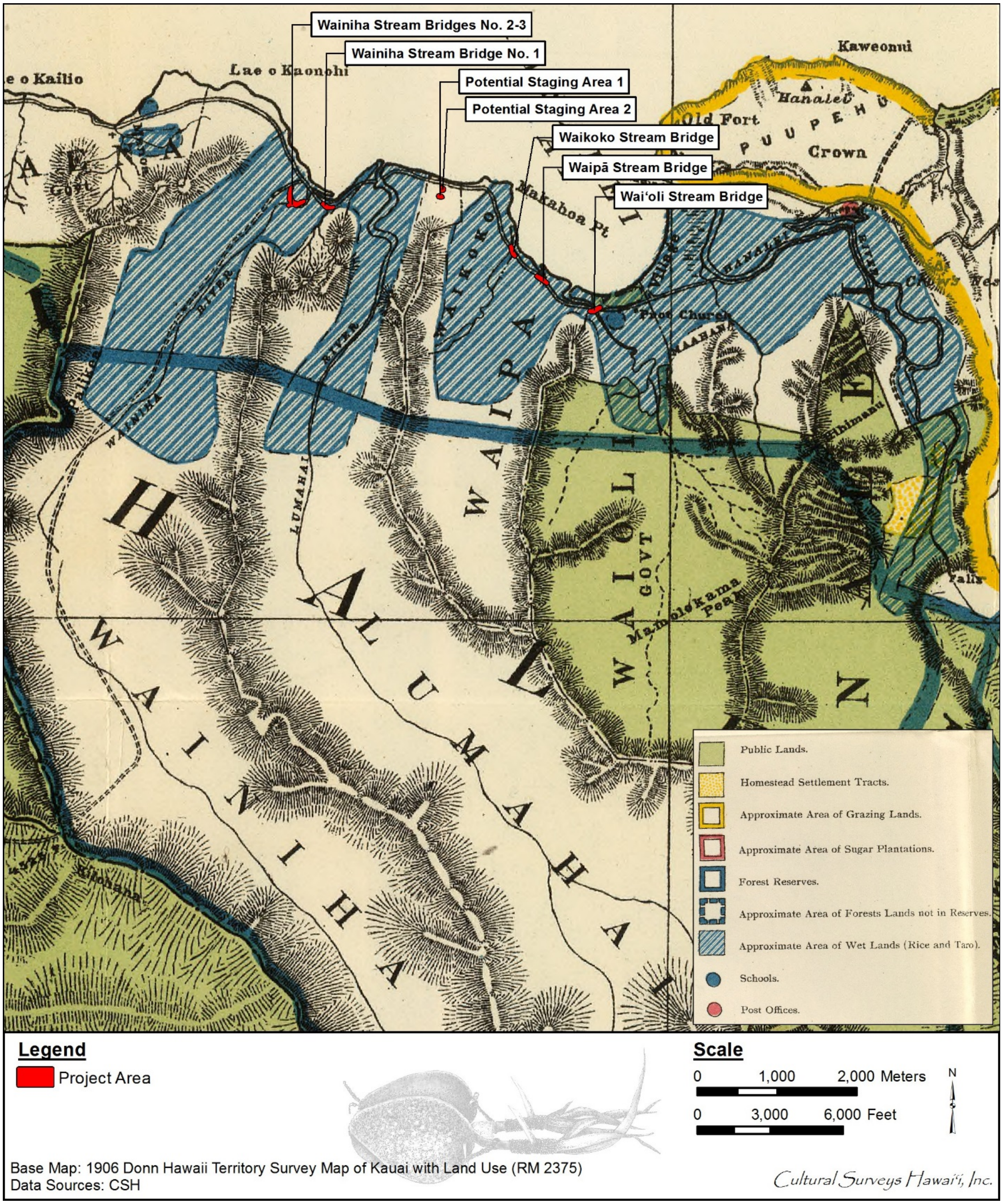


Figure 27. Portion of 1906 Donn Hawaii Territory Survey Map of Kauaʻi with land use

Table 3. Land Commission Awards along Kūhiō Highway in Waipā and Waikoko, East to West

LCA # TMK or maps	Awardee	*Ahupua‘a* and *‘Ili*	Land Use	Landscape Features	Amount
3781:3 5-6-04	Opio	Waipā	Fishpond and *lo‘i*	Public road and *pali*	Two *‘āpana*; 2 acres 15 rods
10171 5-6-04	Mana (not Wai‘oli Mission and not 1071)	Waipā Ha‘aheo	House lot (TMK gives 0.25 acres)	Public road and Makanui	One *‘āpana*; 1 rood
10076:2 5-6-04	Makanui	Waipā Kiwaa, Ha‘aheo	Four *lo‘i*, *kula*, and house lot (TMK gives 0.25 acres)	Government road, *muliwai*, *hau*	One *‘āpana*; 3 roods 14 rods
9118:2 5-6-04	Koukou	Waipā	House lot (TMK gives 0.25 acres)	*Makai* by beach, government road	Two *‘āpana*; 1 rood 33 rods
9832:3	Kupukupu	Waipā Haako	House lot	*Mauka* foot path; *makai* beach	No amount given
7918:2 5-6-04	Kanohokou	Waipā Kapuhae, Kuhihiilu, Kawaihine	House lot in Kapuhae	*Mauka* public road; *makai* sea beach	One *‘āpana*; 1 rood 8 rods
235N:2 5-6-04	Nuuanu	Halaloa, Puaanui	*Kula* and two *lo‘i*		One *‘āpana*; 6 acres 1 rood 31 rods
10663:2 5-6-04	Puaiki	Waipā Wai‘oli	House lot in Waipā		No amount given
7716:1 5-6-03	R. Keelikolani	Waipā Ahupua‘a			No amount given
11216:4 5-6-03	M. Kekauonohi	Waikoko Ahupua‘a			476 acres

Table 4. Land Commission Awards along Kūhiō Highway in Lumaha‘i

LCA # TMK or maps	**Awardee**	***Ahupua‘a* and *‘Ili***	**Land Use**	**Landscape Features**	**Amount**
5224:7 5-7-01	L. Konia Wahine	Lumaha‘i Ahupua‘a			No amount given

Table 5. Land Commission Awards at Coastal Wainiha, East to West

LCA # TMK	**Awardee**	***Ahupua‘a* and *‘Il***	**Land Use**	**Landscape Features**	**Amount**
9169:2 5-8-11	Kealai	Wainiha Kaili, Naue	House lot, *lo‘i*, and *kula*	2) Napali by water course; Ko‘olau by rook Laukalo	No amount given
11216:5 5-8-11 and 12	M. Kekauonohi	Wainiha Ahupua‘a			No amount given
9171:1 5-8-07	Keaka	Wainiha Kapaloa, Puhalanui, Kapaele, Ulukea	1) house lot and farming pasture (TMK is 3.575 acres) 2) *kula* 3) three *lo‘i* 4) one *lo‘i* 5) one *lo‘i*	Bounded *makai* and Ko‘olau by Wainiha River	Five *‘āpana*
9184:2 5-8-06	Kamoolehua	Wainiha Kapohaku	1) house lot 2) two *lo‘i* (TMK is 0.217 acres)	2) Napali by ditch, Ko‘olau by Wainiha River	Two *‘āpana*, 1 acre 34 rods
9267:2 5-8-06	Pumaia	Wainiha Kaeleele, Paulihu	1) house lot in Paulihu 2) three *lo‘i* and *kula* in Kaeleole	No. 2 bounded by *lo‘i*, watercourse, and *konohiki kula*	No amount given
9271:1 and :2 5-8-06	Kapuumaka	Wainiha Kaeluku, Umi	1) house lot in Kaaluhee 2) four *lo‘i* in Umi		Two *‘āpana* in Umi 2.25 acres
9270:1 5-8-06	Kiwaa	Wainiha Kaeleele, Kaluhea	House lot in Kaelieli, two *lo‘i*	*Mauka* church yard and road; Napali, church *makai* Wainiha river; Ko‘olau Kaahoku brook	One *‘āpana*, 1 rood 28 rods

3.4 Late 1800s to Modern Land Use

3.4.1 Late 1800s to Modern Land Use in Waiʻoli

Karol Haraguchi (1987) brackets the rice-growing period from the mid-1860s at the end of the whaling industry, until the 1920s, when California rice began to take over the Hawaiian rice market. The Hanalei Valley of Kauai led all other single geographic units in the amount of acreage planted in rice. "The development and maintenance of the Kūhiō Highway facilitated the export of surplus crops grown in Haleleʻa [Figure 28 and Figure 29]. The valley was one of the first areas converted to this use and continued to produce well into the 1960s" and she notes that Chinese immigrants, who first arrived as contract laborers in 1852, worked most of the rice fields. It was not until after 1882, that Japanese workers supplanted the Chinese labor force in Hawaiʻi. Haraguchi documents revivals of the Hawaiʻi rice industry in 1906, 1933, and 1934, which was especially fruitful in the remote Hanalei Valley where there were at that time no competing demands for the land. Aerial photographs of the project areas in the 1950s show the predominance of agricultural oriented land use in (Figure 30 through Figure 32). By 1985 there is no trace left of the rice fields (Haraguchi 1987:xiii-xv). The production fell off rapidly by 1927 when the stem borer appeared (Territory of Hawaii 1939:95).

3.4.2 Late 1800s to Modern Land Use in Waipā and Waikoko

As with Lumahaʻi, the historical records for Waipā were briefly examined and no modern historic details have been written for this *ahupuaʻa*. However, Waipā Ahupuaʻa most likely took part in the broad changes that swept Haleleʻa after 1850. Early missionary census records for Waipā Ahupuaʻa indicate the population was declining in the decades before the *Māhele.* The 1835 census records show 85 people (73 adults and 12 children) living in Waipā Valley. By 1847, the population of Waipā had declined to 66 people. Between 1853 and 1896, population statistics collected by the Hawaiian Kingdom indicated a population in Hanalei and Koʻolau that fluctuated between a low of 1,558 people in 1872 and a high of 2,775 people in 1896 (Dye 2004:14). In the first half of the twentieth century, the United States census indicated a relatively stable population with a high of 2,630 people in 1900 and a low of 2,065 people in 1940 with a rapid population decline in 1960 falling to 1,312 people (Dye 2004:14).

Historic Taro Production in Waipā

Handy and Handy (1972:420) briefly discuss taro production in Waipā: "Below Hanalei and a little to the west of it on the bay is a compact area of terraces watered by Waipā stream." However, they reprint a reminiscence of an early resident (Lydgate 1913:125-127) concerning the terraces of Wainiha Ahupuaʻa, in the same district.

> All along the river, wherever the encroaching *palis* on either side leave the least available space, the land has been terraced and walled up to make ʻ*lois*.ʼ And so the whole valley is a slowly ascending stairway of steps, broad in the tread and low in the rise, all the way to Laau. [Lydgate 1913:125–127]

Like Lumahaʻi, Waipā was a taro-growing area, and using LCAs records, Earle (1973 and 1978) has been able to pinpoint four irrigation systems along Waipā Stream in 1850 which was used for taro cultivation (Hoffman 1980:15). Waipā Valley followed similar patterns to that of Lumahaʻi, shifting from taro to rice:

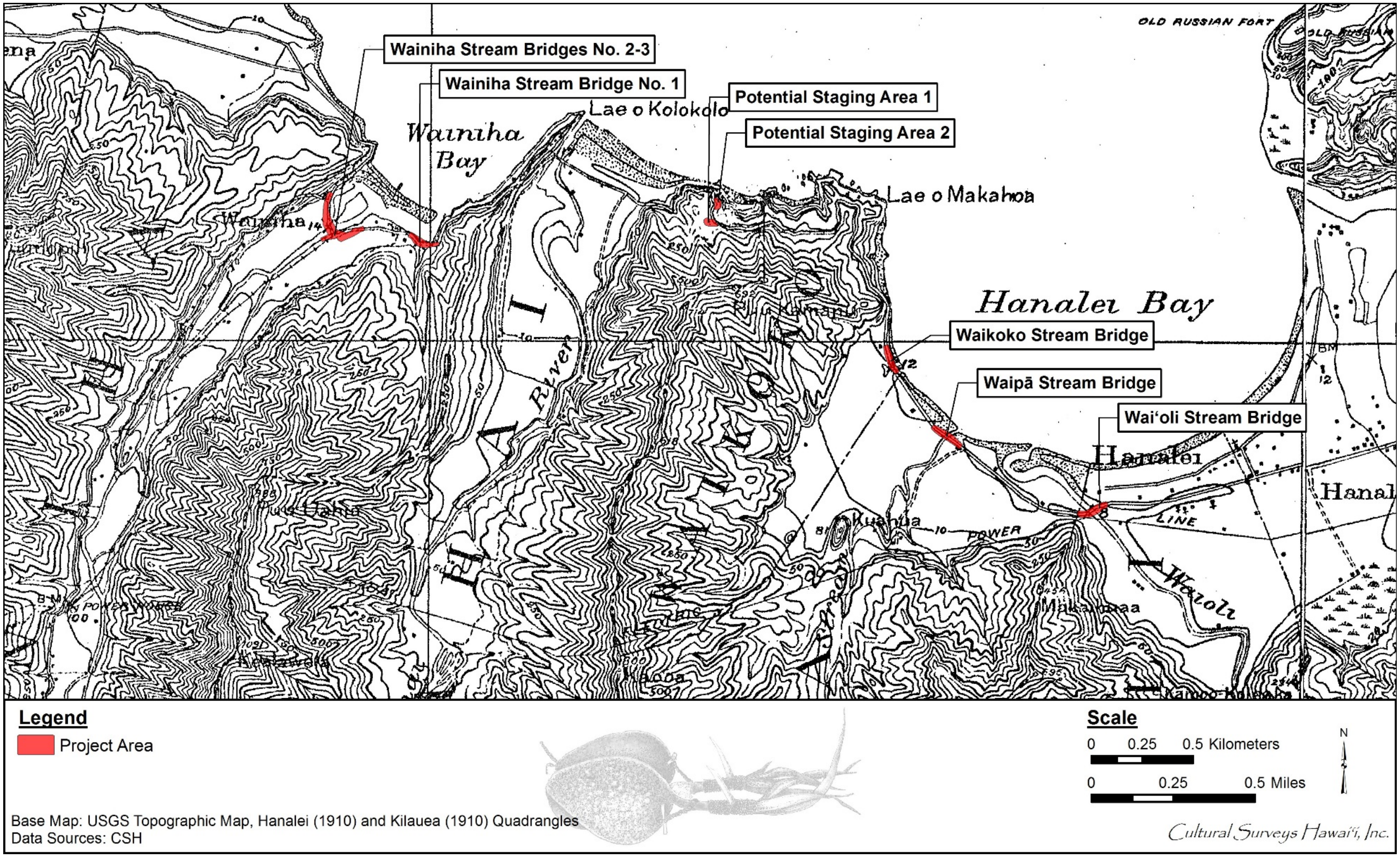


Figure 28. Portions of the 1910 Hanalei and Kilauea USGS 7.5-minute series topographic quadrangles

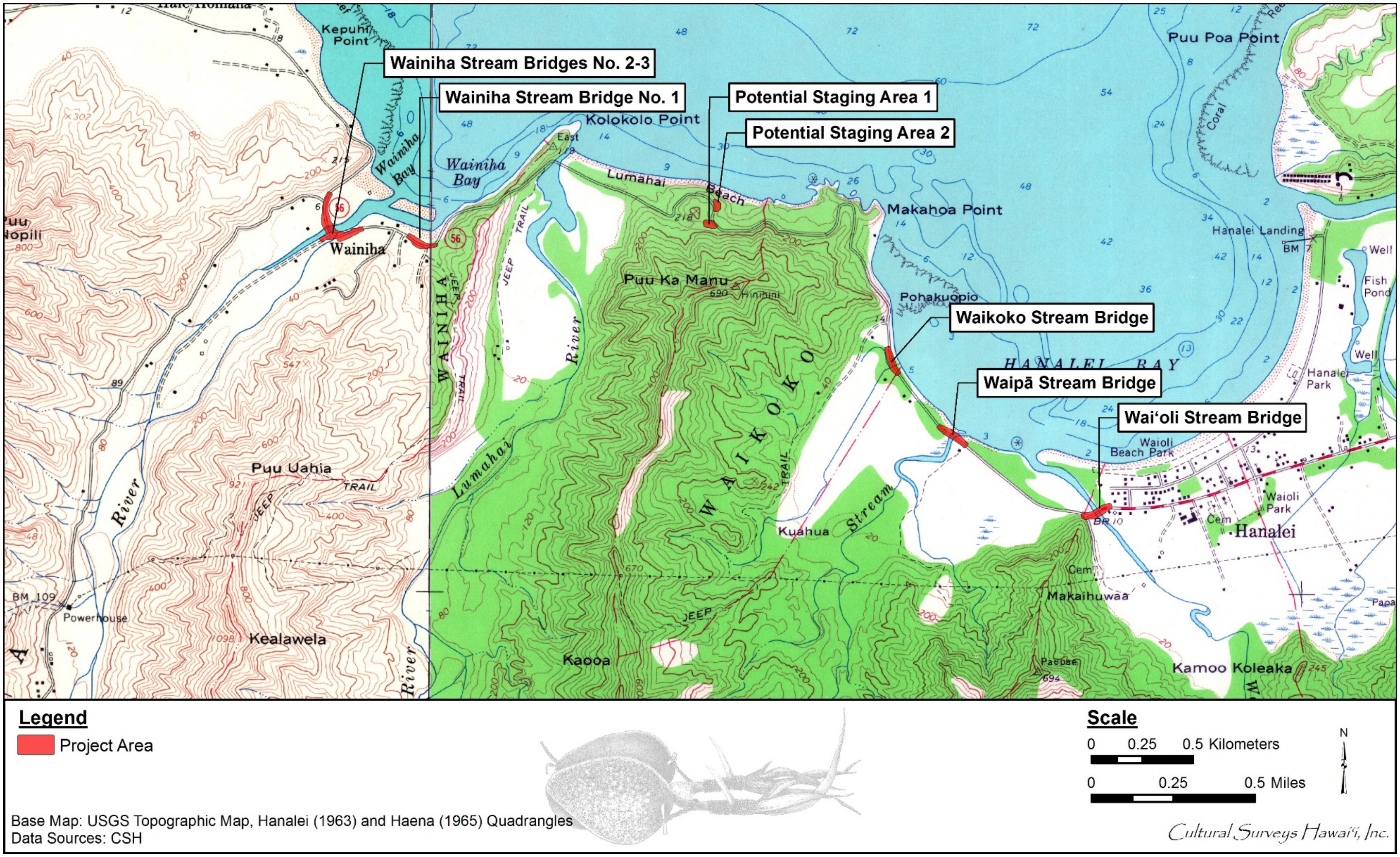


Figure 29. Portions of the 1963 Hanalei and 1965 Haena USGS 7.5-minute series topographic quadrangles

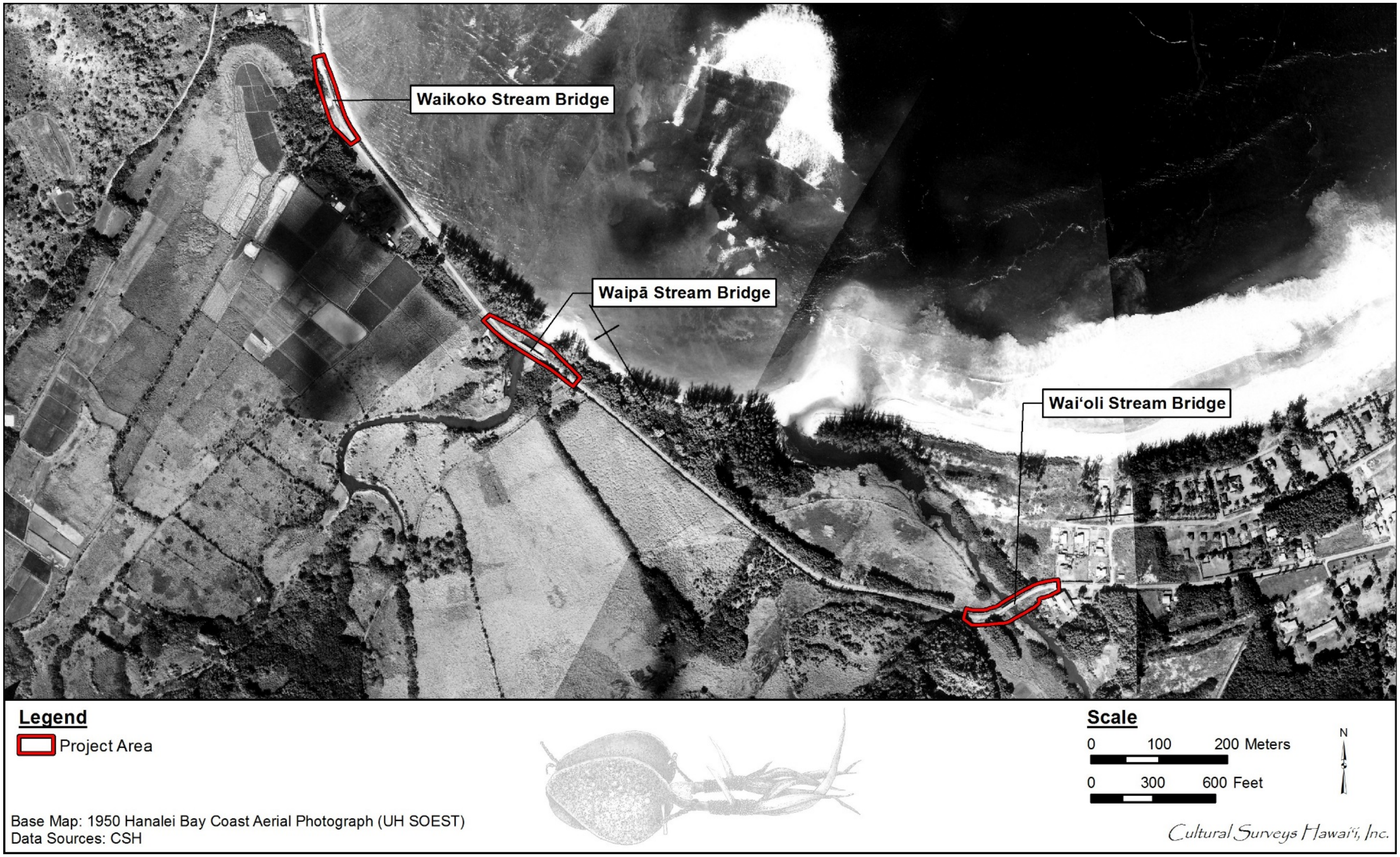


Figure 30. Portion of a 1950 Hanalei Bay Coast aerial photograph of the Wai‘ole, Waipā, and Waikoko Stream Bridge project areas (UH SOEST)

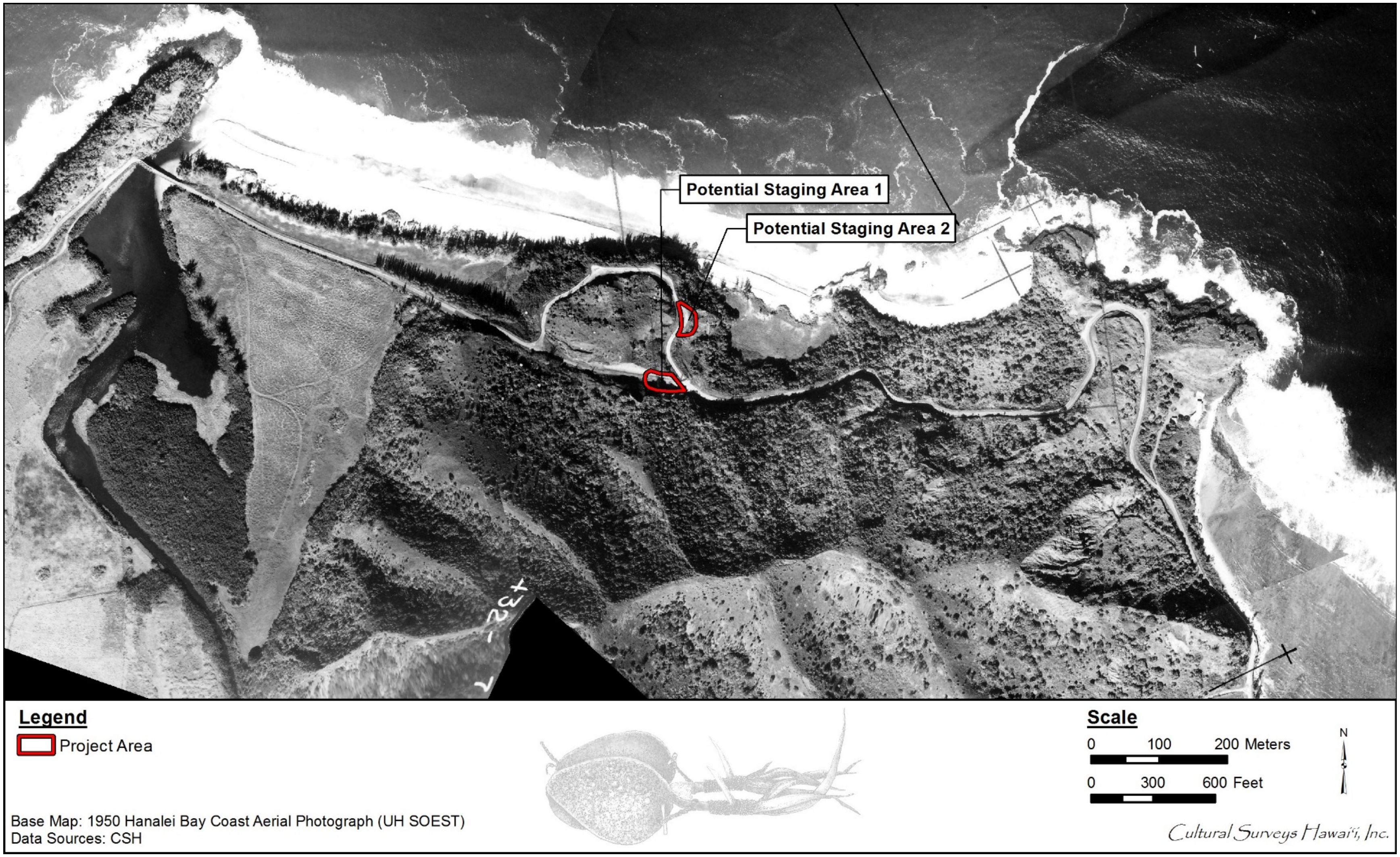


Figure 31. Portion of a 1950 Hanalei Bay Coast aerial photograph of the Potential Staging Areas 1 and 2 (UH SOEST)

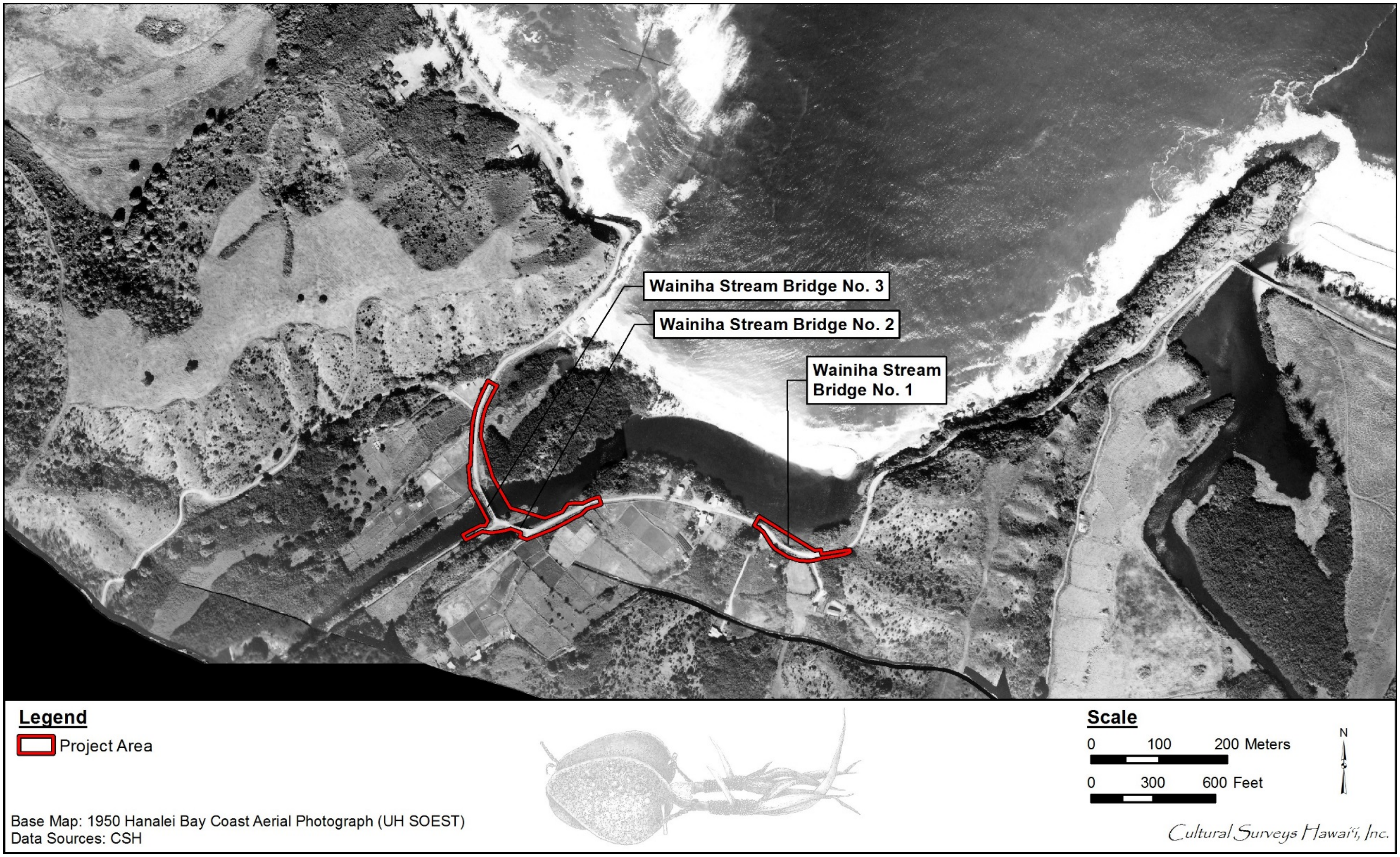


Figure 32. Portion of a 1950 Hanalei Bay Coast aerial photograph of the Wainiha Stream Bridges 1–3 project areas (UH SOEST)

> By the 1860s Chinese and later Japanese laborers imported en masse for plantation bottom lands, large areas of old taro pond fields were converted to rice. From 1880 to 1930 rice became an extremely important export industry for Halelea, and taro was virtually abandoned except in Haena, the most isolated *ahupuaʻa*. Technologically, water buffalos with associated harrowing and leveling implements were introduced to prepare planting surfaces. The increased effectiveness of the individual farmer coupled with a growing market in the western United States resulted in a rapid expansion of the area in production. This was possible only with extensive use of flumes, wood and cement dams, and perhaps more intricate drainage channels. The cleaning of these expanded ditch systems was in turn greatly facilitated by the use of sickles, pitchforks, and shovels. It is highly likely, therefore, that irrigation systems in operation after 1880 were both altered and expanded for rice production. [Earle 1973:183–184 in Dye 2004:14]

The 1938 Territory tax records indicate several dwellings and other buildings in the vicinity of the rice mill in Waipā held by Hiramoto (Dye 2004:15). These Territory tax records list the family names of Takabayashi, Hiramoto, Okazaki, Koga, Morimoto, and Azeka. Hoffman (1980:15) reported the lands in the survey area were Bishop Estate lands entirely used for cow pasture, although the more marshy sections were not well suited for this use. According to Kinichi Shikawa, a Waikoko farmer, the land had been overgrown for a long period of time and some years previously Bishop Estate demanded the lessee, the Robinson family, to make improvements that resulted in massive clearing operations; large areas were chained and bulldozing eliminated sections of irrigation systems east of Waipā Stream (Hoffman 1980:15). In 1986, Bishop Estate leased the land to the Hawaiian Farmers of Hanalei, Inc., a community-based, not-for-profit corporation that manages the *ahupuaʻa* of Waipā (Dye 2004:15).

> Waipā Ahupuaʻa is currently managed by the Waipā Foundation, a community-based 501c3 nonprofit that evolved from an original community initiative in the 1980s. The Waipā Foundation serves as a Native Hawaiian learning center and community center where all who visit can renew ties to the *ʻaina* (land and resources), and learn about traditional values and lifestyle through *laulima* (many hands working together). As stewards of the *ahupuaʻa*, we are intently focused on our *kuleana* (responsibility) to establish and perpetuate a thriving *ahupuaʻa* as an example of healthy interdependent relationships between people and earth's natural resources. We strive to be a leader in demonstrating a Hawaiian approach to watershed-scale natural resource management. [Waipā Foundation 2012]

3.4.3 Late 1800s to Modern Land Use in Lumahaʻi

Earle (1978) provides the following overview regarding Lumahaʻi:

> Very little is known about the land use of this *ahupuaʻa*. Around the turn of this century, there were extensive rice plantations in the alluvial area near the sea. For the earlier historic period (1850), only limited information is available because no land awards were granted to commoners in Lumahaʻi *ahupuaʻa*. The reason for this absence is unclear but it was not for want of a community population (see Schmitt 1966, 1973 for nineteenth century census data). Perhaps the *ahupuaʻa* chief and/or *konohiki* (headman of an *ahupuaʻa* land division under the chief) were instrumental

> in discouraging awards. Extensive bulldozing for pasturage has destroyed all archaeological evidence of pond-fields in the lower section of the valley, but numerous small terrace sites are to be found in the interior. One such site was identified 2.5 km from the sea, during a rapid reconnaissance survey, and others have been described by local hunters. [Earle 1978:33]

Historic Taro and Rice Farming in Lumahai

By the 1860s, taro production was being replaced by rice cultivation in all the valleys of the district except Hāʻena, frequently reworking the irrigation systems previously used for taro pond fields (Hoffman 1980:4). This shift from taro to rice production included the import of Asian laborers for the plantation as well as the introduction of eastern technology developed for irrigation and cultivation of rice. Rice production flourished from 1890 to 1930 in the Haleleʻa District, at which point prices dropped due to increased rice production in California and most Hawaiian rice fields were abandoned (Earle 1973:183). The growth of rice cultivation is documented by a population shift suggested by tax records and by a lease between the Bishop Estate and Chulan and Company in 1882 which rented parts of Lumahaʻi Valley's alluvial plain for rice production (Hoffman 1980:4). The 1865 tax records documented 25 Hawaiians and one Chinese paying taxes. By the time Chulan and Company had been growing rice for three years, the 1890 tax records documented only one Hawaiian and 34 Chinese. The Sing Tai Wai Company also rented lands for rice growing in the Lumahaʻi Valley (Kelly et al.1978).

George Bowser, editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide* (1880) wrote about various statistics and places of interest around the Hawaiian Islands (Maly and Maly 2003). In the following excerpts from "An Itinerary of the Hawaiian Islands," Bowser's narratives offer descriptions of the communities and various attractions of the Haleleʻa region:

> The next place, about two miles further on, is Lumahai. The valley here is about twenty miles long, and is on the average about a mile and a half wide. It is nearly all under cultivation. Messrs. Chulan & Co. have about 100 acres of it under cultivation for a rice crop. The supply of water is abundant at all seasons of the year. The scenery here is extremely grand, the mountain tops being cut into every imaginable shape of crag and peak, and their sides clothed with evergreen trees. In the gulches and ravines the wild banana grows to perfection, and the *awa* is found in profusion. This part of the island will grow any description of vegetable. When there I tasted at the table of my host, Mr. Robinson, some most delicious green peas, the seeds of which had only been sown six weeks before. The weather was delightful when I was there, and, although the rains are sometimes very heavy, the climate as a whole is exceedingly fine and enjoyable. Whilst here I climbed to the top of the dividing range between the Wainiha and Lumahai valleys. The views thus obtained are exceedingly grand. The massive mountain peaks running up to 3,000 feet high, are covered almost to their summits with forests, with occasional intervals of splendid grass. In the distance was the sea with scarcely a ripple on its surface, and the fine beach of brown sand. In the valleys the winding streams pursuing their course to the sea, hidden sometimes by the overhanging trees, with the rice fields in various stages of growth, some covered with water, others

beautifully green and laid out in the most perfect order. Add to this a lovely Italian sky and a pleasant temperature of about 70º, a gentle breeze to make riding no exertion, and you have the scene as I saw it, as charming as any I have seen in the islands . . . [Maly and Maly 2003:36]

The exact date these companies' discontinuation of rice cultivation in Lumahaʻi is unknown but oral reports indicate they were gone by 1925 when six Japanese families moved into Lumahaʻi Valley to grow rice (Hoffman 1980). One family "lived on the eastern side of the stream, about a mile *mauka* [inland] of the highway; the other families lived on the western (Wainiha) side, and their houses still stand today" (Kelly et al. 1978). Four families left the valley as rice prices dropped, while two others converted to taro cultivation (Hoffman 1980). The lease was taken over by Lester Robinson for cattle grazing in Lumahaʻi Valley. Robinson offered the two remaining Japanese families land in neighboring Wainiha Valley and all cultivation in the valley ceased (Hoffman 1980). Handy and Handy (1972) states,

Lumahai must have had many *loʻi* areas in old Hawaiian days, but in 1935 most of it was used for ranch lands, which obliterates the evidences of Hawaiian farming. It could not have supported a population as large as Wainiha or Hanalei. [Handy and Handy 1972:420]

3.4.4 Late 1800s to Modern Land Use in Wainiha

Agriculture and fishing in Wainiha

Agriculture and fishing endeavors continued as the mainstay for Wainiha Ahupuaʻa. By the early 1900s Wainiha had its own Chinese community that included not only the rice farmers, but also merchants and other business people (Coulter and Chun 1937). The rice industry eventually went into decline due to disease, pests, and competition from outside Hawaiʻi, and rice lands reverted to *kalo*. Rice cultivation probably served the unintended purpose of keeping the ancient irrigation systems and *loʻi* operational throughout this period. In the 1930s Handy (1940:73) reported both crops being cultivated simultaneously in Wainiha with actually more land seemingly devoted to *kalo* than rice. The valley even had its own commercial *poi* factory at the time. The cultivation of *kalo* is ongoing today, and is the most active agricultural undertaking in the still rural Wainiha Valley.

The Wainiha Hui

No history of Wainiha is complete without at least a mention of the Wainiha Hui. A detailed and sometimes colorful account of the *hui*'s (group or club) origins and dealings is given by Lydgate (1913) and continued by Thrum (1924). The story provides an understanding of the changing socio-economic aspects of land ownership in Wainiha following the Māhele and entering into the twentieth century. A greatly abbreviated version follows. Sometime after the Māhele, Kekauʻōnohi, a chief, held the *konohiki* lands of Wainiha, those being all of the remaining lands in the valley not awarded to the tenant farmers as *kuleana*.

Seeking a quick profit on a sandalwood deal, Kekauʻōnohi convinced Aldrich & Company of Honolulu to back the venture in the amount of $10,000. Kekauʻōnohi purchased a schooner, the *Manuokawai*, hired a captain and crew, filled the ship with sandalwood and sent it off to the Far East. Whether the ship was wrecked at sea or as Lydgate implies, was stolen by the captain who had less than a pristine reputation, she was never seen in Hawaiʻi again. Able to raise $1,000, Kekauʻōnohi still needed $9,000 to pay off Aldrich & Company. The plan was to sell the land to the Wainiha *kuleana* owners. The residents agreed to the plan although most of them were still basically subsistence farmers and did not have the cash to close the deal. Kekauʻōnohi gave them one year to raise the capital. By the time the year ended, 71 Wainiha residents had convinced Princeville Plantation of Hanalei to underwrite their venture at $100 each with the residents signing notes for the future delivery of agricultural goods, services, and labor to the plantation. This only amounted to $7,100 but Kekauʻonohi persuaded his creditor to let the residents assume the rest of the debt with interest (Lydgate 1913). Thus, in 1877 the Hui Kūʻai ʻĀina O Wainiha, the "group to purchase the land of Wainiha" was officially formed. The Wainiha Hui, as it was commonly called, now owned approximately 15,000 acres of the valley (*The Garden Island* 1947). A plan was instituted to give each shareholder 10 acres of arable land—5 acres *mauka* and 5 acres *makai*. The land was never formally surveyed nor legally partitioned and disputes were settled by an executive committee. In the coming years the *hui* members, in debt and paying property taxes, found that being large landowners was not at all like what Kekauʻōnohi had promised, as shares in the *hui* had essentially become a liability (Lydgate 1913).

Around the turn of the century, McBryde Sugar Company was looking for a source of electrical power to run its irrigation pumps and mill operations at ʻEleʻele on the southwest side of the island. They proposed to build a hydro-electric power plant at Wainiha and to pay the *hui* $1,500 a year for the water rights (Thrum 1924:95–112). The Kauai Electric Company was formed to construct and operate the power plant, which was completed in 1908. They built a landing and warehouse on Wainiha Bay with a light rail system to carry materials up the valley, along with roads, trails, and laborers' camps, as well as the plant itself and the transmission line that traversed the island (Gartley 1908:141–146). While there were other similar groups formed on Kauaʻi, most notably at Hāʻena and Moloaʻa, the Hui Kūʻai ʻĀina O Wainiha remained a singular success story. The lands of Wainiha were finally partitioned and the *hui* dissolved in 1947 after legal action was initiated by McBryde Sugar Company. Each of the original 71 shares was then worth about $5,000. Through the years McBryde had bought up most of the shares and owned 48. The Robinson brothers, Aylmer and Sinclair, held 10 and 6⅓ shares respectively. Only the remaining few shares were still in the hands of the heirs of the original *hui* members (Circuit Court of the Fifth Judicial Circuit 1947).

The Kūhiō Highway, Tsunamis, and Historic Flooding in Wainiha

The Kūhiō Highway, completed in 1917 and listed as site 03001048 on the NRHP (as the Kauaʻi Belt Road), runs throughout the project area. As mentioned previously, in 1895, traveler Eric Knudsen described the route from Hanalei to Hāʻena as a trail, the wagon road ending at Hanalei. "West of Waikoko Stream, Knudsen related that the trail climbed over the bluff and then descended straight down to the ocean before turning back and running along the beach again" (Fung Associates 2013:12).

> According to historian Ralph Kuykendall, nineteenth century Hawaiʻi roads, ʻor what were called roads,' came into existence by a familiar historical process, ʻthe trail became a road.' Many roads, especially in the rural districts like Kauaʻi's North Shore, were little more than cleared rights-of-way. [Fung Associates 2013:12]

By the end of the nineteenth century, each of the major Hawaiian Islands dreamed of building a "belt" road system. The idea for belt roads dated to the early Hawaiians, who built and maintained networks of traditional trails on all of the islands. Belt roads that circumvented the islands played an important role in Hawai‘i’s transportation history, connecting isolated communities to their island’s economic, political, and social centers.

> In 1911, the territorial legislature established a ‘loan fund,’ which provided the bonding needed for each island to build its belt roads and bridges. A Loan Fund Commission (LFC) was appointed for each island . . . By 1917, Kaua‘i considered its belt road complete, a feat that was accomplished earlier than any other island. [Fung Associates 2013:14–15]

Kūhiō Highway, Route 560 (NRHP # 03001048, and HRHP SIHP # 50-30-02-9396) was completed in 1917:

> Route 560 is a 10-mile rural road that was part of the first completed belt road in the Hawaiian Islands (constructed in early 1900s), and has retained a significant portion of its original characteristics and features. In recognition of Route 560’s historic stature, a Rural-Historic Road Corridor Plan was drafted to provide design guidelines for the DOT-HWY that reflect a community consensus for future work on the highway. [Hawai‘i Department of Transportation 2011:12–13]

The highway westward from and including the Hanalei Valley overlook on Kūhiō Highway is identified as a scenic roadway and historic district corridor:

> The historic district begins at Mile Marker 0 on Route 560 and continues to its termination at Mile Marker 10 at Ha‘ena State Park . . .The Kaua‘i Belt Road between Princeville and Ha‘ena traverses ten miles along the island’s north shore and is coterminous with its historic right-of-way. This portion of Kaua‘i’s ‘belt road’ was part of Kaua‘i’s original belt-road system, which extended from Ha‘ena on the north shore to Mana on Kaua‘i’s west shore. Although belt-road systems in the Hawaiian Islands were intended to circumvent each island, Kaua‘i’s road, like the Hawai‘i Belt Road, never completely encircled the island due to the rugged topography of Na Pali Coast. The north shore section of the Kaua‘i Belt Road begins at State Route 560’s Mile Marker 0 at Princeville and passes through the communities of Hanalei, Wainiha and Ha‘ena, ending at Mile Marker 10 at Ha‘ena State Park. The . . . historic district includes the road, the Hanalei Valley Scenic Overlook, and thirteen historic bridges and culverts. The period of significance for the north shore section of the Kaua‘i Belt Road is from 1900 when the Territory of Hawai‘i Superintendent of Public Works began roadway improvements until 1957 when the Wainiha Bridges were rebuilt after a tidal wave. The Kaua‘i Belt Road between Princeville and Ha‘ena retains historic significance and character in its location, alignment, design, setting, and association. The Kaua‘i Belt Road between Princeville and Wainiha was built during the 1910s, and from Wainiha to Ha‘ena circa 1928. Most of the roadway alignment is unaltered and predates the road’s construction. The road passes through rural areas along Kaua‘i’s North Shore, connecting communities much as it did in the early twentieth century when it was built. In many areas, the road was built over a trail used by Hawaiians and nineteenth-century travelers. There is no shoulder along most of the roadway, except near Princeville. The road has been widened since its construction, but is

> still narrow in many locations. The roadbed varies between 18' and 20' wide, being narrower as it hugs the sea cliffs and wider as it passes through valleys and residential communities. Near Princeville and Hanalei, the road is 22' wide. For most of the road's length, there are no guardrails, which contributes to the road's historic feeling. Lava-rock guardwalls, some dating to the 1920s, remain along the road in many locations, although many have been undermined by soil erosion. In a few locations, timber guardrails remain along the road. Only a few steel w-beam guardrails have been installed along the road in recent years. [Fung Associates 2013:6]

Maintaining the aesthetics of this scenic and historic highway, the stream bridges along the Kūhiō Highway of Kauai'i's north shore are all one-lane bridges listed on the NRHP as Historic Bridge Districts on the Kaua'i Belt Road (North Shore Section) (Fung Associates 2013). The one-lane bridges require a local courtesy of taking turns, five to seven cars crossing at a time.

> Most of the bridges and culverts on the Kaua'i Belt Road are one-lane wide and date to the early 1900s. The bridges represent two popular types of construction in early twentieth century Hawai'i: steel truss and reinforced-concrete flat slab. The reinforced concrete bridges feature solid concrete parapets. In addition, there are also several pipe culverts with masonry rock headwalls that were probably constructed in the first half of the twentieth century. [Fung Associates 2013:10]

Improvements to Kūhiō Highway and specifically to Kauai'i's north shore bridges became a high priority in the early twentieth century:

> Kaua'i's bridge-building program was extensive in 1912. During a special meeting in May, the LFC decided to build 'a number of bridges' near Hanalei, including Waikoko, Waipa, and Wai'oli. The LFC instructed Moragne to prepare plans and specifications for concrete structures, and he designed three flat-slab bridges with solid concrete parapets. Within months of Moragne's assignment, contracts were authorized for George Mahikoa to build the Wai''oli and Waikoko bridges; and George Ewart to build Waipa Bridge. Work on the new bridges began almost immediately and was none too soon. In August 1912, three of the timber bridges that were to be replaced collapsed under the strain of wagons delivering crushed rock for the new concrete bridges. [Fung Associates 2013:16]

Wainiha is vulnerable to inundation by tsunamis originating in the North Pacific Ocean. The tsunami of 1946 greatly impacted the northern shore of Kaua'i. Shepard et al. (1950:415) detail the following disturbing account of the damage at the coast in the vicinity of the current project area:

> Half a mile east of Haena Bay the water swept inland 1,600 feet, knocking over trees, and a little further east it smashed through a dense grove of pandanus, laying the trees over in parallel rows . . . Fishes were carried inland, as at many other places; and 11 days after the wave, small fish were found still alive in a pool 1,000 feet inland . . . At the head of Wainiha Bay the water rose 24 to 27 feet above normal sea level. . . several houses were wrecked and some loss of life occurred. [Shepard et al. 1950:415]

This destruction included stripping the sediment from the beach areas, which was washed varying distances inland and deposited. Coral blocks, up to 12 ft in diameter, were picked up and carried as much as 500 ft inland (Shepard et. al. 1950:414–415). Another account reports, “The 1946 tsunami hit with two powerful waves, with a maximum run-up of forty-five feet in elevation. All the bridges at Wainiha were washed out, and the tiny village of Wainiha itself was flattened” (Pacific Worlds & Associates 2001)

The 1957 tsunami caused a 38 ft rise in sea level at Wainiha and low-lying areas as far as 4,000 ft inland were inundated (DLNR 1975). Flooding due to heavy rainfall is also a frequent occurrence in Wainiha and results in stream-channel overflow. The valley has recorded rainfall as high as 24 inches in 24 hours. Since 1956 there have been at least eight damaging floods in Wainiha, one of which caused loss of life (DLNR 1975). As previously mentioned, the flooding of Wainiha is referred to in folklore (Pukui 1951:67). Perhaps it is this natural characteristic of the valley which explains the origin of the name “unfriendly water.”

Thus, navigating the streams of Kauaiʻi’s north shore, the bridges within the project areas have historically had to contend with periodic flash floods and tsunami storms. Indicating the severe natural elements that the bridges are exposed to, the stream crossings within the project areas periodically require seasonal reworking or replacement:

> In January 1921 the Wainiha River cut a new channel during a storm, which necessitated another bridge, as flooding had carved a ‘long slim island out of the agricultural land of the valley.’ The Garden Island reported that the new bridge would ‘make three bridges in the valley, in within [*sic*] a distance of about 500 yards.’ This third structure at Wainiha became known as Wainiha Bridge #2. Plans for a new single-span bridge of 75’ were drawn in 1922. The design was a timber-truss structure that complemented the adjacent timber-truss bridge (Wainiha #3). Even though the plans were drawn in February 1922, a construction date was not determined. The Territorial Highway Department records state that the bridge was constructed in 1931.No information was located to indicate when the original Wainiha Bridge #2 was built, although it may have been built as early as the first decade of the twentieth century. [Fung Associates 2013:40-41]

Wainiha Bridges 1 and 3 were originally constructed in 1904 with wooden trusses and by 1921 an additional bridge was built to cross a new stream channel that formed during flooding. This middle Wainiha Bridge, referred to as Wainiha Bridge 2, was completed in 1931, however, successive storms in 1946, 1957, and 1966 destroyed or damaged all three original wooden Wainiha Bridges which were replaced.

> Natural disasters struck the Wainiha bridges on two occasions in 1957. On March 9, three tidal waves struck Wainiha Valley, destroying the west span and small approach span of Wainiha Bridge #3 as well as Wainiha Bridges #1 and #2. The only span that remained after the tidal wave was the east (Hanalei side) span of Wainiha #3. In December, flooding from Hurricane Nina damaged Wainiha Bridge #3 again, making it impassable to traffic until it was repaired. [Fung Associates 2013:22]

Storms in 2004 and 2007 further damaged the replacement bridges, which were then demolished and replaced with the modular steel truss bridges currently in place.

Raw materials used in the construction of the stream crossings along the Kūhiō Highway of Kauaiʻi's north shore have included timber, steel, concrete, and basalt. The bridges were likely originally constructed from locally milled timber and were ultimately replaced with steel and concrete bridges. As discussed further in Section 4, the 1946 repair of the Waikoko Stream Bridge involved utilizing the fallen concrete structure in place with basalt boulders and concrete used to stabilize and level the feature.

> The earliest bridges on Kauaʻi were constructed of wood and steel. Wood was a prevailing construction material throughout the Hawaiian Islands during the nineteenth century; it was widely available, relatively inexpensive, and fairly durable. By the end of the nineteenth century, steel represented the latest in industrial technology and was a preferred construction material for its strength. Although steel bridges had to be imported from the United States or Great Britain, the strength of steel provided a feasible solution for spanning Kauaʻi's wide rivers. Steel was also used throughout the islands to erect the substantial bridges required to carry railroads over Hawaii's rivers and rugged gulches . . . By 1904 timber bridges spanned the rivers at Wainiha, Waikoko, and Waipā, and plans were made for a steel bridge over the Lumahaʻi River. [Fung Associates 2013:13]

3.5 Previous Archaeological Research in the Project Areas

Approximately 30 previous archaeological studies have been conducted near the current proposed project areas in the Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa (Figure 33). Previous archaeological studies are described below for each *ahupuaʻa*. Previous archaeological studies in the Waiʻoli Ahupuaʻa are summarized in Table 6 and historic properties identified are summarized Table 7. Waipā and Waikoko previous archaeological studies are summarized in Table 8 and historic properties identified are summarized in Table 9. Figure 34, shows the location of historic properties identified during the previous studies in Waiʻoli, Waipā, and Waikoko. The previous archaeological studies in Lumahaʻi are summarized in Table 11 and historic properties identified are summarized in Table 12. Wainiha previous archaeological studies are summarized in Table 13 and include two of Bennet's (1931) sites, Sites 152 and 153, described as taro terraces and a house site respectively, are within the Wainiha Valley:

> This interesting taro section is high on the side of the valley utilizing a little stream and a small flat area. The hill is on one side and the stream and a bluff on the other, leaving a fairly steep section in between. At one place above the terraces stones are built across the stream as an intake, which could, with the addition of a few more stones, shunt the water into a ditch which runs between large rocks and dirt walls. All along the edge of the stream is a wall built to keep the water from running back. The terraces are from 6 inches to 3 feet high . . . Site 153. House sites, on Mauna Hina ridge in Wainiha Valley. Remains of many old house sites and much irrigated land. The house sites are mostly of the terraced type and 10 to 15 feet wide. [Bennett 1931:135, 136]

Earle's documentation of irrigated taro systems in Wainiha is shown on a USGS map of the valley (Earle 1978:59) (Figure 35). Earle's System 14 extends along Wainiha River to just southeast of Powerhouse Road. Earle observed that the lower portion of Wainiha Valley was extensively used for taro cultivation through the 1850s (Earle 1978:32).

Historic properties identified within Wainiha are summarized in Table 14. Historic properties identified during previous studies in Lumahaʻi and Wainiha are illustrated in Figure 36. The tables and figures are followed by discussions of the type of research and cultural resources, if identified.

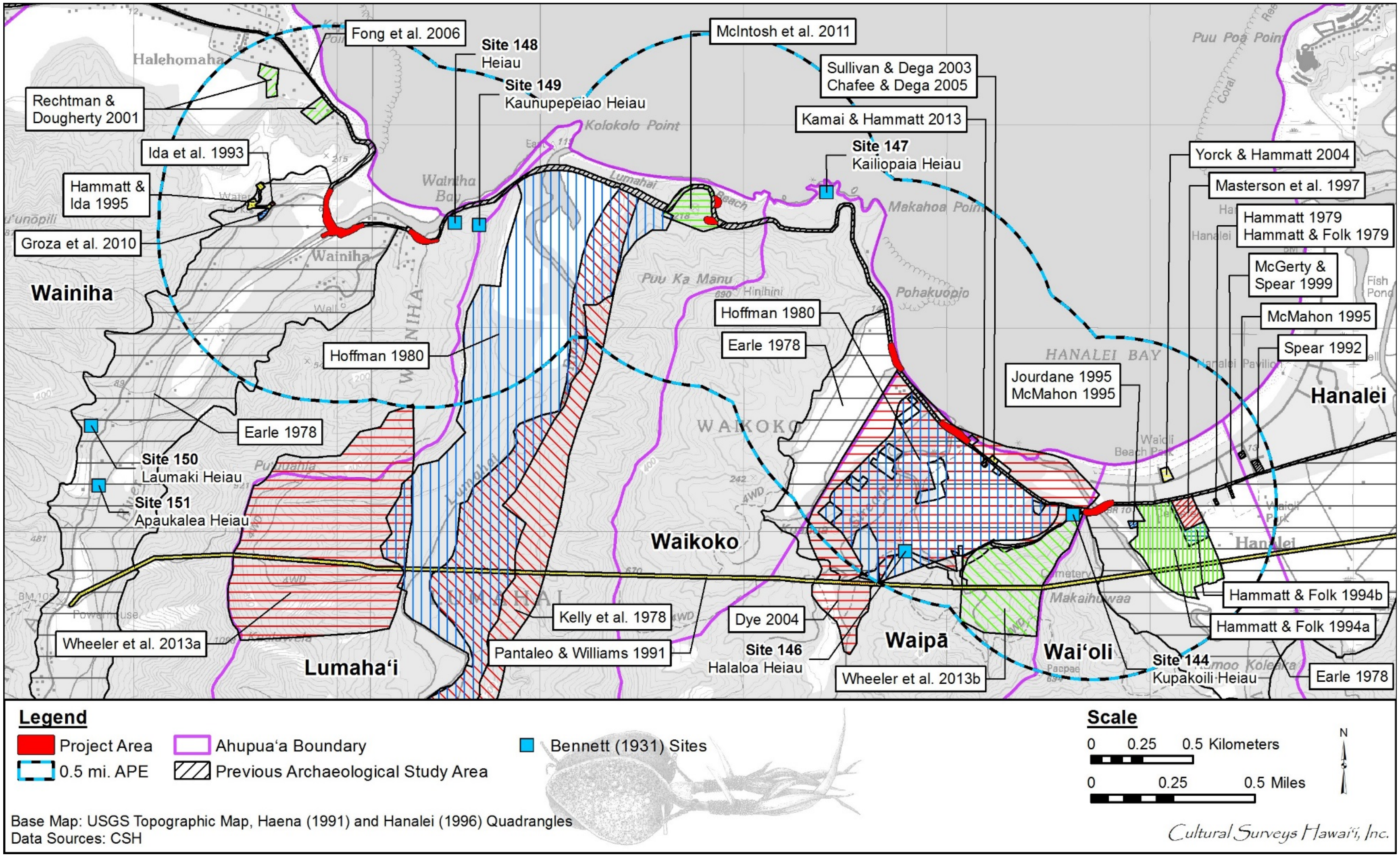


Figure 33. Portions of the 1991 Haena and 1996 Hanalei USGS 7.5-minute series topographic quadrangles showing the locations of the previous archaeological studies and Bennett sites

3.5.1 Previous Archaeological Research in Wai‘oli

The following two tables outline the archaeological research (Table 6) and cultural resources (Table 7) identified in and around Wai‘oli Ahupua‘a. These tables are followed by discussion of the research and cultural resources. Table 6 provides a list of archaeological research conducted within Wai‘oli and the easternmost portion of Hanalei Ahupua‘a, including columns for source, location, nature of study, and results. The locations of these archaeological studies are shown in Figure 33. Table 7 is a list of known cultural resources within the *ahupua‘a* and includes columns for state site numbers, site type, location and reference. The locations of identified cultural resources within Wai‘oli and eastern end of Hanalei Ahupua‘a are shown in Figure 34.

3.5.1.1.1 *Thomas G. Thrum (1906)*

The earliest archaeology of Wai‘oli is described by Thomas G. Thrum (1906) in his article *Heiau*s and *Heiau Sites Throughout the Hawaiian Islands* where he lists two *heiau* in Wai‘oli:

> Nakikoniawaiaau Wai‘oli uka - An open paved space, not large, dedicated to Laka, to which offerings at the annual festivities were brought.
>
> Mamalahoa Wai‘oli - A small *heiau* 24x60 feet in size, paved with walls 3 to 5 feet high. Of husbandry class. Kanehekili its deity; Kapihi its priest. [Thrum 1906:43]

Thrum lists Kupakoili *Heiau* (State Site 50-30-03-144), “Reported as a small *heiau*; probably simply a place of offering” as in Waipā but it appears to be in Wai‘oli.

3.5.1.1.2 *Wendell Bennett (1931)*

Wendell Bennett, in The Archaeology of Kaua‘i (1931:135), lists Nakikoniawalaau Heiau (State Site 50-30-03-145), but furnishes only Thrum's description for it and does not give a specific location for it. The Tax Map Key 5-6 shows the site of Nakikoniawalaau Heiau on the east side of Wai‘oli Stream far inland of Kūhiō Highway. Bennett locates Kupakoili Heiau: “on the west side of the *pali* west of Wai‘oli Stream, not far from the sea.” The Tax Map Key 5-6 shows the site of “Kupaloili Unu” just *mauka* of Kūhiō Highway on the west side of Wai‘oli Stream seemingly in Wai‘oli Ahupua’a. Bennett does not mention Mamalahoa Heiau and its location is unknown. Bennett notes that the Hanalei section of the island was known for its “ease of cultivation” (1931:5).

3.5.1.1.3 *Timothy K. Earle (1978)*

Timothy K. Earle (1978) did the first in-depth study of the Halele‘a District, in Economic and Social Organization of a Complex Chiefdom: The Halele‘a District, Kaua‘i. This work is a seminal piece of research within the vicinity of the project area, and as a classic archaeological study of traditional irrigations systems. Earle (1978) showed that the taro *lo’i* in Wai‘oil had been replaced by the cultivation of coffee and rice before the turn of the century. Earle's Systems 22, 23 and 24 describe the Wai‘oli valley systems. However, within Wai‘oli Ahupua’a all of these documented taro systems lie 200 m or more *mauka* of Kūhiō Highway.

Table 6. Previous Archaeological Studies in Waiʻoli Ahupua'a

Source	**Location**	**Nature of Study**	**Results (SIHP # t0-30-03)**
Earle 1978	Haleleʻa District: Waiʻoli	Economic and social organization study	Describes Waiʻoli Valley irrigation systems 22 and 23
Hammatt 1979	Waiʻoli Mission Hall	Archaeological surface examination and subsurface testing	Documents SIHP # -00601, pre-Contact and early historic cultural layer
Hammatt and Folk 1979	Waiʻoli Mission Hall	Archaeological excavations	Discusses findings and conclusion for SIHP # -00601, pre-Contact and early historic cultural layer
Pantaleo and Williams 1991	Transmission line corridor	Archaeological reconnaissance	No cultural resources identified in Waiʻoli
Spear 1992	St. Williams Church, TMK: [4] 5-5-002:037	Archaeological inventory survey	SIHP # -06028, pre-Contact and early historic cultural layer
Hammatt and Folk 1994a	30 acres (TMK: [4] 5-5-006:009)	Burial treatment plan	SIHP # -01877, single burial
Hammatt and Folk 1994b	30 acres (TMK: [4] 5-5-006:009)	Archaeological inventory survey	Identified SIHP #s -06031, a marsh deposit; -06032, buried cultural deposit; and -06028, a human burial
Jourdane 1995	5-5496C Kūhiō Hwy, TMK: [4] 5-5-006:012	Inadvertent burial report	SIHP # -03014, inadvertent skeletal remains
McMahon 1995a, b	Malolo Road, Hanalei, TMK: [4] 5-5-003:035	Inadvertent burial report	SIHP # -01982, three burials described
Masterson et al. 1997	Hanalei School lot, *mauka* of Kūhiō Hwy, TMKs: [4] 5-5-006: por. 009, 018	Archaeological monitoring	SIHP # -01988, three burials and five isolated human remains
McGerty and Spear 1999	Waiʻoli Town Park, *mauka* of Kūhiō Hwy, TMK: [4] 5-6-002:005	Archaeological inventory survey	No cultural resources identified
Yorck and Hammatt 2004	Coastal Residence, TMKs: [4] 5-5-004:009and 010	Archaeological monitoring	Three discrete features identified; historic to modern layer, three historic bottles, and two cow teeth, no SIHP # given

Source	Location	Nature of Study	Results (SIHP # t0-30-03)
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Haʻena	Archaeological monitoring	No cultural resources identified

Table 7. State Inventory of Historic Places Sites in Wai‘oli Ahupua’a

SIHP # 50-30-03-	Site Type/Name (if any)	Location	Reference
B004	Wai‘oli Hui‘ia Church Cemetery	South of Kūhiō Hwy, between Wai‘oli Park and Hanalei School, TMK: [4] 5-5-006:019	Kikuch and Remoaldo 1992:13–14
00601	Pre-Contact and early historic cultural layer	Wai‘oli Mission Hall	Hammatt 1979; Hammatt and Folk 1979
01877	Pre- and post-Contact deposits	Wai‘oli	Spear 1992
01982	Burial	Malolo Rd, Hanalei	McMahon 1995a
01988	Burials	Hanalei School	Masterson et al. 1997
03014	Burial	Kobayashi Subdivision, Wai‘oli	Jourdane 1995
06028	Burial	Kobayashi Subdivision, Wai‘oli	Hammatt and Folk 1994; Hammatt 1994
06031	Marsh deposit	Kobayashi Subdivision, Wai‘oli	Hammatt and Folk 1994
06032	Cultural deposit	Kobayashi Subdivision, Wai‘oli	Hammatt and Folk 1994
09300	Waioli Mission District	Wai‘oli	SHPD files
09374	Mahamoku (Wilcox Hanalei Beach House)	5344 Weke Rd, Hanalei, Kaua‘i, TMK: [4] 5-5-003:010	Historic Hawai‘i Foundation
09386	Douglas Baldwin Beach House	5242 Weke Rd, Hanalei, Kaua‘i, TMK:[4] 5-5-002:107	Historic Hawai‘i Foundation
09388	Say Dock House	Hanalei	Historic Hawai‘i Foundation
none	Excavated pits	75 m southwest of Site 144	Wheeler 2013b
none	Irrigation system 22	East of Wai‘oli Stream	Earle 1978:67–68
none	Irrigation system 23	West of Wai‘oli Stream	Earle 1978:69–70

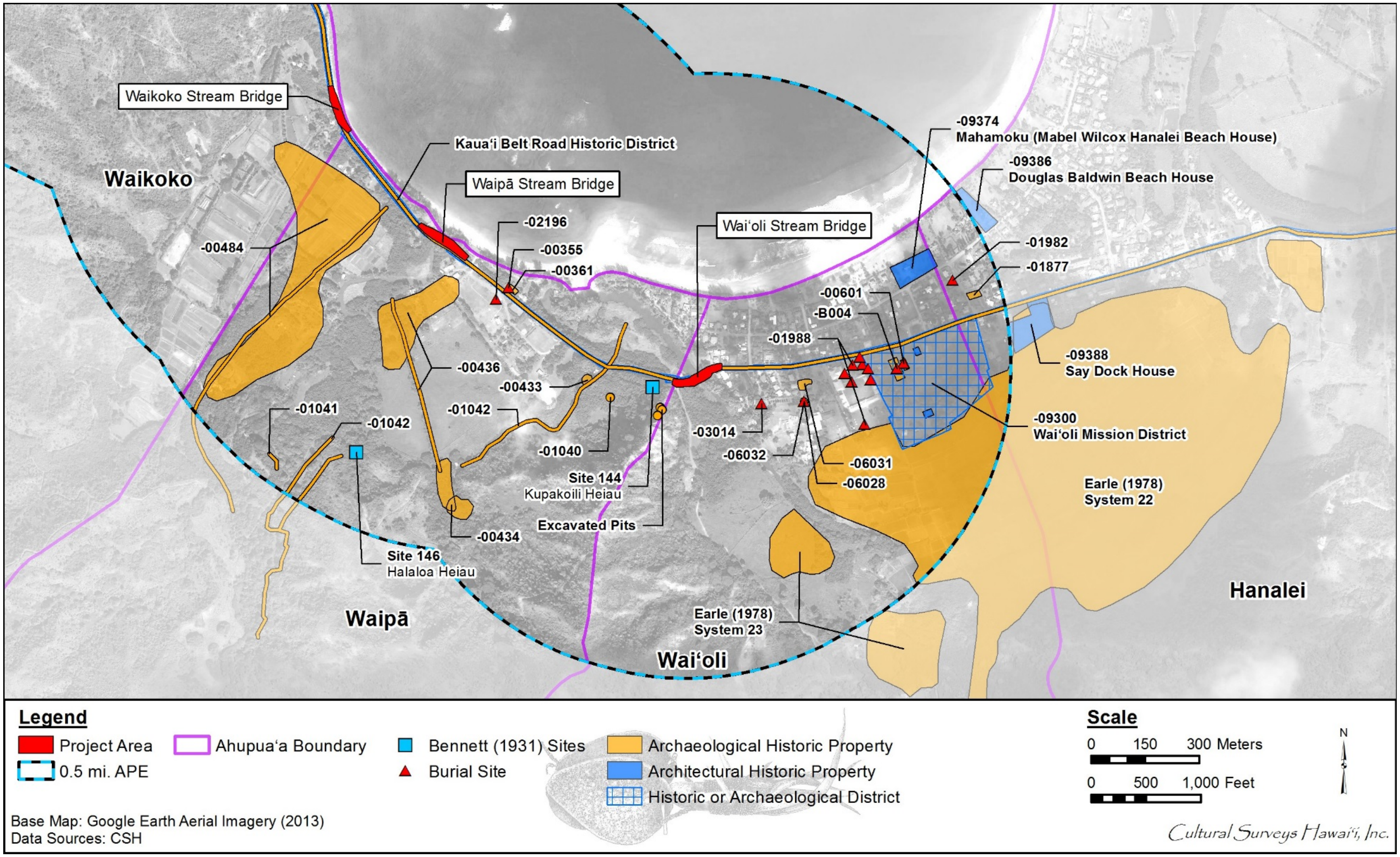


Figure 34. Aerial photograph (Google Earth 2013) showing locations of previous identified historic properties in portions of Hanalei, Wai‘oli, Waipā, and Waikoko Ahupua‘a

3.5.1.1.1 *Hammatt (1979); Hammatt and Folk (1979) and William K. Kikuchi (1987)*

In 1979, a rare opportunity in Hawaiian archaeology occurred in data collected from testing within the Waiʻoli Mission Hall. Archaeological testing, which revealed a stratigraphic sequence beneath the floor of the Mission Hall, was followed up by full-scale excavation (Hammatt 1979; Hammatt and Folk 1979). The excavations of the missionary church at Waiʻoli helped document the entire history from 1832 to the twentieth century.

William K. Kikuchi (1987:11–12) in an article called "Kauaʻi Fishponds," describes six *loko-i-a-kalo* ponds that grew both taro and fresh water crustacean, fish, shellfish, and certain aquatic plants (1987:11) in Waiʻoli:

B1a Name Ahau, of unknown acreage,

B1b Name unknown, of unknown acreage,

B1c Name unknown, of unknown acreage,

B6A Named Kaiulu, of unknown acreage,

B25a Name unknown, of 10.3 acres, and

B25b Name unknown of .12 acres.

Kikuchi (1987:8) suggests these five fishponds were near the shore in Waiʻoli. He also lists five other "unknown type" fishpond sites at Waiʻoli:

B6b Name Kaaikahala, of 1.34 acres,

B10b Name Kuloko, of 1.06 acres,

B16a Name Maikai, of unknown acreage,

B16b Name Momona, of unknown acreage, and

B18a - name Opahale of 0.25 acres.

These unknown types of ponds are mentioned in the LCAs as being in the upland above the big bend in the river. These fishponds were in use in 1848 but already by 1852 some of them had disappeared (cf. Native Register 1847-1853 and Foreign Testimony 1848-1850).

3.5.1.1.2 *Pantaleo and Williams (1991)*

In 1991, an archaeological reconnaissance survey was conducted in selected portions of Port Allen to Wainiha transmission line corridor. The purpose of the study was to determine the presence and/or absence of any inclusive cultural resources. Portions of this survey were conducted on the north side of Kauaʻi including Waiʻoli, Waipā, Waikoko, LumahaʻI, and stops in Wainiha Valley at the Wainiha Valley Hydro-electric Plant. No new cultural resources were identified in the Waiʻoli Ahupuaʻa.

3.5.1.1.3 *Spear (1992)*

In 1992, Robert Spear conducted an archaeological inventory survey of St. Williams Church. Results of this archaeological inquiry included documentation of SIHP # -06028, a pre-Contact and early historic cultural layer.

3.5.1.1.4 *William Kikuchi and Susan Remoaldo (1992)*

In 1992, William Kikuchi and Susan Remoaldo printed their first volume of the inventory on Kauaʻi cemeteries. There is only one site inventoried in detail, the Waiʻoli Huiʻia Church Cemetery (their site 50-30-03-B004). They catalogue 48 gravesites with markers giving the range of known dates from 1842 through 1980. The family names were Aaron, Deverill, Doiron, Doso, Haumea, Johnson, Kapu, Kaukaha, Kawika, Kekauoha, Lota, Mahinai, Maka, Pauole, Peters, Rindt, Waiuli, Werner, and Willis (Kikuchi and Remoaldo 1992:13–17). A historical study (Waiʻoli Mission House, Hanalei, Kauaʻi, Grove Farm Homestead and Waiʻoli Mission House, Kauaʻi) has also been done on the Waʻoli Mission by Barnes Riznik (1987). The Hawaiʻi Register of Historic Places (DLNR 1974) lists the Mission House as State Site 50-30-03-9300. Riznik documents the families who lived there and the process of restoring the Mission House. Designare Architects report a recent assessment of damage done by Hurricane ʻIniki to the Waiʻoli Huiʻia Church and Meeting Hall (1992).

3.5.1.1.5 *Hammatt and Folk 1994a and b*

Within the central area of the Waiʻoli Ahupuaʻa just *mauka* of the highway, CSH conducted a couple of archeological studies. Three cultural resources were identified during an archaeological inventory survey of a 30-acre proposed subdivision. SIHP #s -6031, a marsh deposit, -6032, a buried A horizon with few scattered flakes and sparse charcoal, and -6028, a flexed human burial were identified (Hammatt and Folk 1994a). Another AIS including subsurface testing was conducted in Hanalei School. Pond field sediments were observed in test trenches. Based on radiocarbon date of the sediments, the pond fields date to the 1960s (Hammatt and Folk 1994b).

3.5.1.1.6 *Jourdane 1995, McMahon (1995a, b), and Masterson et al. 1997*

In 1995, SHPD investigated inadvertent burial finds near the project area (Jourdane 1995; McMahon 1995a, b). Burials were also identified while monitoring in Hanalei School in 1997 by a CSH archaeologist. SIHP # -01988, three burials and five isolated human remains, were identified (Masterson et al. 1997).

3.5.1.1.7 *McGerty and Spear (1999)*

In 1999, SCS conducted an AIS with limited subsurface testing to observe stratigraphy beneath the surface. A total of seven test units were excavated. No cultural resources were identified.

3.5.1.1.8 *Yorck and Hammatt 2004*

In 2004, CSH put together an archaeological monitoring package for renovation and relocation of a house site along the Waiʻoli coastal area. The monitoring package consisted of a monitoring plan (Hammatt and Shideler 2003) and monitoring report (Yorck and Hammatt 2004). Three historic to modern discrete features were observed during the monitoring. The findings include a layer containing modern to historic refuse, three historic bottles, and two cow teeth (Yorck and Hammatt 2004:21).

3.5.1.1.9 *Fong et al. 2006*

In 2006, CSH monitored an approximate 10-mile stretch from Princeville to Haʻena for the Kūhiō Highway, Route 560 Shoulder Improvements project (Fong et al. 2006). On the basis of historic research and previous archaeology, monitoring was recommended and an archaeological monitoring plan was written (Shideler et al. 2004). During monitoring of subsurface activities, sediments appear as disturbed by previous road construction. No cultural resources were observed (Fong et al. 2006).

3.5.2 Previous Archaeological Research in Waipā and Waikoko

Table 8 and Table 9 outline the archaeological research and cultural resources identified in Waipā and Waikoko Ahupuaʻa, followed by discussion of the research and cultural resources. The locations of these archaeological studies are shown in Figure 33. The locations of identified cultural resources within Waipā and Waikoko Ahupuaʻa are shown in Figure 34.

Overview of Previous Archaeological Studies in Waipā and Waikoko

3.5.2.1.1 *Thrum (1906)*

Thrum (1906:43) lists the *heiau* of Kupakoili, in the *ahupuaʻa* of Waipā, and says it is "reported as a small *heiau*; probably simply a place of offering." While Hoffman (1980) places the *heiau* just *mauka* of Kūhiō Highway in Waipā, Thrum also lists Halaloa Heiau in the *ahupuaʻa* of Waipā. He relates it as located "at Waipā Stream. A square *heiau* of about 80 feet in size, with low walls, Kāne its deity," noting that it was destroyed years ago for a mill site.

3.5.2.1.2 *Bennett (1931)*

Bennett (1931) describes no sites in Waikoko and Halaloa *heiau* at Waipā. Hoffman places the location of this historic property more than 500 m inland of the highway (Bishop Museum site KA-D8-1; SIHP # 50-30-03-146) (see Figure 33 and Figure 34) more than 500 m inland of the highway.

> Site 146: Halaloa *heiau*, at the end of a little road running up on the east side of Waipā stream, at the site of an old rice mill. Thrum describes it as 'A square *heiau* of about 80 feet in size, with low walls. Kāne its deity. Destroyed years ago for mill site.' Nothing remains now but a few stones scattered about. [Bennett 1931:135]

3.5.2.1.3 *Earl (1978)*

Earle (1978) describes four wetland taro irrigation systems at Waipā as System Number(s) 18, 19, 20, and 21 (Figure 35 and Table 10) with one of these systems extending into Waikoko. None of these agricultural systems extends as far seaward. Wetland taro irrigation "System 18" is the only one of the four *loʻi kalo* irrigation systems of Waipā that Earle describes in detail under the heading of "Halelea's Modern Taro Irrigation" (perhaps because it was the only one in active use at the time of the 1971/1972 fieldwork). Earl (1978) indicates that:

> In 1850, System 18 irrigated a major section of the ahupuaʻa of Waipa but now it is used only to irrigate one taro farm in the neighboring ahupuaʻa of Waikoko. The primary ditch of System 18 taps the Waipa stream in the narrow valley just before the stream enters the broad alluvial plain. The intake is placed at a natural bend in the stream so that the main ditch line continues the direction of stream flow above the dam. The head dam, itself, is a standard stone mound percolation dam using in situ boulders. River cobbles (15-30 cm) are heaped between the boulders to create a mound wall 8 m long, 1 m wide, and 0.6 m high. The primary ditch, then, channels the water around a small hill and through the alluvial plain. This ditch is a simple earth channel about 1.1 m wide by 0.5 m deep at natural ground level. Along much of the ditch's length, roots of the *hau*, which grows exuberantly, clog the ditch and present a major maintenance problem. Excess water is hand-led simply by a spillway to the Waikoko stream. The primary ditch is now about 1.32 km long, The ditch follows the line of an old ditch for the first 0.84 km and then it turns at right

Table 8. Previous Archaeological Studies in Waipā and Waikoko Ahupua’a

Source	**Location**	**Nature of Study**	**Results (SIHP # 50-30-03)**
Thrum 1906	Island-wide	Island-wide survey	Nakikoniawaiaau, Mamalahoa, and Kupakoili *heiau* (SIHP # -144)
Bennett 1931	Waipā and Waikoko	Island-wide survey	SIHP #s -144, Kupakoili Heiau; -146, Halaloa Heiau; and -147, Kailiopaia Heiau
Hoffman 1980	Alluvium plains of Waipā Valley	Archaeological survey, limited test excavations	Confirmed Earle’s irrigation systems
Pantaleo and Williams 1991	Transmission line corridor	Archaeological reconnaissance survey	No cultural resources identified in Waipā and Waikoko
Sullivan and Dega 2003	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Burial treatment plan	SIHP # -00355, two burials and isolated skeletal remains
Dye 2004	KSBE lands, leased to Hawaiian farmers of Hanalei, TMKs: [4] 5-6-004:022, 023, and 025	Archaeological inventory survey	Two previously identified cultural resources: SIHP #s -00146, rice mill at the site of Halaloa Heiau and -00484, irrigation system described by Tim Earle as System 18 and three newly identified cultural resources in project area: SIHP #s-01040, a cave shelter; -01041, *‘auwai*, and -01042, an *‘auwai* system
Chafee and Dega 2005	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Archaeological monitoring	Two cultural resources identified: SIHP #s -00355, two burials and isolated skeletal remains, and -00361, a cultural layer containing pre- and post-Contact artifacts
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Ha‘ena	Archaeological monitoring	No cultural resources identified in Waipā and Waikoko
Kamai and Hammatt 2013	KSBE land; TMK: [4] 5-6-004:023	Burial site component of an archaeological preservation plan	SIHP # -2196, an inadvertent burial discovery

Source	Location	Nature of Study	Results (SIHP # 50-30-03)
Wheeler et al. 2013b	KSBE land, TMK: [4] 5-6-003:001 por.	Archaeological reconnaissance survey and literature review	One cultural resource identified: three excavated pits on Makaihuwaʻa Ridge

Table 9. State Inventory of Historic Places Sites in Waipā and Waikoko Ahupua’a

SIHP # 50-30-03-	**Site Type/Name (if any)**	**Location**	**Reference**
144	Kupakoili Heiau	West of Wai‘oli Stream	Thrum 1906:43; Bennett 1931:135; Hoffman 1980
146	Halaloa Heiau	East side of Waipā	Bennett 1931:135
147	Kailiopaia Heiau	Western portion of Makahoa Point	Bennett 1931:135
00355	Burials and isolated skeletal remains	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Chafee and Dega 2005
00361	Cultural deposit containing pre- and post-Contact artifacts	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Chafee and Dega 2005
00433	Irrigation system 21	Eastern edge of Waipā Ahupua‘a	Earle 1978:234; Hoffman 1980:25; Dye 2004
00434	Irrigation system 20	Eastern boundary of Waipā Ahupua‘a, at the base of the hills	Earle 1978:234; Hoffman 1980:25; Dye 2004
00436	Irrigation system 19	Southwest of Waipā Stream	Earle 1978:223; Hoffman 1980:25; Dye 2004
00484	Irrigation system 18	Northwest of Waipā Stream	Earle 1978:33, 67; Hoffman 1980:24; Dye 2004
01040	Cave shelter	*Mauka* end of a natural depression	Dye 2004:21–24
01041	‘*Auwai* section	East side of Waipā Stream	Dye 2004:25
01042	‘*Auwai* system	East side of Waipā Ahupua‘a	Dye 2004:26–27
02196	Inadvertent burial	KSBE land, TMK: [4] 5-6-004:023	Kamai and Hammatt 2013
	Excavated pits	Makaihuwa‘a Ridge	Wheeler et al. 2013b:47–56

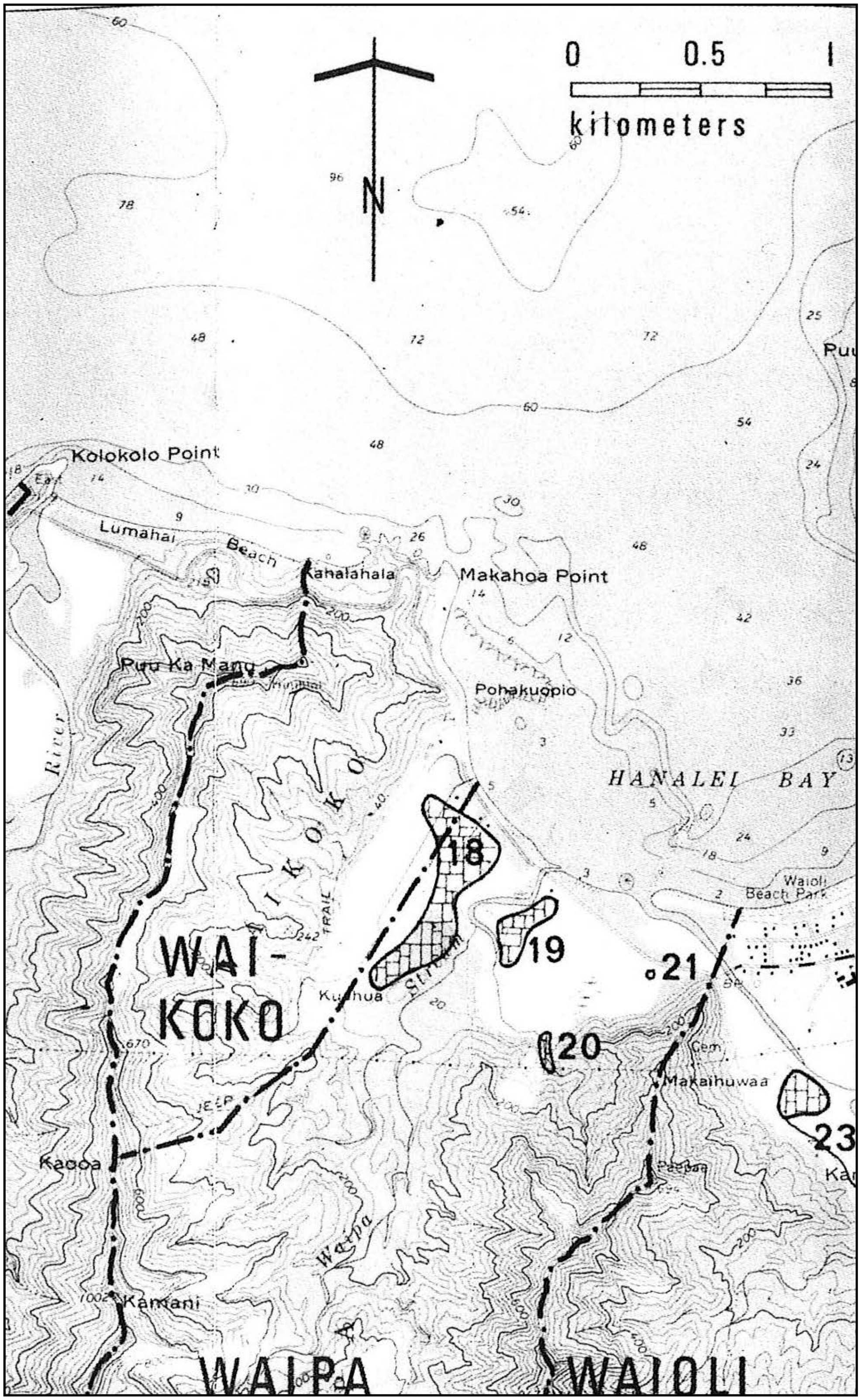


Figure 35. *Loʻi* systems of Waipā as documented by Timothy Earle (1978:196a)

Table 10. Waipā Irrigation System as Documented by Earle (1978:125)

System #	Type	Source	Length in Meters of Irrigation Ditch		Area in Hectares of Irrigation System		Number of Farmers on Irrigation System	
			Total	Initial Segment	Net	Gross	Net	Gross
18 (SIHP # 50-30-03-484)	Alluvial Coastal Plain	Main stream	1,095	400	2.56	5.18	6	8
19 (SIHP # 50-30-03-436)	Alluvial Coastal Plain	Main stream	875	745	1.80	1.80	5	9-10
20 (SIHP # 50-30-03-434)	Alluvial Bottom	Small independent stream	0	0	0.33	0.33	2	2
21 (SIHP # 50-30-03-433)	–	Ground water	0	0	0.36	0.36	1	1

> angles to the west where it is flumed across the Waikoko stream to water a farm with twelve pond fields. This westerly extension of the system is apparently recent, dating after the introduction of rice. The system is presently operated by a single oriental farmer. [Earl 1978:67]

The Waipā systems are clearly small for Haleleʻa District as a whole. Earl (1978:127) notes the mean net area for these Haleleʻa District systems was calculated to be 1.93 ha (range 0.1-16.38). This may be compared to the mean net area for the Waipā systems of 1.26 (range 0.33-2.56). On the basis of "receiving grants," Earle (1978:127) concludes, "The mean number of farmers within an irrigation system [of Haleleʻa] was 4.7 (range 1 – 43)." The corresponding mean for the farmers of Waipā appears to be 3.5 (range 1-6). It appears Earl's estimate of the total number of farmers likely to have been working on the Waipā *loʻi* systems was approximately 20 to 21.

3.5.2.1.4 *Hoffman 1980*

The Hoffman study notes previous massive clearing operations in the coastal flats of Waipā. No new sites were identified but seven previously located sites are briefly summarized. The only two sites Hoffman discusses are Kupakoili Heiau previously discussed and Earle's agricultural system 21, BPBM # KA-D8-7, SIHP # -433, which is located "along Kūhiō Highway." Hoffman notes this later site included a fishpond as indicated in 1850 land records. Neither of these sites was investigated in the Hoffman study.

3.5.2.1.5 *Panteleo and Williams (1991)*

In 1991, an archaeological reconnaissance survey was conducted in selected portions of Port Allen to Wainiha transmission line corridor. The purpose for the study was to determine the presence and/or absence of any inclusive cultural resources. Portions of this survey were conducted on the north side of Kauaʻi including Waiʻoli, Waipā, Waikoko, LumahaʻI, and stops in Wainiha Valley at the Wainiha Valley Hydro-electric Plant. No new cultural resources were identified in the Waipā and Waikoko Ahupuaʻa.

3.5.2.1.6 *Sullivan and Dega 2003; Dye 1994a and Chafee and Dega 2005*

In 2003, SCS wrote a burial treatment plan for two inadvertently disturbed human remains discovered during excavation of a structure foundation and a leach field of a single family residence (Sullivan and Dega 2003). Tom Dye conducted an archaeological inventory survey with subsurface testing for Waipā Foundation in 2004. Further information regarding two previously identified cultural resources and three newly identified cultural resources were documented. Previously identified cultural resources consists of SIHP # -146, a rice mill at the site of Halaloa Heiau and SIHP # -484, an *ʻauwai* system first identified by Tim Earle who labeled it as "System 18." Dye describes the current condition of the mill, and notes that some of the waterworn cobbles used in the concrete mill construction might have been taken from the *heiau*. The newly identified cultural materials include SIHP # -01040, a cave shelter and SIHP # -01041, "likely associated with the *heiau* ceremonial complex in pre-Contact times" (Wheeler 2013b:39-40). Additionally, Dye (2004) documents a section of *ʻauwai* along the east bank of Waipā Stream and SIHP #s -01042 and -484, an *ʻauwai* system on the east side of the Waipā Ahupuaʻa (Dye 2004). Archaeological monitoring was conducted after the discovery of inadvertent burials. The burials and isolated finds were given SIHP # -00355; SIHP # -00361 was identified as a cultural layer (Chaffee and Dega 2005).

3.5.2.1.7 *Fong et al. (2006)*

In 2006, CSH monitored an approximate 10-mile stretch from Princeville to Haʻena for the Kūhiō Highway, Route 560 Shoulder Improvements project (Fong et al. 2006). On the basis of historic research and previous archaeology, monitoring was recommended and an archaeological monitoring plan was written (Shideler et al. 2004). During monitoring of subsurface activities, the soil all appeared to be previously disturbed by road construction. No cultural resources were identified (Fong et al. 2006).

3.5.2.1.8 *Kamai and Hammatt (2013) and Wheeler et al. 2013b*

In 2013, CSH wrote a burial site component of an archaeological preservation plan for the Waipā Foundation Community Cultural Center project. An inadvertent discovery of human remains were identified during the excavation of an electrical trench. The burial was given SIHP # -2196 (Kamai and Hammatt 2013).

Also in 2013, CSH conducted a reconnaissance survey and literature review for a portion of Waipā for Kamehameha Schools. One cultural resource was identified, a *loʻi* (SIHP # -00434) and three excavated pit features were documented on the Makaihuwaʻa Ridge. The pit features may relate to a traditional account of an aid to navigation on the ridge (Wheeler et al. 2013b) (see Appendix A).

The central of the three pit features is by far the largest. This central pit is roughly circular, measuring between 2.5 and 3.0 m in diameter and having a maximum depth of 1.7 m below the brow of the ridge on the south side. The walls of this pit are nearly vertical on the southeast, south, and southwest sides. The north side is somewhat sloping, seemingly due to collapse. The floor is roughly level and of the nature of a shallow bowl, perhaps the result of deliberate excavation into the relatively soft saprolitic, decomposing basalt of the ridge summit. This pit was observed to be located in an area with a particularly good view of the sweep of Hanalei Bay to the northwest, north, and northeast; Waipā Valley extending back to the southwest; and Waiʻoli Valley extending back to the southeast. (Wheeler et al. 2013b:47–56)

Wheeler et al. (2013b) note the following preliminary points in comparing the Wichman (1985) account to the archaeological reality observed:

- The aid to navigation is deliberately placed "higher . . . over the treetops and [below where] the clouds swirled just above . . . the chief . . ." on Makaihuwaʻa Ridge (Wichman 1985:40–41). This fits the location of the observed historic property very well. The tradition and the archaeology both command the ideal location.
- The chief said "Here we must dig out a platform from the edge of the ridge . . . A small platform dug out of the side of a hill" (Wichman 1985:41). This is what was observed: a larger excavation with seemingly two smaller excavations with relatively level bottoms.
- "Another group formed a line reaching to the river beds of Waipaʻa and Waikoko and passed smooth stones hand to hand to the work site" (Wichman 1985:41). This was a proverbial way of thinking about how *menehune* worked. No water-rounded cobbles and boulders were observed. There would have been no clear need for the transport of such stones for the story to be basically true.
- The chief sat father up the ridge where he could see the work, and his voice shouting instructions could be heard. A minor mystery was the evidence of two smaller constructions spaced above and below the main pit feature. The upper one, which is certainly close enough for a chief to shout instructions, could have been a supervisory position.
- The account relates a roof over the platform, higher in front than in back in order to protect the torches from the rain and also high enough so the roof wouldn't catch on fire. No archaeological remnant of a roof would be expected with the passage of time in such an exposed, open, wet (approximately 100 inches of rain a year) location. The 1.7-m deep hole was a surprise in that it initially was not obvious why anyone would dig such a deep hole for a signal fire. The concept that the construction/excavation was a response to the extraordinary rain and wind does, however, make perfect sense. While remnants of a roof support system were not observed, more careful analysis might develop details of what this would have looked like.
- The nature of the fire is consistently indicated to be "*lamakū*." The concept is presented as if the lights were akin to chiefly torches understood as *kukui* nut kernels strung on a midrib, woven into cylinders and bundled with dried banana leaves. *Lamaku* does, however, also mean "signal fires" which more prosaically might be of dried wood. No charcoal was observed in the archaeological properties. After the passage of two centuries it would seem likely that even a meter-thick charcoal deposit might entirely disappear from such an exposed, open, wet location. It may be that the preferred fuel would leave less trace than a bonfire (Wheeler et al. 2013b:55–56).

Accounts of pre-Contact Hawaiian aids to navigation are few. Love Dean's *The Lighthouses of Hawaiʻi* is somewhat dismissive, asserting that:

> Before Western contact, Hawaiians did not need permanent navigational aids. Those who set out in boats to fish or to travel to neighboring villages or islands knew the coastlines and all the landmarks well. An open fire to guide them safely to shore was used only at night or during storms. [Dean 1991:1]

We do however, have an account of a trade agreement made between the planters at Kukuiolono ("Light of Lono"; Kalāheo, Kauaʻi) and the fisherman of the Kona District that required that a huge torch be kept burning at night atop Kukuiolono cinder cone. It is said that fisherman relied on this light for navigation as it could be seen along the whole south coast of Kauaʻi, from Kōloa to Niʻihau (Sandison 1956). Clark (1977:41) relates another popular derivation from "*lei*" and "ʻ*ahi*" or "wreath of fire" which may have been related to the tradition of signal beacon fires lit on the crater rim—either for special occasions and/or as a beacon for canoes. Clark also notes the probability that the prominent Leahi cape (lae) was used as a reference point in locating the deep sea fishing grounds or *koʻa* for *ahi* fish.

3.5.3 Previous Archaeological Research in Lumahaʻi

The following two tables outline the archaeological research (Table 11) and cultural resources (Table 12) identified in Lumahaʻi Ahupuaʻa. These tables are followed by discussion of the research and cultural resources. Table 11 provides a list of archaeological research conducted within Lumahaʻi, including columns for source, location, nature of study, and findings. The locations of these archaeological studies are shown in Figure 33. Table 12 is a list of known cultural resources within the *ahupuaʻa* and includes columns for state site numbers, site type, location and reference. The locations of identified cultural resources within Lumahaʻi Ahupuaʻa are shown in Figure 36.

3.5.3.1.1 *Bennett (1931)*

Puʻuohewa and Puʻuomama were not found during Bennett's survey. Bennett (1931) lists one archaeological site at Lumahaʻi :

> Site 147. Kailiopaia *heiau*, shoreward of the government road, to the east of Lumahaʻi stream on a raised coral point. [Bennett 1931:135]

3.5.3.1.2 *Earle (1978)*

Earle (1978) discusses Lumahaʻi in a general way but develops no detailed information regarding the agricultural systems of Lumahaʻi. He notes the following:

> Extensive bulldozing for pasturage has destroyed all archaeological evidence of pond fields in the lower section of the valley, but numerous small terrace sites are to be found in the interior. One such site was identified 2.5 km from the sea, during a rapid reconnaissance survey, and others have been described by local hunters.

This identified terrace site was given Bishop Museum site number Ka-D7-3 and SIHP # 50-30-03-450.

3.5.3.1.3 *Cordy (1978) and Kelly and Hee (1978)*

Cordy surveyed a large portion of the floor of Lumahaʻi Valley but notes the limitations of his work (1978:48) which may better be understood as a reconnaissance-level study. His work

Table 11. Previous Archaeological Studies in Lumahaʻi Ahupua'a

Source	Location	Nature of Study	Results (SIHP # 50-30-03)
Bennett 1931	Lumahaʻi	Island-wide survey	Site -147, Kailiopaia Heiau
Earle 1978	Haleleʻa District: Lumahaʻi	Study of economic and social organization	No cultural resources identified in Lumahaʻi
Kelly et al. 1978	Lumahaʻi Valley	Historical survey	Traditional and historical literature review; identified one cultural resource, SIHP # -00445, Chinese Camp
Cordy 1978	Lumahaʻi Valley	Archaeological survey	Two cultural resource areas identified: Area 1, enclosures and a wall and Area 2, terrace lines
Hoffman 1980	Alluvium plains of Lumahaʻi Valley	Archaeological survey	Confirmed three previously identified cultural resources and identified five new cultural resources: SIHP #s -00440 through -00444
Pantaleo and Williams 1991	Transmission line corridor	Archaeological reconnaissance survey	No cultural resources identified in Lumahaʻi
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Haʻena	Archaeological monitoring	No cultural resources identified
McIntosh et al. 2011	Vicinity of Lumahaʻi: old loop road and bypass road corridor, TMK: [4] 5-7-003	Archaeological inventory survey	No cultural resources identified
Wheeler et al. 2013a	99-acre portion of Lumahaʻi Ahupuaʻa, TMK: [4] 5-7-002:001 por.	Field inspection and literature review	No cultural resources identified

Table 12. State Inventory of Historic Places Sites in Lumahaʻi Ahupua'a

SIHP # 50-30-03-	Site Type/Name (if any)	Location	Reference
00445	Chinese Camp	Lumahaʻi Valley	Kelly and Hee 1978:35

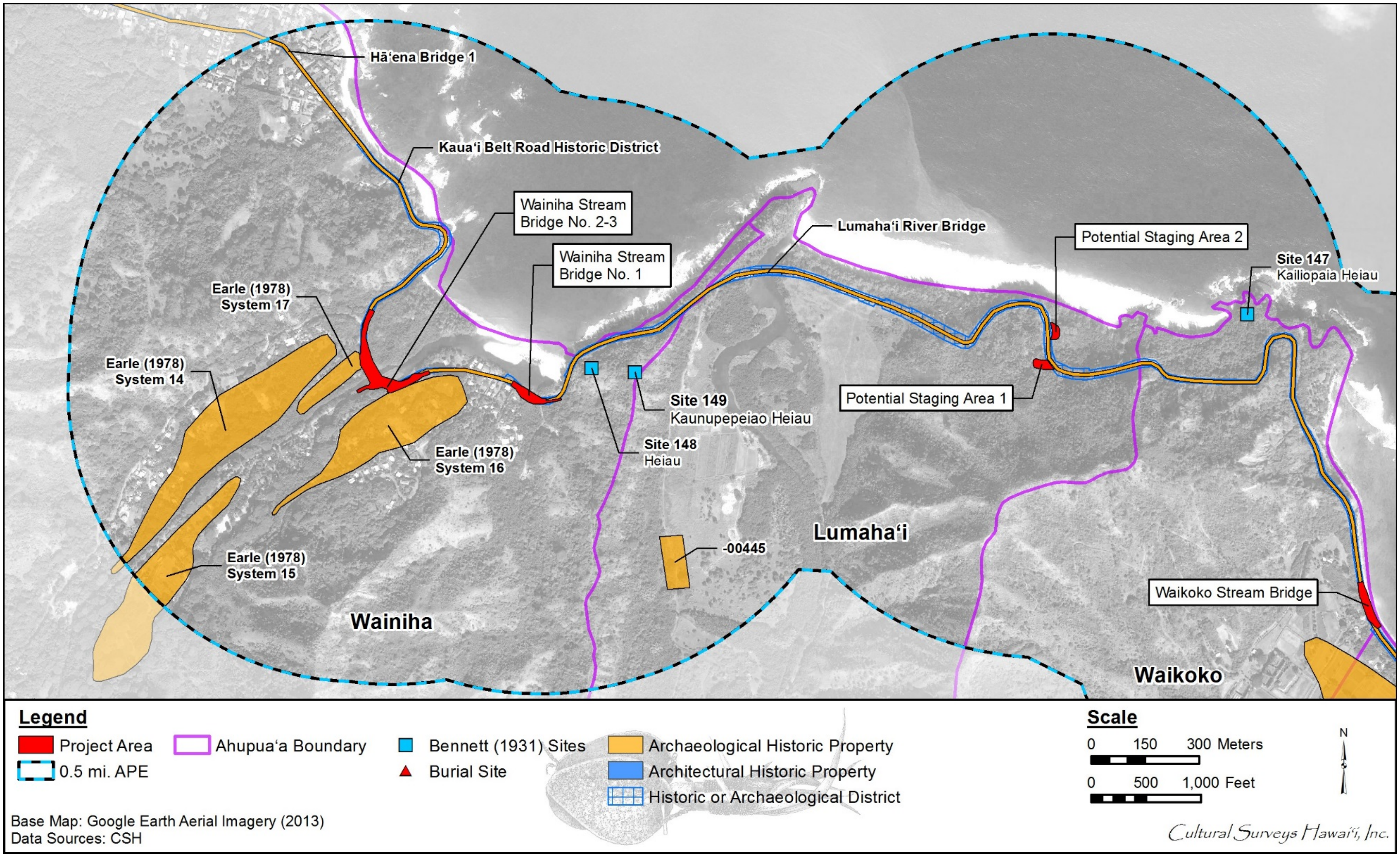


Figure 36. Aerial photograph (Google Earth 2013) showing locations of previous identified cultural resources in Luamahaʻi and Wainiha Ahupuaʻa; note Bennett's (1931) sites 152 and 153 are beyond the scope of this map, further south within Wainiha Valley

identified two dryland agricultural site areas: 1) enclosures and a wall (Bishop Museum site number Ka-D7-4; SIHP # -449) and 2) terrace lines (Bishop Museum site number Ka-D7-6; SIHP # -447) both located over a mile inland of Kūhiō Highway. These sites are suggested to be pre-Contact or early historic in date. A companion historical survey by Marion Kelly and Clayton Hee (1978:29–33) identified another site(s) (two dams and a tunnel) in Lumahaʻi also located over a mile inland of Kūhiō Highway and given Bishop Museum site number Ka-D7-6 and Ka-D7-7 (SIHP #s -446 and -447). These appear to be remnants of a rice irrigation system and were recorded on a 1920 survey map. They also identified houses of Japanese farmers who entered the valley in the late 1920s (Bishop Museum site number Ka-D7-8; SIHP # -445).

3.5.3.1.4 *Hoffman (1980)*

Hoffman (1980) performed a survey of approximately 300 acres along the floor of Lumahaʻi Valley overlapping the Cordy (1978) and Kelly and Hee (1978) study areas but extending farther to the west. The Hoffman study confirmed three previously reported sites and identified five previously unrecorded sites, Bishop Museum sites KA-D7-9 through -13; SIHP #s -440 through -444. All of these sites are 1.3 km inland or more. She notes the "massive earth-moving operations of historic times" and confirms earlier work: as Earle (1973:233) suggests, "no sites remain in the coastal plain; all located sites are above the 6-meter contour line" (Hoffman 1980:6). Hoffman (1980) does plot the location of Kaliopaia Heiau, just east of the mouth of Lumahaʻi River but notes the site was "not located by survey team."

3.5.3.1.5 *Pantaleo and Williams (1991)*

In 1991, an archaeological reconnaissance survey was conducted in selected portions of Port Allen to the Wainiha transmission line corridor. The purpose of the study was to determine the presence and/or absence of any inclusive cultural resources. Portions of this survey were conducted on the north side of Kauaʻi including Waiʻoli, Waipā, Waikoko, Lumahaʻi, and stops in Wainiha Valley at the Wainiha Valley Hydro-electric Plant. No new cultural resources were identified in the Lumahaʻi Ahupuaʻa (Pantaleo and Williams 1991).

3.5.3.1.6 *Fong et al. (2006)*

In 2006, CSH monitored an approximate 10-mile stretch from Princeville to Haʻena for the Kūhiō Highway, Route 560 Shoulder Improvements project (Fong et al. 2006). On the basis of historic research and previous archaeology, monitoring was recommended and an archaeological monitoring plan was written (Shideler et al. 2004). During monitoring of subsurface activities, the soils all appear disturbed by previous road construction. No cultural resources were observed (Fong et al. 2006).

3.5.3.1.7 *McIntosh et al. 2011*

In 2011, Pacific Legacy, Inc. conducted an archaeological inventory survey in the vicinity of Lumahaʻi along the highway for a proposed bypass road and emergency repair work. No cultural resources were identified (McIntosh et al. 2011).

3.5.3.1.8 *Wheeler et al. (2013a)*

In 2013, CSH conducted an archaeological field inspection and literature review for an approximately 99-acre portion of Lumahaʻi Ahupuaʻa for Kamehameha Schools. The purpose of the study was to provide the landowner (or their representative) with an overview of existing archaeological conditions, to facilitate planning, and to inform our client on appropriate archaeological considerations on land use for planning (Wheeler et al. 2013a:1).

3.5.4 Previous Archaeological Studies in Wainiha

Table 13 outlines previous archaeological research in Wainiha and Table 14 summarizes the historic properties identified. Two of Bennett’s (1931) sites, 152 and 153, described as taro terraces and house site respectively, are within Wainiha Valley:

> This interesting taro section is on the high side of the valley utilizing a little stream and small flat area. The hill is on one side and the stream and a bluff on the other, leaving a fairly steep section in between. At one place above the terraces stones are built across the stream as intake, which could, with the addition of a few more stones, shunt the water into a ditch which runs between large rocks and dirt walls. All along the edge of the stream is a wall built to keep the water from running back. The terraces are from 6 inches to 3 feet high . . . Site 153. House sites, on Mauna Hina ridge in Wainiha Valley. Remains of many old house sites and much irrigated land. The house sites are mostly of the terraced type and 10 to 15 feet wide. [Bennett 1931:135–136]

Table 13 provides a list of archaeological research conducted within Wainiha, including columns for source, location, nature of study, and findings. The locations of these archaeological studies are shown in Figure 33. Table 14 is a list of known cultural resources within the *ahupua‘a* and includes columns for state site numbers, site type, location and reference. The locations of identified cultural resources within Wainiha Ahupua‘a are shown in Figure 36.

3.5.4.1 *Overview of Previous Archaeological Studies in Wainiha*

3.5.4.1.1 *Bennett (1931)*

Bennett (1931) in his systematic, but not exhaustive, survey of archaeological sites on Kaua‘i, describes six sites in Wainiha, all of which appear to be on or near Wainiha River. Two of Bennett’s sites (148, 149) are on or close to the coast, and the four remaining sites are all upstream and include two *heiau* (Site 150 - Laumaki Heiau, Site 151 - Apaukalea Heiau), taro terraces (Site 152), and house sites on Mauna Hina Ridge (Site 153). Bennett describes the sites:

> Site 148. *heiau* on Popoki knoll. Popoki knoll is located next to the road (inland side) in front of Site 149 near the Wainiha river. It is said to have been a *heiau* site, but nothing remains to mark it. [Bennett 1931:135]

> Site 149. Kaunupepeiao Heiau, back of the first house on the first *pali* east of the mouth of the Wainiha River. A flat place about 30 feet wide and 20 feet deep with stones along the front edge meet the description given by Thrum: ‘A 12-foot open-paved *heiau* of husbandry class; probably simply a place of offering.’ [Bennett 1931:135]

> Site 150. Laumaki *heiau*, on a knoll west of the ‘Power Hous’ road—about one mile from the government road, in Wainiha valley. Thrum describes this *heiau* as ‘A small, open platform, paved heiau, 2 feet high, of husbandry class.’ The platform measures 20 feet wide and 10 feet deep and faces the sea. It is paved with river stone. [Bennett 1931:135]

Table 13. Previous Archaeological Studies in Wainiha Ahupua'a

Source	Location	Nature of Study	Results
Bennett 1931	Island-wide	Archaeological survey	Lists three *heiau* in Wainiha: Laumiki, Apaukalea, and Kaunupepeiao
Earle 1978	Haleleaʻa District: Wainiha	Archaeology and socio-economics	Identifies extensive *lo'i* systems along Wainiha Stream
Pantaleo and Williams 1991	Transmission line corridor	Archaeological survey	No cultural resources identified in Lumahaʻi
Ida et al. 1993	West side Wainiha Valley back from river mouth, TMK: [4] 5-8-002:003	Archaeological survey	No cultural resources identified
Hammatt and Ida 1995	West side of Wainiha valley back from mouth, TMK: [4] 5-8-002: por. 003	Archaeological investigation	No cultural resources identified
Rechtman and Dougherty 2001	Two parcels at Wainiha, TMK: [4] 5-8-012:005, 011	Archaeological inventory survey with subsurface testing	No cultural resources identified
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Haʻena	Archaeological monitoring	No cultural resources identified
Groza et al. 2010	Proposed Wainiha Well, TMK: [4] 5-8-002:003	Archaeological assessment	No cultural resources identified

Table 14. State Inventory of Historic Places Sites in Wainiha Ahupua’a

SIHP # 50-30-03-	**Site Type/Name (if any)**	**Location**	**Reference**
148	*Heiau*	On Popoki knoll	Bennett 1931:135
149	Kaunupepeiao Heiau	First *pali* east of mouth of Wainiha River	Bennett 1931:135
150	Laumaki Heiau	1 mile in Wainiha Valley from hwy	Bennett 1931:135
151	Apaukalea Heiau	Wainiha Valley, inland from Site 150	Bennett 1931:135
152	Taro terraces	Wainiha Valley, high on the side of the valley	Bennett 1931:135
153	House site	Mauna Hina Ridge	Bennett 1931:136
None	System 14	West side of Wainiha Stream	Earle 1978:58–63
None	System 15	On an island between two major channels of Wainiha Stream	Earle 1978:59, 63–66
None	System 16	On the east side of Wainiha Stream	Earle 1978:59
None	System 17	On flat alluvial soils west of Wainiha Stream	Earle 1978:66–67

Site 151. Apaukalea *heiau*, adjoins the “Power House” road on the east side, inland from Site 150 in Wainiha valley:

> The remains of recent occupation together with modern stone platforms, walks, graves with tombstones and other such work, make the distinction of this heiau difficult. The *heiau* consists of a small, square, paved area about 35 feet on a side. The east wall is 15 feet wide, and badly tumbled on the outside, though 3 feet high on the inside. The north wall is irregular, about 15 feet wide, and 2 feet high. A projection inwards forms a platform 10 by 15 feet. The west wall is just a trace of stone, but seems to have been 15 feet wide. The south wall is of varying width and runs from the road to the bluff, a distance of 130 feet. It is about 3 feet high. To the west of this enclosure is a flat space with two lines of stone traversing it, while on the east are two paved house sites about 10 feet square. [Bennett 1931:135]

Two of Bennett’s (1931) sites, Sites 152 and 153, described as taro terraces and house site respectively, are within the Wainiha Valley:

> This interesting taro section is high on the side of the valley utilizing a little stream and a small flat area. The hill is on one side and the stream and a bluff on the other, leaving a fairly steep section in between. At one place above the terraces stones are built across the stream as an intake, which could, with the addition of a few more stones, shunt the water into a ditch which runs between large rocks and dirt walls. All along the edge of the stream is a wall built to keep the water from running back. The terraces are from 6 inches to 3 feet high . . . Site 153. House sites, on Mauna

> Hina ridge in Wainiha Valley. Remains of many old house sites and much irrigated land. The house sites are mostly of the terraced type and 10 to 15 feet wide. [Bennett 1931:135, 136]

3.5.4.1.1 *Earle (1978)*

Earle’s documentation of irrigated taro systems in Wainiha is shown on a USGS map of the valley (Earle 1978:59). Earle’s System 14 extends along Wainiha River to just southeast of Powerhouse Road. Earle observed that the lower portion of Wainiha Valley was extensively used for taro cultivation through the 1850s (Earle 1978:32).

3.5.4.1.2 *Pantaleo and Williams (1991)*

In 1991, an archaeological reconnaissance survey was conducted in selected portions of the Port Allen to Wainiha transmission line corridor. The purpose for the study was to determine the presence and/or absence of any inclusive cultural resources. Portions of this survey were conducted on the north side of Kaua‘i including Wai‘oli, Waipā, Waikoko, Lumaha‘i, and stops in Wainiha Valley at the Wainiha Valley Hydro-electric Plant. No new cultural resources were identified in the Wainiha Valley area (Pantaleo and Williams 1991).

3.5.4.1.3 *Ida et al. (1993)*

In 1993, CSH conducted an archaeological inventory survey for a 50-ft by 50-ft parcel for a GTE Hawaiian Tel telecommunications hut (Ida et al. 1993) adjacent to an existing water pump. The old Wainiha Powerhouse Road and water pump access road cut through the eastern portion of the parcel, providing a maximum stratigraphic profile of 90 cmbs (cm below surface). No cultural material was found during the pedestrian survey or during a review of the exposed stratigraphy within the road cuts. No further work was recommended and the project area was observed to be too steeply sloped for agricultural cultivation or habitation.

3.5.4.1.4 *Hammatt and Ida (1995)*

In 1995, CSH conducted an archaeological investigation (Hammatt and Ida 1995) in the same general area as the Ida et al. (1993) project described above. The field survey included an area designated as Lot 1 that consisted of a 6,000-sq-ft area with a water tank, and a 15,769-sq-ft utility easement that extended from a pump station on Powerhouse Road to the Lot 1 water tank. No cultural material was observed during the field survey or during a review of the exposed stratigraphic profile within the road cuts. The same stratigraphic profile observed during the Ida et al. (1993) project was also present within this project area.

3.5.4.1.5 *Rechtman and Dougherty (2001)*

In 2001, Rechtman Consulting conducted an archaeological inventory survey for two noncontiguous parcels (TMKs: [4] 5-8-012:005, 011) within Wainiha Ahupua‘a (Rechtman and Dougherty 2001), one of which is approximately 500 m north and the other 500 m northeast of the current project area. Subsurface testing included a total of three trenches within Parcel 5 and four trenches within Parcel 11. No further work was recommended based on the lack of findings during the pedestrian survey and subsurface testing.

3.5.4.1.6 *Fong et al. (2006)*

In 2006, CSH monitored an approximate 10-mile stretch from Princeville to Ha‘ena for the Kūhiō Highway, Route 560 Shoulder Improvements project (Fong et al. 2006). On the basis of historic research and previous archaeology, monitoring was recommended and an archaeological monitoring plan was written (Shideler et al. 2004). During monitoring of subsurface activities, the soils all appeared to be disturbed by previous road construction. No cultural resources were observed (Fong et al. 2006).

3.5.4.1.7 *(Groza et al. 2010)*

In 2010, CSH (Groza et al. 2010) conducted an archaeological inventory survey with shovel testing for a proposed Wainiha well. No cultural resources were identified.

3.6 Background Summary and Predictive Statements

Background research emphasizes the traditional importance of the Haleleʻa District in pre-Contact times. Historical documentation indicates the traditional settlement pattern for Waiʻoli, Waipā, Lumahaʻi, and Wainiha was a combination of intensive agriculture, predominantly taro cultivation, some fishponds, and a scatter of houses, particularly along the shoreline. With the exception of SIHP #s -00484, -147, and -00445, little is known of the traditional history of Lumahaʻi and Waikoko (Earle 1978). That said, one of the classic archaeological/anthropological studies undertaken in the Hawaiian Islands concerns irrigated taro cultivation systems in the Haleleʻa District and their implications for traditional social structure (Earle 1978).

LCAs and previous archaeology provide corroborating evidence that the coastal areas and valleys of the project areas were used for irrigated cultivation. Dams and irrigation ditches are common features on flat areas. Handy and Handy (1972:420) have stated there was a compact area of terraces near the coast watered by Waipā Stream. In nearby Wainiha, in all available space the land was terraced in steps into the higher valleys. The LCA documents describe at least 154 taro *loʻi* along Waiʻoli Stream and 27 unspecified *kula*, but based on traditional *kula* lands, there would have also been sweet potatoes, yams, bananas, and sugarcane. Only 14% of the awardees claimed to have held the land prior to 1824. Eleven individuals were awarded lands in Waipā Ahupuaʻa which included taro *loʻi* and house lots. The house lots were generally located along the coast, although there has been evidence of habitation and agricultural structures discovered as far inland as 1.5 km from the coast. *Kuleana* documentation specifies that the entire *ahupuaʻa* of Lumahaʻi was awarded to L. Kōnia, granddaughter of Kamehameha I, wife of Paki and mother of Bernice Pauahi Bishop, and that the *ahupuaʻa* of Waikoko was awarded to M. Kekauonohi, great-granddaughter of Kekaulike, King of Maui and granddaughter of Kamehameha the Great. A study of all the claims and their supporting testimony for Wainiha shows a typically well-developed land system in place. *Ahupuaʻa*-based settlement patterns should be visible archaeologically with habitation near the coast and agricultural concerns in the well-watered interior areas.

In the mid- to late 1800s, the shift from taro to rice production was a direct response to the importation of Asian laborers as sugar plantation workers in the Hawaiian Islands as well as the introduction of eastern technology developed for irrigation and cultivation of rice. This transition in land use patterns may be visible archaeologically within the vicinity of the project areas. Kelly and Hee 1978 document a historic Chinese Camp in the Lumahaʻi Valley. The shift to rice cultivation in Waipā and Lumahaʻi is further documented by leases between the Bishop Estate (owners of the former Kōnia Lumahaʻi lands), and Chulan and Company (Hoffman 1980:4) and the Sing Tai Wai Company (Kelly and Hee 1978). The peak of rice cultivation was between 1890 and 1930, but decreased when local production could not compete with cheaper prices of imported California rice (Earle 1973:183). By the early 1900s areas in the Haleleʻa District had their own Chinese community that included not only the rice farmers, but also merchants and other business people (*The Garden Island*, 12 January 2015). That said, traditional Hawaiian agricultural practices have been locally reestablished, with cultivation of *kalo* ongoing throughout the lands surrounding the project areas and representing the largest active agricultural activity in the Halele‘a District. This reinvigorated appreciation for—and efforts to teach and perpetuate—Hawaiian ways of knowing is also represented by the activities of the Waipā Foundation. Archaeological inquiry within this setting should be in the context of appreciation for the ongoing revitalization of Hawaiian traditions, cultural resources and traditional historic properties in the vicinity of the project areas.

Human remains have been found within coastal Wai‘oli, Waipā, and Wainiha archaeological studies, with two burial sites documented in the vicinity of the Waipā and Waikoko project areas and four traditional burial sites plus a church cemetery documented in Wai‘oli. Three *heiau*, including Kupakoili, Halaloa, and Kailiopaia are documented in Waipā and Waikoko Ahupua’a. Four *heiau* are documented in the vicinity of the Wainiha project areas: Kaunupepeiao, Laumaki, Apaukalea, and a *heiau* on Popoki knoll. Traditional Hawaiian house sites, *kalo* terraces, and other agricultural infrastructure have also been documented (Earle 1978).

In the mid-twentieth century, portions of the lands within and surrounding the project areas were utilized as cattle pasture. In referencing this time period, Earle (1978) indicated extensive bulldozing for pasturage destroyed many archeological sites within the project area vicinity. Hoffman also documents the obliteration of traditional agricultural lands changed into pasture lands (Hoffman 1980:4). Halaloa Heiau was a casualty of rice cultivation as described by Thrum (1907): “At Waipa stream.- A square heiau of about 80 feet in size, with low walls. Kane its deity. Destroyed years ago for a mill site” (Thrum 1907:43).

Archaeological studies in the vicinity of the project area typically note extensive bulldozing and land modifications in both the coastal and inland sections of the vicinity surrounding the project areas, particularly along the more developed coastal plain. In fact, Earle (1973:233) has suggested no sites remain in the Lumahai‘i coastal plain.

In inland areas, historic and pre-Contact taro agricultural terrace remnants are found along the major rivers, in addition to later features associated with rice irrigation and water control. Ranching infrastructure features are also noted. Previous archaeological surveys have found pre-Contact sites in areas difficult to access such as ridges and gulches.

In summary, the probability of identifying pre-Contact habitation and agricultural sites in the project areas is moderated by the subjection of these lands to 150 years of historic land modification by farmers, ranchers, and residential developers. In the twentieth century, bulldozing to create cattle pasture lands destroyed many former pre-Contact sites. Previous archaeological surveys have found pre-Contact sites in areas difficult to access such as ridges and gulches. Based on background research and previous archaeological studies, the probability of encountering in situ buried cultural resources exists. Evidence of pre-Contact land use may include, but not be limited to, human burials, midden deposits, artifacts, and trail alignments. Evidence of post-Contact land use could include agricultural infrastructure, human burials, trash pits, privies, roadways, and historic building foundations.

Section 4 Results of Fieldwork

Fieldwork conducted for the AIS included a 100% pedestrian inspection and subsurface testing. The pedestrian inspection included identification and documentation of cultural resources within the project area and a description of the overall project area including ground visibility, modern use or disturbance, and vegetation. Subsurface testing consisted of six shovel tests (ST-1 through ST-6). CSH archaeologists Johnny Dudoit, B.A., Gerald Ida, B.A, Missy Kamai, B.A., William H. Folk, B.A., and principal investigator Hallett H. Hammatt, Ph.D., completed the fieldwork for this AIS, conducted in compliance with HAR §13-276, under state archaeological permit number 15-03, issued by the SHPD, per HAR §13-13-282. The pedestrian survey was conducted on 6 October 2014. Shovel testing within the proposed project area and the study areas was conducted on 7-8 October 2014. Recordation of cultural resources for this inventory survey was conducted on 9 October 2014. Sixty working days were required to complete fieldwork for this archaeological inventory survey.

4.1 Pedestrian Survey Results

Archaeologists took numerous photographs to illustrate the terrain and dense vegetation. No surface pre-Contact habitation or agricultural sites and no early historic rice agricultural or ranching features were identified. Ground visibility during the pedestrian inspection was good. Vegetation in undeveloped areas within the project area included tall invasive grasses (Megathyrus and Urochloa) and dense *naupaka* (*Scaevola* sp.). Portions of the project include mowed grass, wedelia, and ironwood (*Casuarina* sp.). A pattern exists in the building of palatial estate residences *makai* of Kūhiō Highway with predominantly farmland and farm residences *mauka* of Kūhiō Highway. Four new historic properties are identified within the project areas including SIHP # 50-30-03-2296, the Waiʻoli Bridge, SIHP # 50-30-03-2297, the Waipā Bridge, SIHP # 50-30-03-2298, the Waikoko Bridge, and SIHP # 50-30-02-2299, a concrete culvert and supporting basalt and mortar revetments at both ends beneath Kūhiō Highway approaching the Wainiha Bridge 2, northbound (Figure 37 through Figure 43). Table 15 summarizes the historic properties identified within the project areas, depicted in Figure 44 through Figure 76. All cultural resources encountered within the project areas are historic and none of them is deemed traditional Hawaiian. Historic properties identified within the project areas are summarized in Table 15 and their distributions are depicted on Figure 37.

Table 15. Summary of Historic Properties Identified within the Project Area

Temp CSH #	Feature Type	Function	Age	Notes
1	Bridge	Transportation	1912	Waiʻoli Bridge
2	Bridge	Transportation	1912	Waipā Bridge
3	Bridge	Transportation	1912; 1946	Waikoko Bridge
4	Culvert	Rainwater runoff drainage	1917	Concrete culvert and supporting basalt and mortar revetments at both ends beneath Kūhiō Hwy approaching Bridge 2, northbound

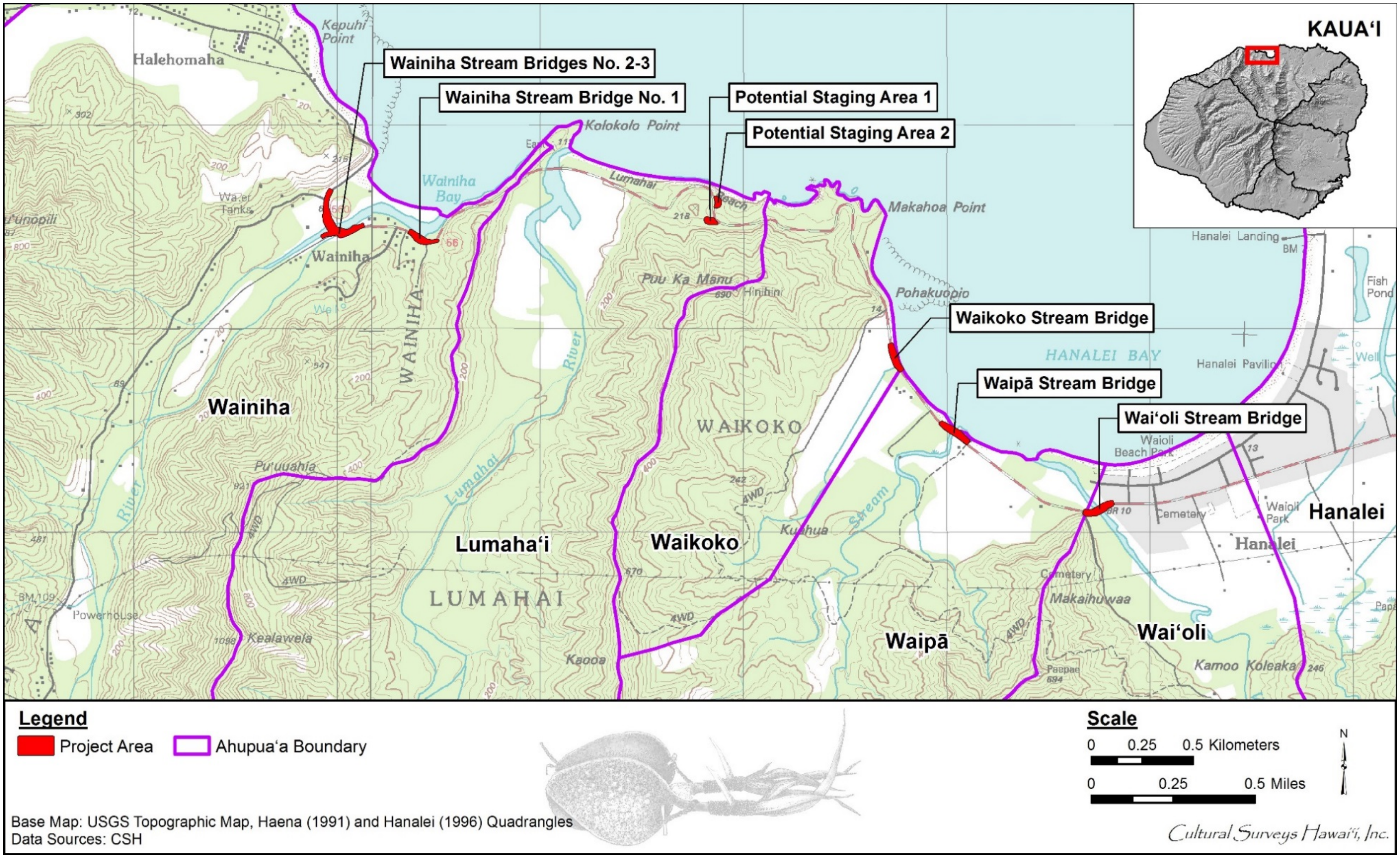


Figure 37. Portion of the 1991 Haena and 1996 Hanalei USGS 7.5-minute series topographic quadrangles showing the location of SIHP #s 50-30-03-2296, 50-30-03-2297, 5030-03-2298, and 50-30-02-2299 within the project areas

Figure 38. Portion of Kūhiō Highway, Wainiha Stream Bridge 1, a non-contributing structure within the historic bridges district, view to east

Figure 39. Portions of the Wainiha River downstream from Kūhiō Highway between Wainiha Bridges 2 and 3, non-contributing structures within the historic bridges district, panoramic view toward the Wainiha River mouth, to north

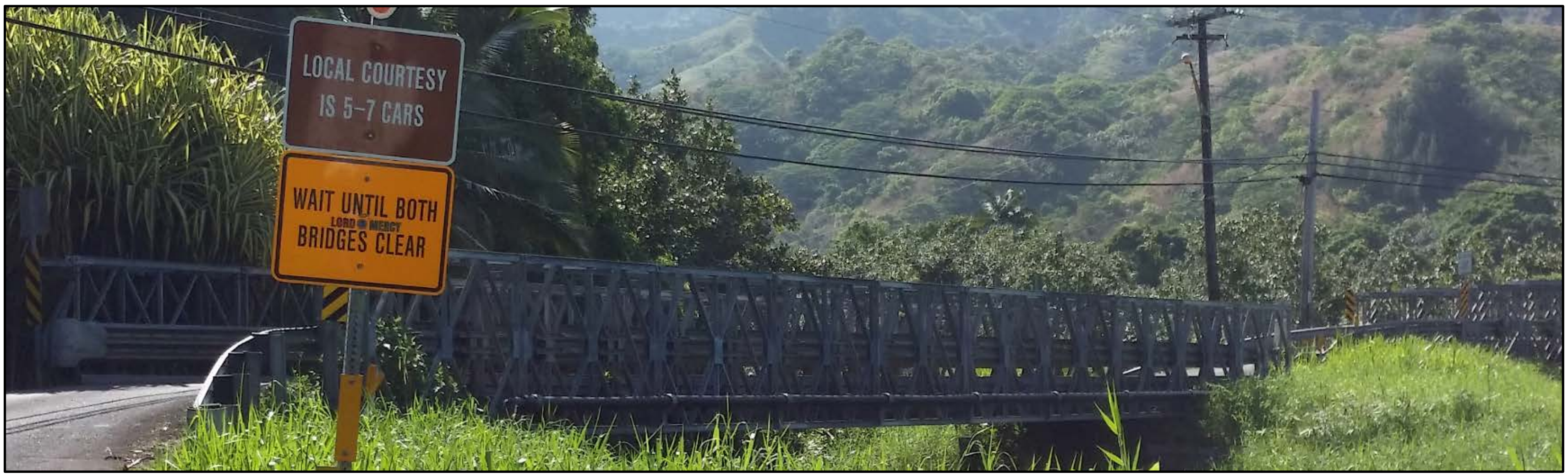


Figure 40. Portion of the Kūhiō Highway, view to south of Wainiha Bridge 2; note sign indicating the local custom of taking turns to cross the bridge, allowing 5-7 cars across at a time

Figure 41. A portion of the Kūhiō Highway, view to south from the east side of the Wainiha Bridge 2, a non-contributing structure within the historic bridges district, general location of ST-3 in the foreground

Figure 42. A portion of the Kūhiō Highway at the Wainiha Bridge 3, a non-contributing structure within the historic bridges district, general view to north

Figure 43. A portion of the Kūhiō Highway, Wainiha Bridges 3 and 2 respectively, non-contributing structures within the historic bridges district, general view to southeast with Pu‘uuahia in the background

The project areas include the Kauaʻi Historic Bridge District, within the Kauaʻi Belt Road (North Shore Section) Historic District, on the National and State Registers of Historic Places. Contributing structures to the Kauaʻi Historic Bridge District include the Waiʻole Stream Bridge, the Waipā Stream Bridge, and the Waikoko Stream Bridge (Appendix C, Figure 105). The portions of the project areas that cross the Wainiha River include three steel bridges built less than 50 years ago, deemed non-contributing structures within the Kauaʻi Belt Road--North Shore section (National Register of Historic Places Information System ID: 03001048) and thus not included in the inventory of historic properties identified:

> By 1921, three bridges were required to carry the road over the Wainiha River. At least one bridge crossed the Wainiha River between 1904 and 1918, a two-span timber truss structure located on the site of what is today known as Wainiha Bridge #3 . . . [Fung Associates 2013:18]

All vestiges of these earlier bridges at Wainiha were most likely removed or have been totally obscured by flooding and replacement in 2004. The bridges have all been recently replaced by steel frame and panel bridges (see Figure 38 through Figure 43). "This bridge is a non-contributing feature of the Kauai Belt Road (North Shore section) district due to the complete replacement of the original 1931 bridge in 2004. It was replaced with a temporary modular prefabricated steel truss bridge" (Fung Associates 2013:3-76). No portions of the historic Wainiha Stream bridge features were observed by CSH archaeologists.

> In January 1921 the Wainiha River cut a new channel during a storm, which necessitated another bridge, as flooding had carved a 'long slim island out of the agricultural land of the valley.' The Garden Island reported that the new bridge would 'make three bridges in the valley, in within a distance of about 500 yards.' This third structure at Wainiha became known as Wainiha Bridge #2. Plans for a new single-span bridge of 75' were drawn in 1922. The design was a timber-truss structure that complemented the adjacent timber-truss bridge (Wainiha #3). Even though the plans were drawn in February 1922, a construction date was not determined. The Territorial Highway Department records state that the bridge was constructed in 1931. [Fung Associates 2013:19]

4.2 Site Descriptions

4.2.1 SIHP # 50-30-03-2296, the Waiʻoli Stream Bridge

FORMAL TYPE:	Bridge
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	1912
TEST EXCAVATIONS:	Shovel Test 5 (ST-5) on the *mauka* side of the highway in a gravel bar of the west flood terrace of Waiʻoli Stream
TAX MAP KEY:	[4] 5-5-005:005, 007, 021, 028; [4] 5-5-005; [4] 5-5-006:014, [4] 5-5-006; [4] 5-6-002:002, 004; [4] 5-6-002
LAND JURISDICTION:	State Department of Transportation (HDOT)
PREVIOUS DOCUMENTATION:	Fung Associates 2013

SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, Hawaiʻi State Bridge Number 007005600500343, located on the western boundary of Hanalei Town, 0.21 km (0.13 miles) west of Anae Road, is the oldest concrete girder bridge in Hawaiʻi (Fung Associates 2013:8-10) (Figure 44 through Figure 48). Designed by Joseph Hughes Moragne and built by George W. Mahikoa, the Waiʻoli Stream Bridge was built in 1912 and was determined eligible to the National Register in 1978 with high preservation value eligibility status. The bridge is a contributing structure to the Kauaʻi Belt Road (North Shore section) archaeological district (Fung Associates 2013:3-83).

The Waiʻole Stream Bridge features a concrete flat slab, concrete parapet with square concrete rail cap, three spans with a concrete through girder superstructure, a concrete abutment wall and concrete wall pier substructure, a solid concrete parapets/railings with a concrete cap, a total length of 27.4 m (90 ft) and width of 4.7 m (15.4 ft). The date of the bridge’s construction, 1912, is incised in the bridge concrete on the interior of the southern parapet.

The Waoʻoli Stream Bridge, the easternmost stream crossing in the project area, essentially marks the western terminus of single-family residences of Hanalei. Headed west from Hanalei, the Waiʻoli Bridge is the first in a series of one-lane bridges along the 6 miles of Kūhiō Highway from Hanalei to its eastern terminus at Haʻena State Park. West of the Waiʻoli Bridge the Kūhiō Highway takes on the bucolic serenity of intensively traditionally farmed basins amidst relatively undeveloped “luxuriant vegetation, coral sand beaches and mountain ridges” (Earle 1978:21).

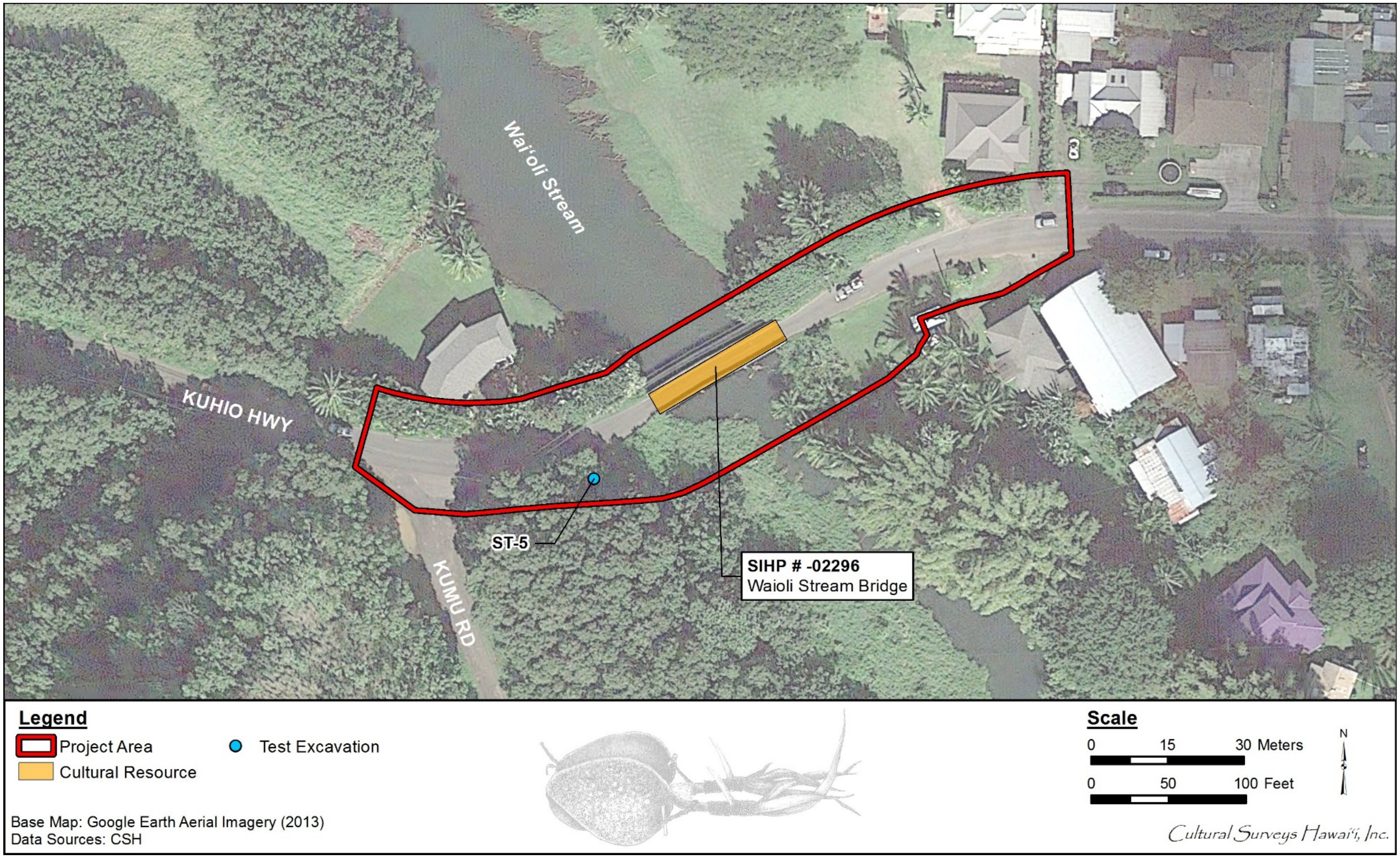


Figure 44. Aerial photograph showing the location of SIHP # 50-30-03-2296, the Wai‘ole Stream Bridge (Google Earth 2013)

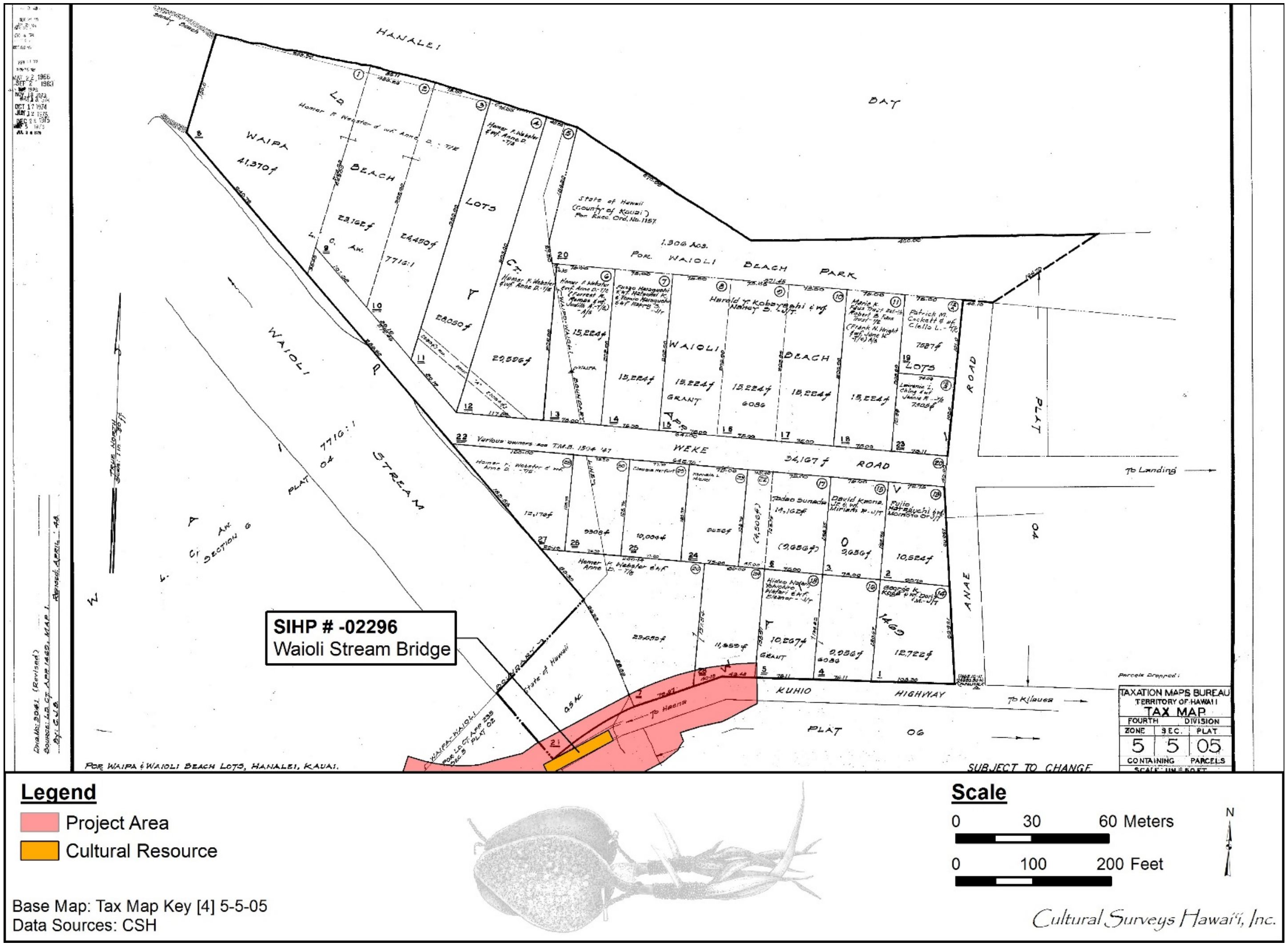


Figure 45. TMK: [4] 5-6-05, showing the location of SIHP # 50-30-03-2296, the Wai‘ole Stream Bridge

Figure 46. SIHP # 50-30-03-2296, Waiʻole Stream Bridge, profile view to north

Figure 47. SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, profile view to north

Figure 48. SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, profile view to west, showing concrete stamped "1912"

4.2.2 SIHP # 50-30-03-2297, the Waipā Stream Bridge

FORMAL TYPE:	Bridge
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	1912
TEST EXCAVATIONS:	Shovel Test 6 (ST-6) on the *mauka* side of the highway on the west side of Waipā Stream Bridge
TAX MAP KEY:	[4] 5-6-004:014, 022, 023; [4] 5-6-004
LAND JURISDICTION:	State Department of Transportation (HDOT)
PREVIOUS DOCUMENTATION:	Fung Associates 2013

The Waipā Stream Bridge, Hawaiʻi State Bridge Number 007005600500396, was designed by Joseph Hughes Moragne (Figure 49 through Figure 56). Originally built in 1904 as a timber bridge by the Department of Public Works, the Waipā Stream Bridge, 0.79 km (0.49 miles) west of Kumu Road, was rebuilt in 1912 as a reinforced concrete T-beam bridge and extended in 1925. The Waipā Stream Bridge built by George R. Ewart, Jr. in 1912 features a concrete flat slab, a concrete T-beam superstructure, a concrete abutment and concrete wall pier with solid concrete parapets/railing with a concrete cap, including three spans with a total length of 13.7 m (45 ft) and width of 4.7 m (15.4 ft). The date of the bridge's construction, 1912, is incised in the bridge concrete on the interior of the southern parapet. An extension was added to the Waipā Stream Bridge in 1925, designed by Ralph L. Garlingouse, a five-span, cast-in-place feature, adding 27.4 m (90 ft) to the previous length with a width of 4.9 m (16 ft). The total length of the Waipā Stream Bridge is currently 41 m (134.5 ft). Both portions of the bridge's parapets are concrete with rail caps, however, the bridges are of slightly different widths and the parapets are slightly different heights:

> According to Territorial Highway Department reports, the Waipa Bridge was modified and assumed its unusual design of two different bridges in 1925. The original design plans for the Waipa Bridge indicated there was an existing 'old' timber bridge over the river in 1912. In addition . . . the 1912 concrete bridge served as an extension of the timber bridge and was probably built to span a widened river channel . . . one of the timber bridge spans had collapsed, so the second concrete bridge at Waipa apparently became a replacement for the timber bridge. The Waipa Bridge collapsed in 1919 and a temporary trestle of 'light construction' was built to span the washout. No plans were found for the new concrete bridge extension, although County Engineer R.L. Garlinghouse drew a similar concrete-slab bridge design for another structure in 1925. The Waipa extension bridge had five spans for a total length of 90'. It was an unusual structure as it did not match the original bridge's width, wall design, or wall height. [Fung Associates 2013:21]

The Waipā Stream Bridge was nominated to the National Register of Historic Places in 1978 with high preservation value. The bridge is a contributing structure to the Kauaʻi Belt Road (North Shore section) archaeological district (Fung Associates 2013:3-88).

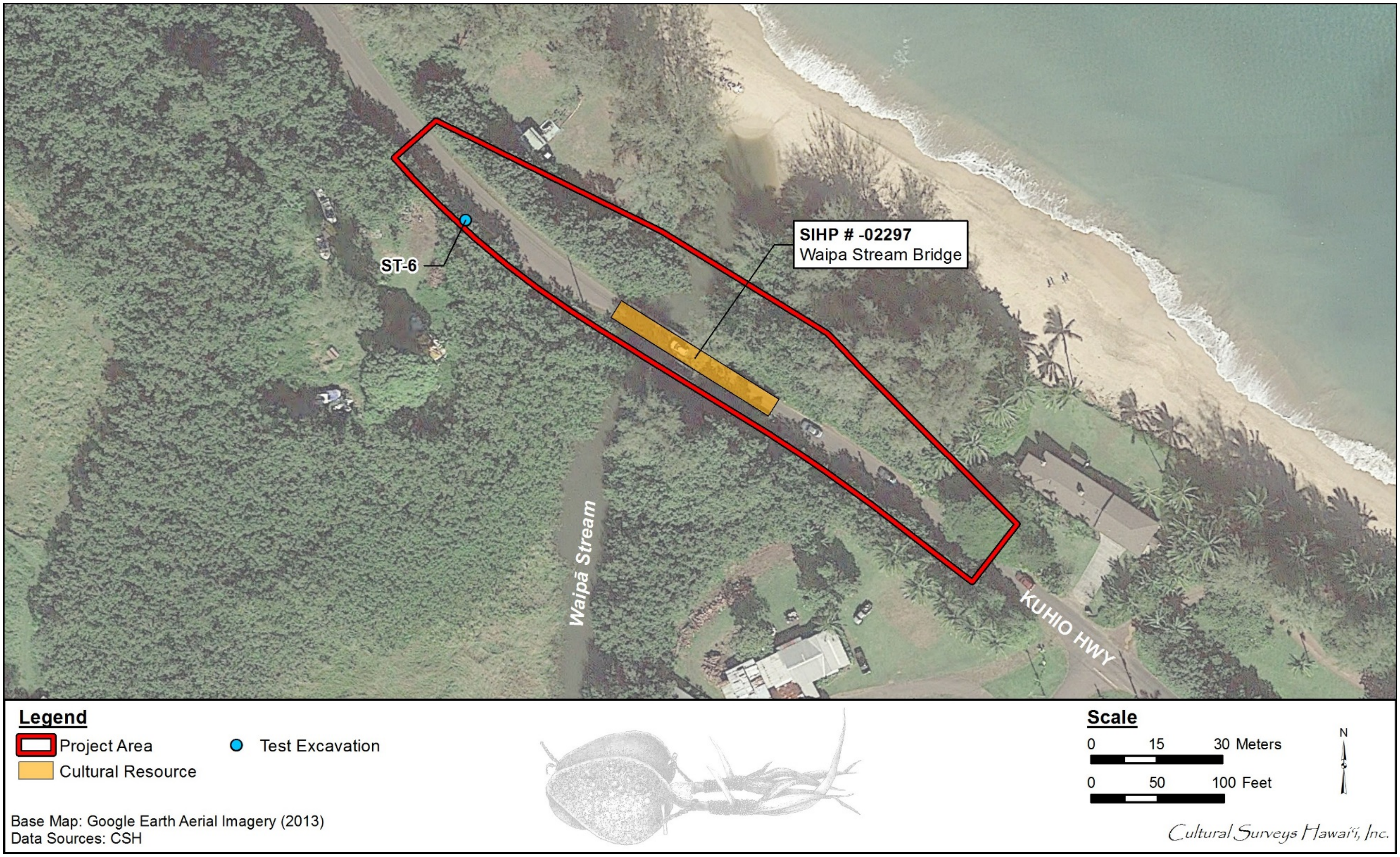


Figure 49. Aerial photograph showing the location of SIHP # 50-30-03-2297, the Waipā Stream Bridge (Google Earth 2013)

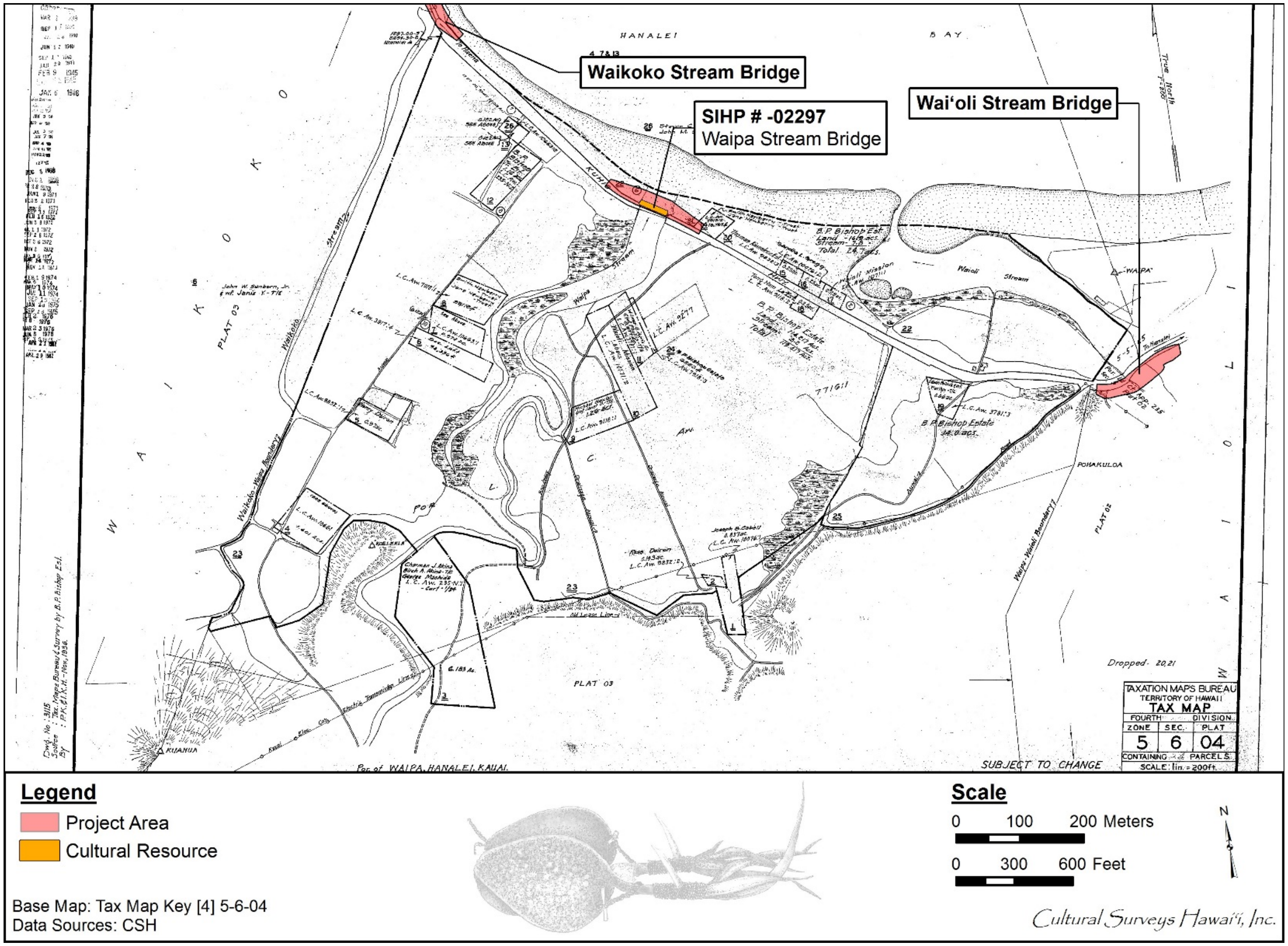


Figure 50. TMK: [4] 5-6-04, showing the location of SIHP # 50-30-03-2297, the Waipā Stream Bridge

Figure 51. SIHP # 50-30-03-2297, the Waipā Stream Bridge, general view to northwest; note the 1912 bridge portion in the foreground

Figure 52. SIHP # 50-30-03-2297, the Waipā Stream Bridge, view to southeast; note the 1925-built concrete bridge extension in the foreground

Figure 53. SIHP # 50-30-03-2297, the Waipā Stream Bridge, portion of the 1925 extension, profile view to west

Figure 54. SIHP # 50-30-03-2297, the Waipā Stream Bridge, view to north; note the 1912-built bridge portion in the foreground

Figure 55. SIHP # 50-30-03-2297, the Waipā Stream Bridge, view to north; note the 1912-built bridge portion in the foreground

Figure 56. SIHP # 50-30-03-2297, the Waipā Stream Bridge, showing concrete stamped "1912," view to west

4.2.3 SIHP # 50-30-03-2298, the Waikoko Stream Bridge

FORMAL TYPE:	Bridge
FUNCTION:	Transportation
NUMBER OF FEATURES:	1
AGE:	1912; 1946
TEST EXCAVATIONS:	none
TAX MAP KEY:	[4] 5-6-003:002; [4] 5-6-003; [4] 5-6-004
LAND JURISDICTION:	State Department of Transportation (HDOT)
PREVIOUS DOCUMENTATION:	Fung Associates 2013

The Waikoko Bridge, Hawaiʻi State Bridge Number 007005600500427, originally built in 1904 as a timber bridge, was replaced 1912-1913 as a concrete flat slab, one-span bridge, with a concrete through girder superstructure, a concrete abutment wall substructure and masonry/rock parapets/railings, with a total length of 13.7 m (45 ft) and a width of 4.7 m (15.4 ft) (Fung Associates 2013:13) (Figure 57 through Figure 68). Located 1.3 km (0.8 miles) west of Kumu Road, the Waikoko Bridge was designed by Joseph Hughes Moragne and built by George Mahikoa.

The 1912 construction utilized a solid concrete parapet with rail cap. In 1946, the east abutment was undermined by a tidal wave, requiring its parapets to be rebuilt with basalt (Fung Associates 2013:28). The bridge was determined eligible to the National Register in 1978, with high preservation value eligibility status. The bridge is a contributing structure to the Kauaʻi Belt Road (North Shore section) archaeological district (Fung Associates 2013:3-65).

Currently the Waikoko Bridge abuts the shoreline, with large basalt boulders piled, as a base course, approximately 2 m high to create the road bed approaching both sides of the bridge. After the southeast end of the 1912 concrete bridge collapsed in the 1946 tsunami event, it was repaired with approximately eight courses of mortared basalt boulders on the *makai* face and approximately five courses of stacked stones atop the original concrete bridge on the *mauka* bridge face, both sides utilizing a smoothed concrete cap. A portion of the original concrete bridge now supports the road and the stacked and mortared basalt boulder repair at an approximately 30 degree angle to the ground and stream surface below, extending into the beach sands on the southeastern portion of the bridge.

The basalt boulders used in the *makai* face of the 1946 tsunami repair include a basalt boulder base course of unprepared and unmortared basalt boulders averaging 1 m by 0.5 m. The second through fourth courses of stacked stone in the *makai* face of the 1946 repair include unprepared, mortared basalt boulders averaging 0.75 by 0.50 m, approximately 1 m high at the southeast bridge corner tapering to zero approximately 2 m south of the northeastern bridge terminus. The fifth through eighth courses include stacked and mortared basalt boulders with roughly prepared faces, averaging 25 cm by 15 cm on both the *makai* and *mauka* faces of the bridge. The first through fourth courses of stacked basalt boulders do not appear on the *mauka* bridge face.

> Hawaii's well-known April Fool's Day tidal wave of 1946 inflicted Kauaʻi's most severe damage in the Hanalei region . . . Waikoko Bridge was . . . damaged when

the tidal wave undermined its eastern abutment, which caused the bridge to sink on one side. The bridge settled to rest at an angle of nearly 30 degrees. Several days after the tidal wave, the County Board of Supervisors instructed the county engineer to make plans to rebuild the Wainiha and Waikoko bridges . . . Waikoko Bridge was repaired by filling the collapsed end of the bridge to a level grade and laying a new roadbed on the bridge. The original bridge still rests on an angle . . . [Fung Associates 2013:22]

Figure 57. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, general view to north

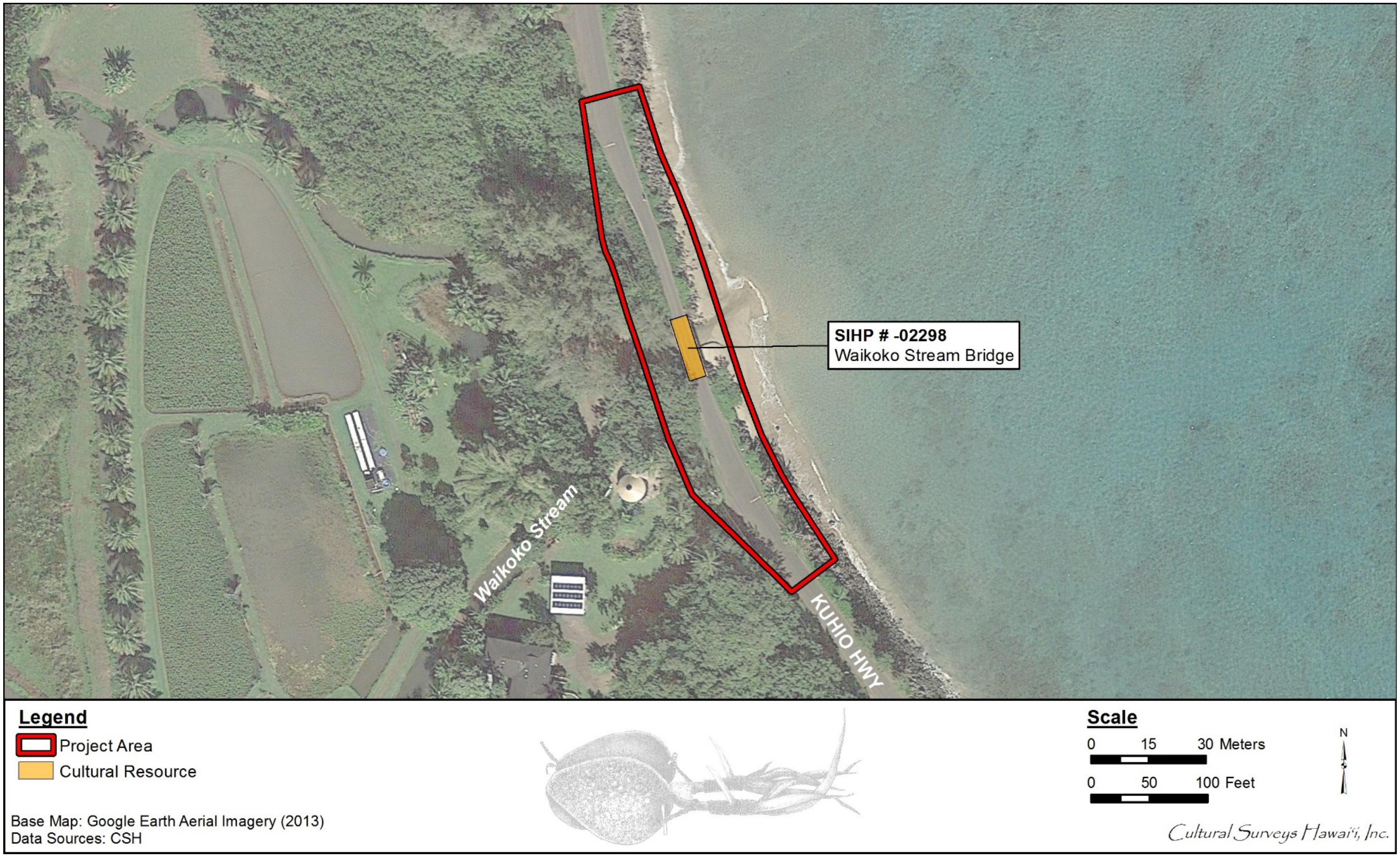


Figure 58. Aerial photograph showing the location of SIHP # 50-30-03-2298, the Waikoko Stream Bridge (Google Earth 2013)

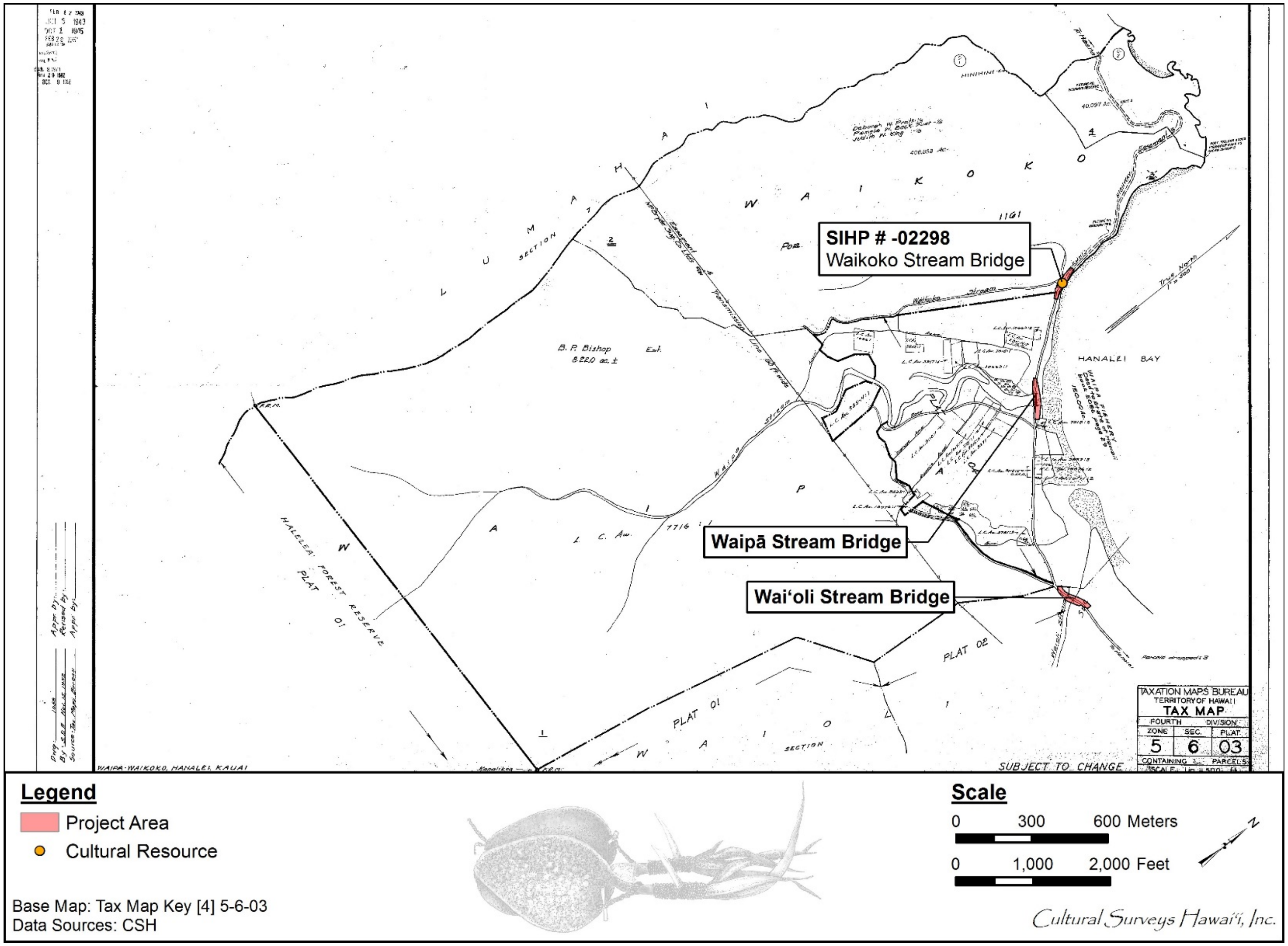


Figure 59. TMK: [4] 5-6-03, showing the location of SIHP # 50-30-03-2298, the Waikoko Stream Bridge

Figure 60. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, general view to west of the bridge's *makai* face; note approximately eight courses of basalt boulders mortared on top of the concrete portion of the bridge damaged in the 1946 tsunami

Figure 61. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, profile view to west of the southern terminus of the bridge's *makai* face; note the successive courses of stacked and mortared basalt (one through eight)

Figure 62. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, general view to northeast of the bridge's *mauka* face; note approximately five courses of basalt boulders mortared on top of the concrete portion of the bridge damaged in the 1946 tsunami

Figure 63. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, general view to northwest

Figure 64. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, underneath profile view to south of the 1912 portion of the bridge undermined by the 1946 tsunami

Figure 65. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, profile view to southwest; note the 1912 portion of the bridge undermined by the 1946 tsunami, with portions of the overlying basalt boulder and mortar repair

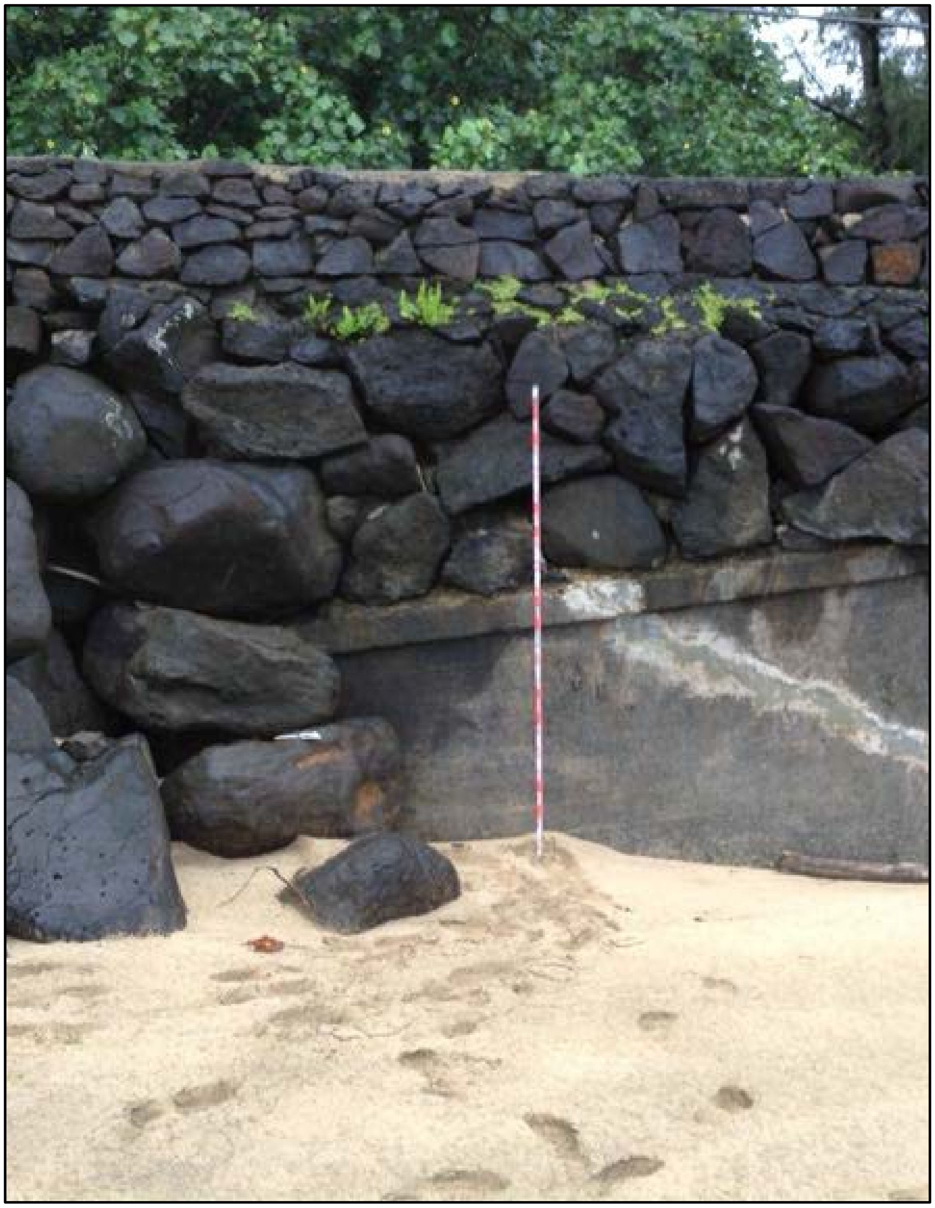


Figure 66. SIHP # 50-30-03-2298, the Waikoko Stream Bridge, profile view to southwest; note the 1912 portion of the bridge undermined by the 1946 tsunami, with portions of the basalt base coarse and overlying basalt boulder and mortar repair

Figure 67. Southern portion of SIHP # 50-30-03-2298, basalt boulder base course of the Waikoko Stream Bridge, view to north

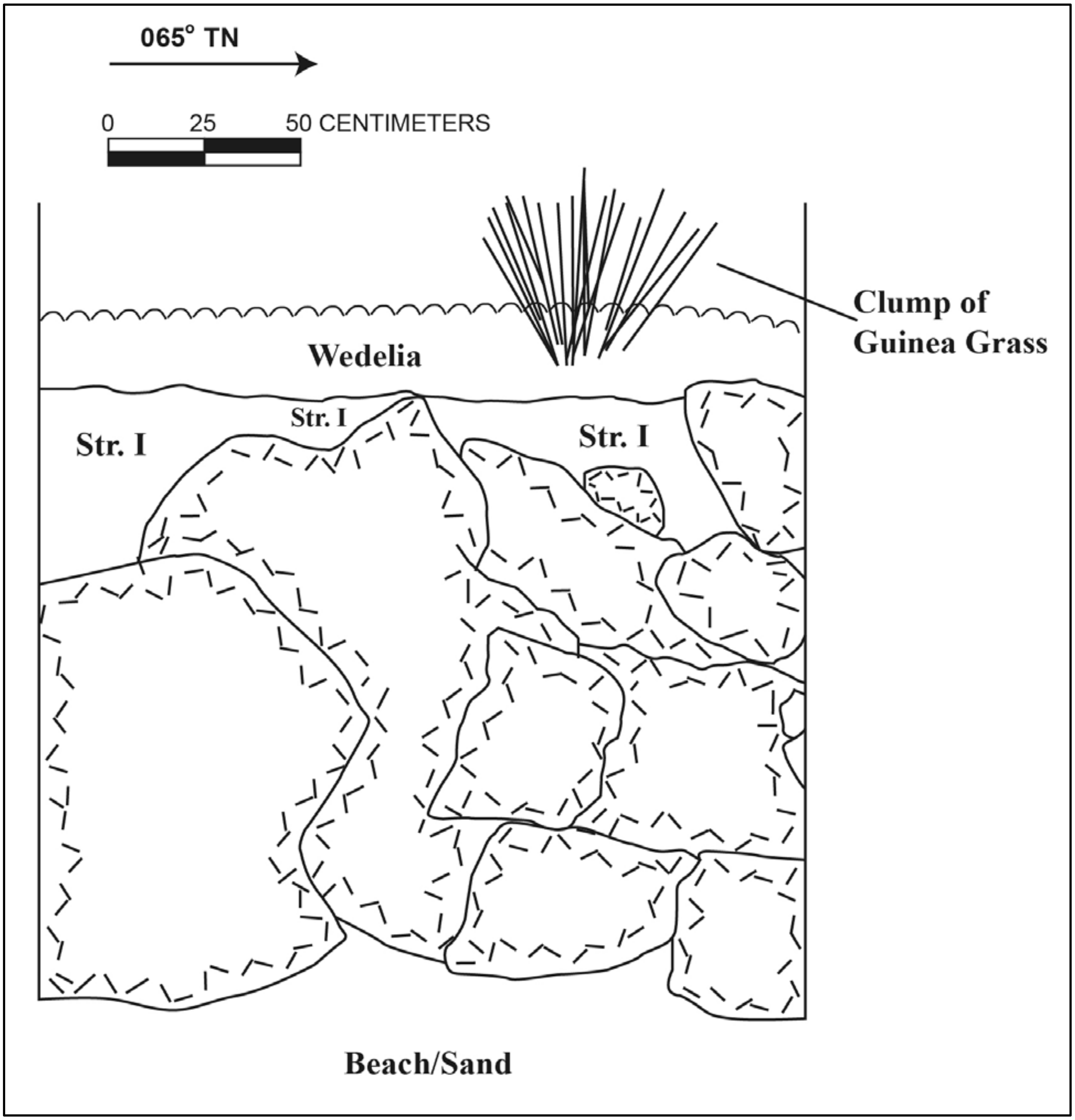


Figure 68. Illustrated stratigraphic profile of southern portion of CSH3, basalt boulder base course of the Waikoko Stream Bridge

4.2.4 SIHP # 50-30-02-2299, Concrete Culvert and Supporting Basalt and Mortar Revetments at Both Ends beneath Kūhiō Highway, Wainiha Stream Bridge 2

FORMAL TYPE:	Road Culvert
FUNCTION:	Rainwater runoff drainage
NUMBER OF FEATURES:	2, intake and outtake
AGE:	Post-1917
TEST EXCAVATIONS:	ST-2, located on the south section of road segment between Wainiha Bridges 2 and 3 and ST-3, located on the *makai* side of the highway in the approach to Wainiha Bridge 2 northbound
TAX MAP KEY:	[4] 5-8-006
LAND JURISDICTION:	State Department of Transportation (HDOT)
PREVIOUS DOCUMENTATION:	None

SIHP # 50-30-02-2299, is a concrete culvert and supporting basalt boulder and mortar revetments at both ends beneath Kūhiō Highway east of Wainiha Stream Bridge 2 (Figure 69 through Figure 76). The function of this road culvert, which includes intake and outtake portions, is to aid in rainwater runoff drainage underneath Kūhiō Highway. The exact age of this feature is unknown, however, as it exists to aid in drainage of the Kūhiō Highway, its construction most certainly post-dates 1917.

The intake portion of this road culvert exists on the west side of Kūhiō Highway, east of Wainiha Bridge 2 and includes two pre-formed concrete drainage pipes approximately 80 cm in diameter. Approximately 50% of the opening of the intake is obscured with standing water, vegetation, debris, and in-filled sediments. The concrete intake pipes are framed and supported by roughly shaped basalt boulders averaging approximately 30 cm by 12 cm, stacked, mortared, and overlying the concrete intake pipes in four courses and extending approximately 50 cm above the opening and on both sides of the two concrete intake pipes. An active steel irrigation pipe, approximately 20 cm in diameter, extends parallel along and beyond the intake face of this feature.

The outtake portion of this road culvert exists on the east side of Kūhiō Highway, east of Wainiha Bridge 2 and includes the two pre-formed concrete drainage pipes approximately 80 cm in diameter framed and supported by stacked and mortared basalt with at least five courses on both sides of the concrete outtake pipes. Standing water, vegetation, debris, and in-filled sediments obscure over 50% of this portion of the feature. The basalt stones used in framing the concrete outtake pipes are roughly shaped basalt boulders averaging approximately 30 cm by 12 cm, stacked, mortared, and extending on both sides of the concrete outtake pipes.

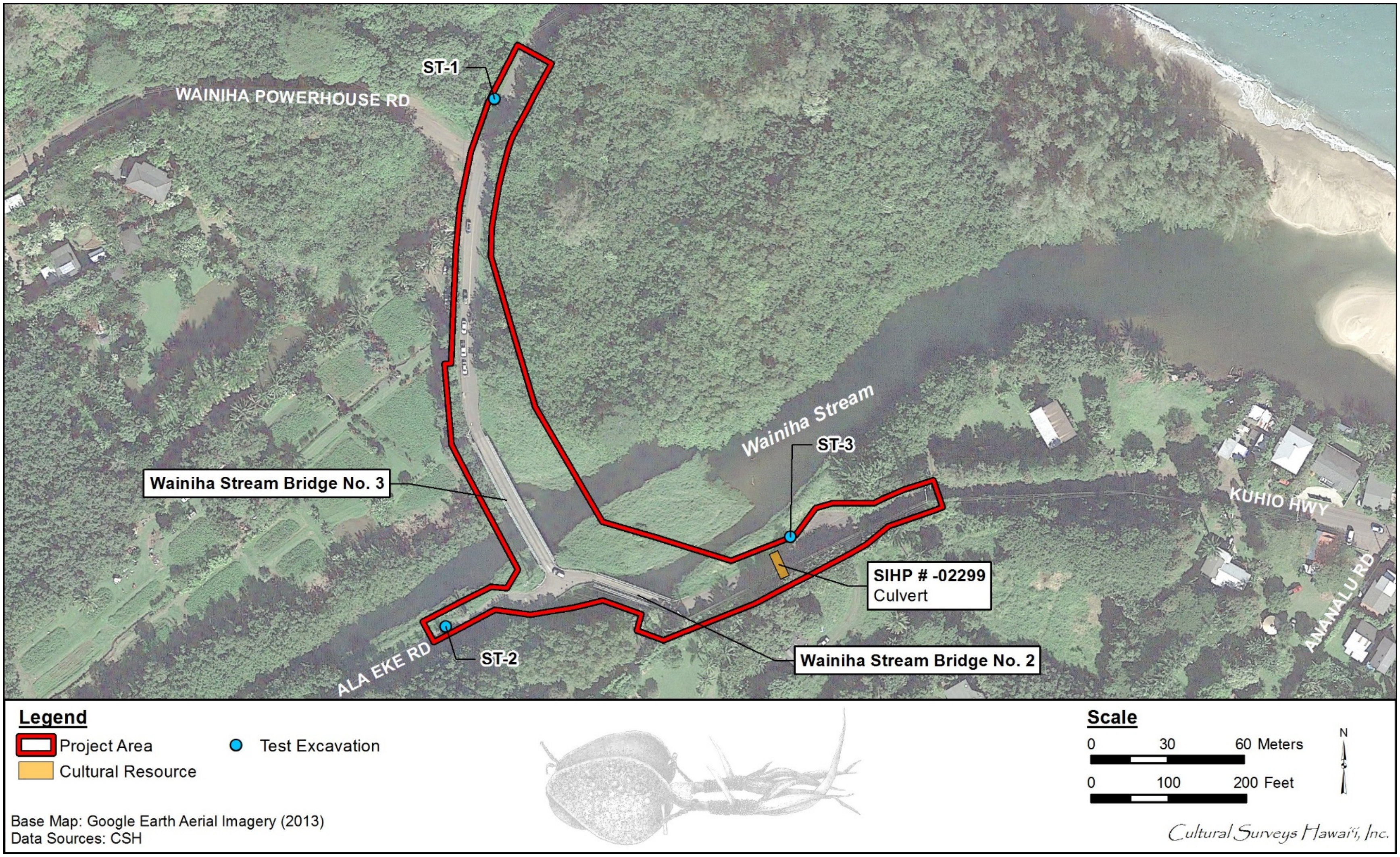


Figure 69. 2013 aerial photograph showing the location of SIHP # 50-30-02-2299, a road culvert associated with Kūhiō Highway (Google Earth 2013)

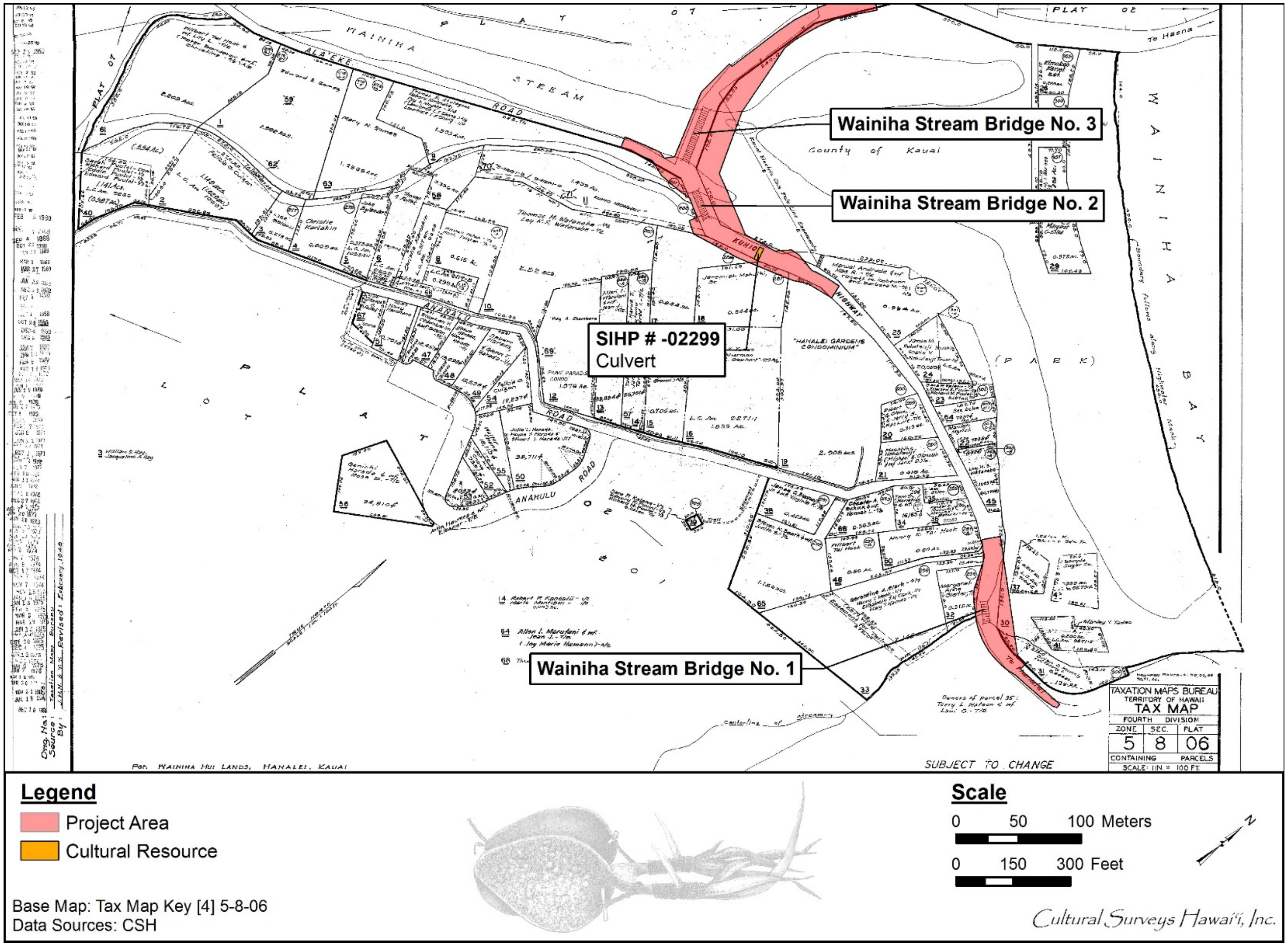


Figure 70. TMK: [4] 5-8-06, showing the location of SIHP # 50-30-02-2299, a road culvert associated with Kūhiō Highway

Figure 71. SIHP # 50-30-02-2299, road culvert and revetment northeast of Wainiha Bridge 2, outflow end on the west side of Kūhiō Highway, view to northeast

Figure 72. Portion of SIHP # 50-30-02-2299, road culvert and revetment northeast of Wainiha Bridge 2, outflow end (at lower right) on the west side of the road, view to south

Figure 73. SIHP # 50-30-02-2299, intake portion of the road culvert and buttressing northeast of Wainiha Bridge 2, on the east side of Kūhiō Highway, view to southwest

Figure 74. SIHP # 50-30-02-2299, road culvert northeast of Wainiha Bridge 2, portion of the intake revetment on the east side of Kūhiō Highway, view to southeast

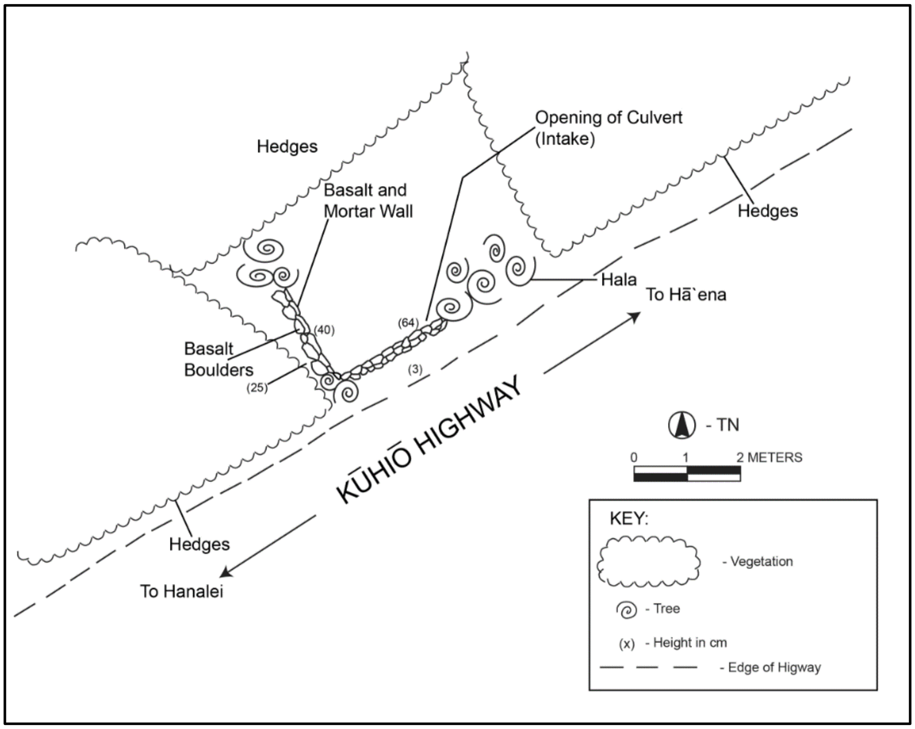


Figure 75. SIHP # 50-30-02-2299, illustrated plan view of intake culvert

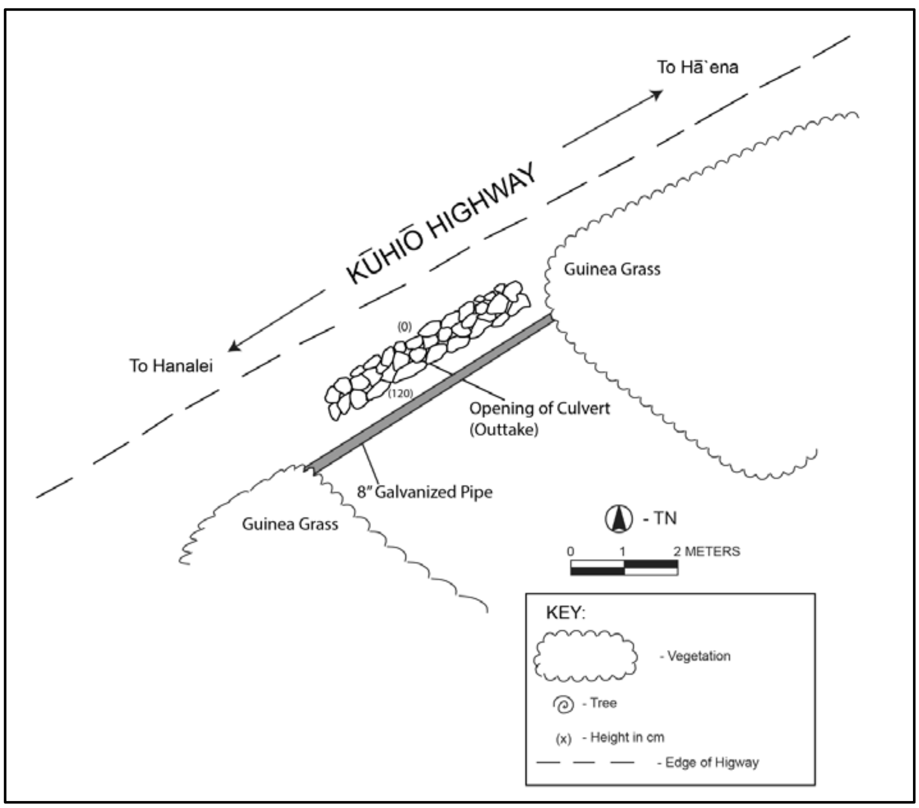


Figure 76. SIHP # 50-30-02-2299, illustrated plan view of outtake culvert

4.3 Shovel Testing Results (ST-1 through ST-6)

CSH archaeologists Johnny Dudoit, B.A., Gerald Ida, B.A, Missy Kamai, B.A., William H. Folk, B.A., and principal investigator Hallett H. Hammatt, Ph.D., completed the archaeological shovel testing fieldwork on 7 and 8 October 2014. A total of six shovel test units were excavated; four in the Wainiha area (ST-1 through ST-4), one in the Waiʻoli area (ST-5), and one in the Waipā area (ST-6):

> ST-1: Located on the *mauka* side of the highway north of Wainiha Bridge 3; contained all natural sediments and large boulders located at bottom of excavation at a depth of 70 cmbs;
>
> ST-2: Located on the south section of road segment between Wainiha Bridges 2 and 3; sand is present at a depth of 55 cmbs continuing below the bottom of excavation at 120 cmbs;
>
> ST-3: Located on the *makai* side of the highway in the approach to Wainiha Bridge 2 northbound; road fill material from the surface and continuing below the bottom of excavation at 85 cmbs;
>
> ST-4: Located on *mauka* side of the highway at the east approach to Wainiha Bridge 1; sand is present at a depth of 37cmbs and continues below the bottom of excavation at 93 cmbs;
>
> ST-5: Located on the *mauka* side of the highway in a gravel bar of the west flood terrace of Waiʻoli Stream Bridge; sand is present from 25 cmbs; and continues below the bottom of excavation at 95 cmbs;
>
> ST-6: Located on the *mauka* side of the highway on the west side of Waipā Stream Bridge 2; sand is present at 60 cmbs and continues to the bottom of excavation at 95 cmbs.

The following stratigraphic summaries describe the location and situation of each shovel test prior to excavation. Subsequent excavation is documented according to stratigraphy, with sediment descriptions for each identified stratum. Soil stratigraphic profile illustrations, one profile per shovel test, are shown, correlating with descriptions for each shovel test using standard USDA soil terminology. Figure 77 through Figure 80 indicate the locations of ST-1 through ST-6.

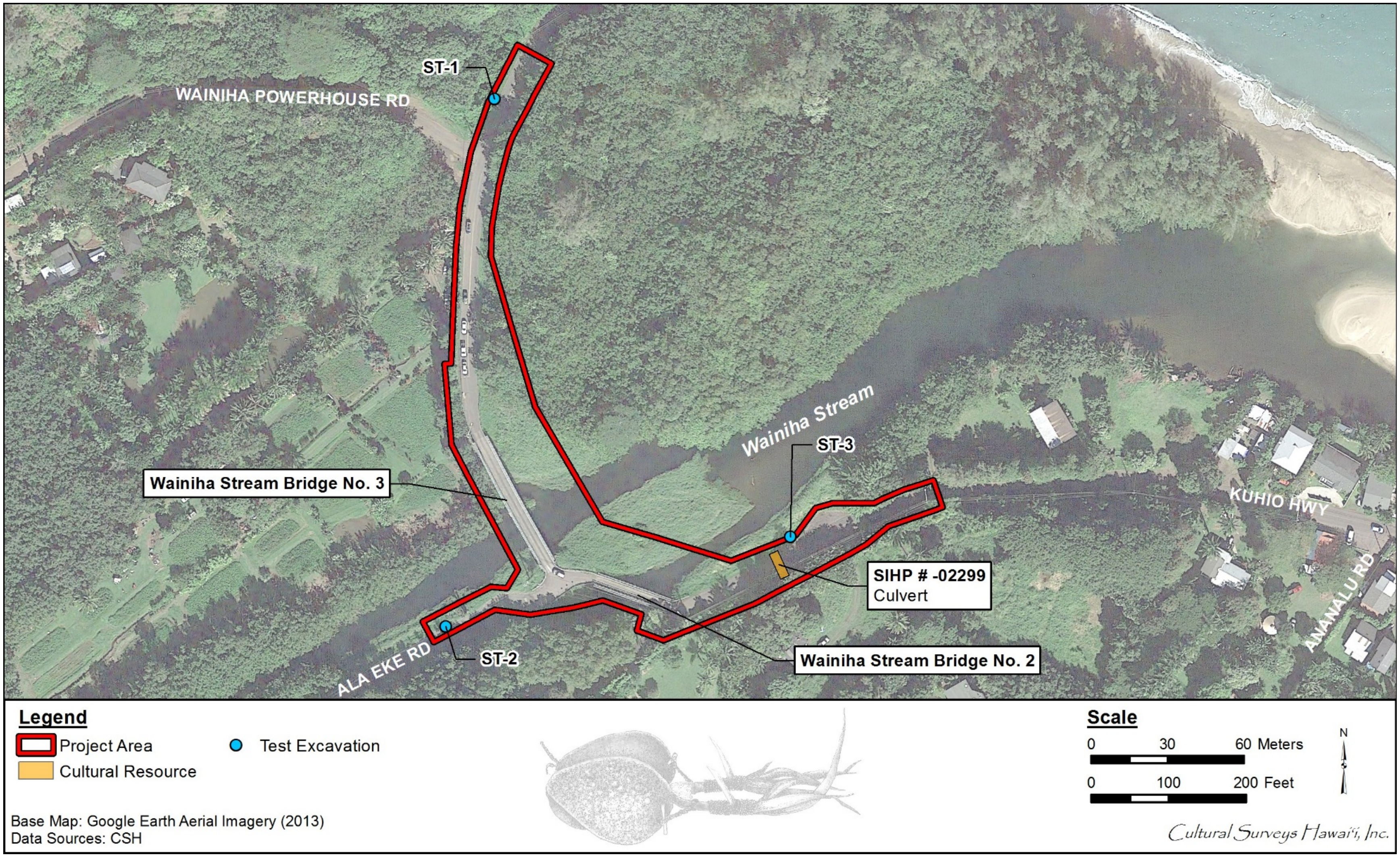


Figure 77. 2013 aerial photograph showing the location of ST-1, ST-2, and ST-3 in relation to SIHP # 50-30-02-2299, a road culvert associated with Kūhiō Highway, within the Wainiha Bridges 2 and 3 project area (Google Earth 2013)

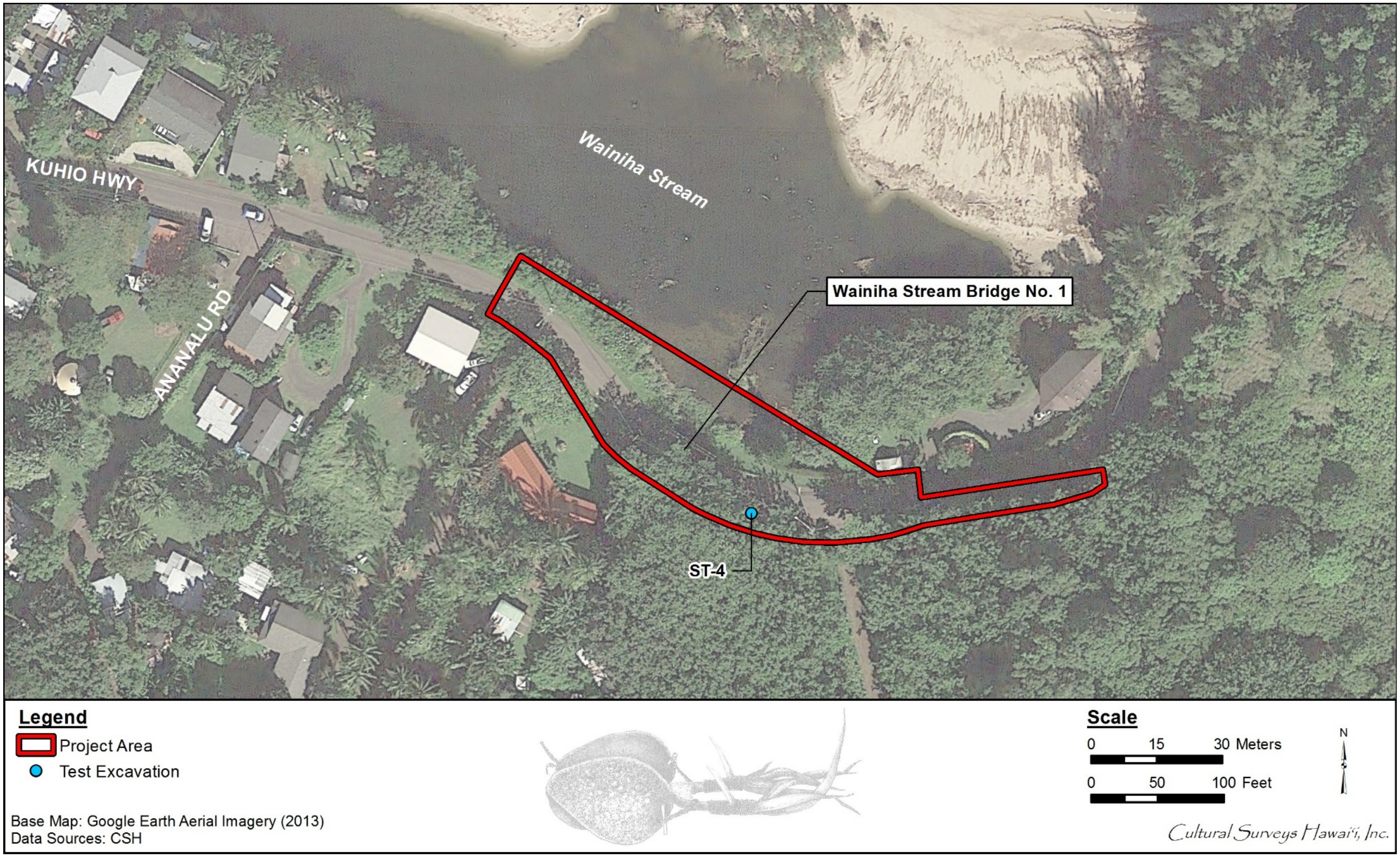


Figure 78. Aerial photograph showing the location of ST-4 in relation to the Kūhiō Highway, within the Wainiha Bridge 1 project area (Google Earth 2013)

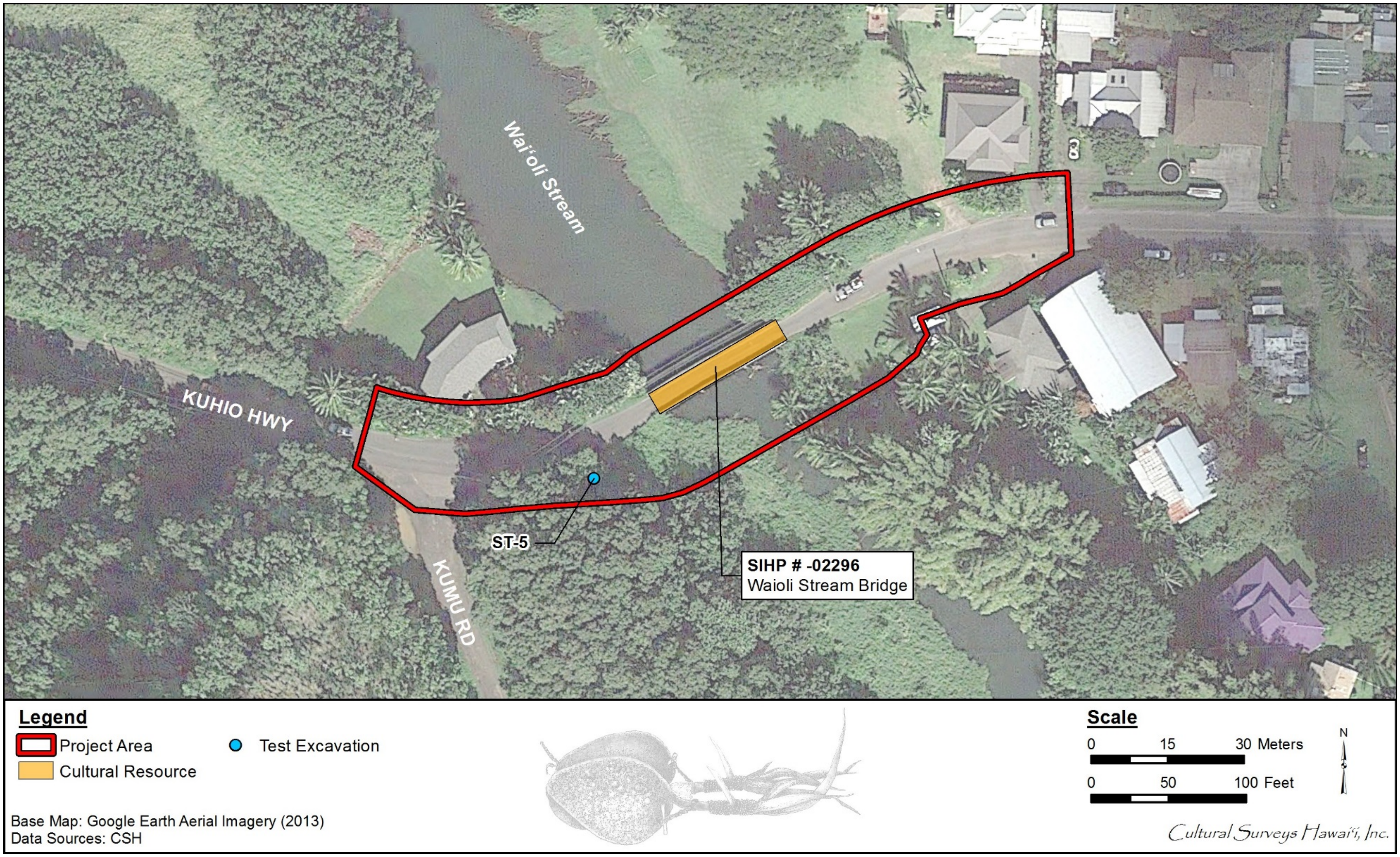


Figure 79. Aerial photograph showing the location of ST-5 in relation to SIHP # 50-30-03-2296, the Wai‘ole Stream Bridge on the Kūhiō Highway, within the Wai‘ole Stream Bridge project area (Google Earth 2013)

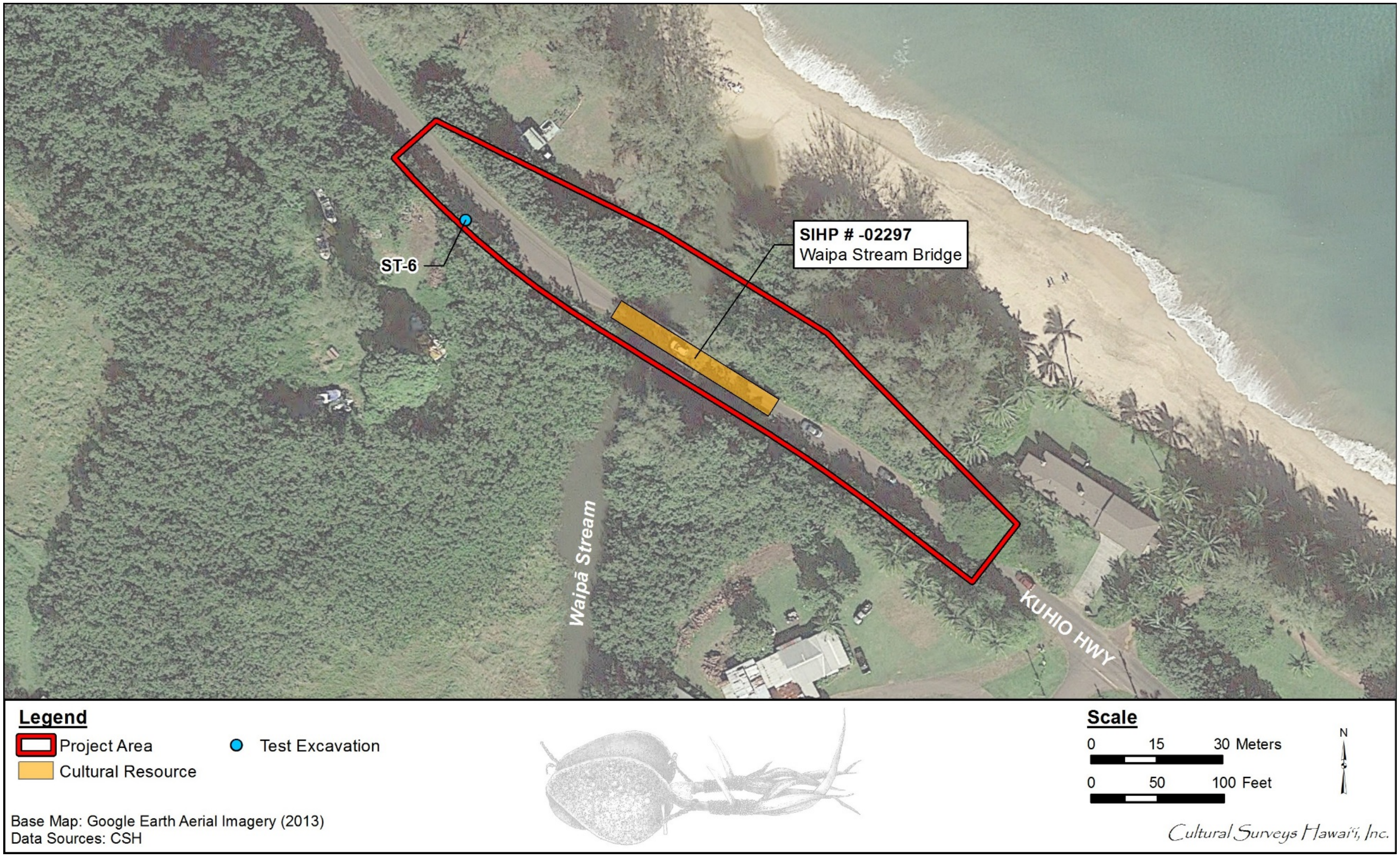


Figure 80. Aerial photograph showing the location of ST-6 in relation to SIHP # 50-30-03-2297, the Waipā Stream Bridge on the Kūhiō Highway, within the Waipā Stream Bridge project area (Google Earth 2013)

4.3.1 Shovel Test 1 (ST-1) Stratigraphic Summary

ST-1 is located in the far western portion of the project area, on the northern *mauka*, side of the highway north of Wainiha Bridge 3 (see Figure 77). ST-1 measures 0.7 m deep by 0.5 m in diameter. The stratigraphic profile of ST-1 consists of dark grayish brown silty loam, A horizon (Stratum I, 0–35 cmbs), dark yellowish brown silt loam, B horizon alluvium (Stratum II, 35–60 cmbs), yellowish red, C horizon silt loam with oxidized waterworn pebbles and cobbles (Stratum III, 60–70 cmbs), and at 70 cmbs large boulders form the base of excavation (Stratum IV). The water table was not observed in ST-1. Zero artifacts were recovered from ST-1. Figure 81 through Figure 84 depict the ST-1 situation and stratigraphic profile and Table 16 provides a stratigraphic summary. The natural sediments observed in ST-1 indicate an upper portion of the present flood plain of the Wainiha Stream, with alluvium marked by lag stream gravels and terminating in waterworn stream boulders.

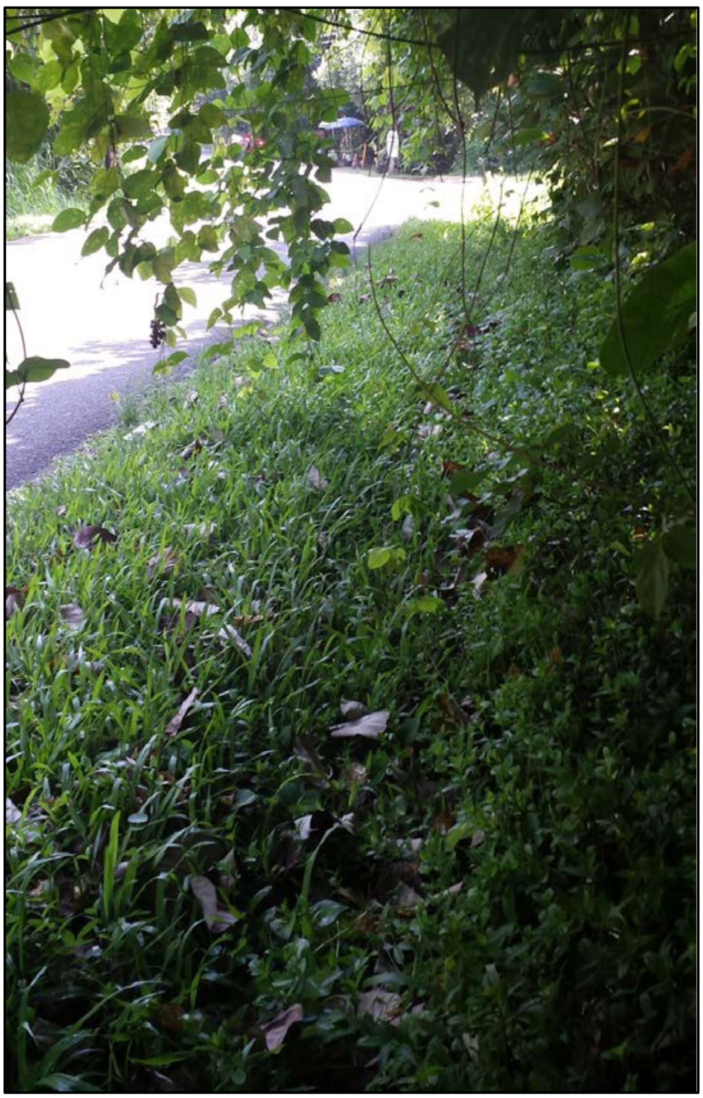


Figure 81. ST-1, general vicinity, view to southeast

Figure 82. ST-1 ground surface prior to excavation, view to north

Figure 83. ST-1, profile view to northwest

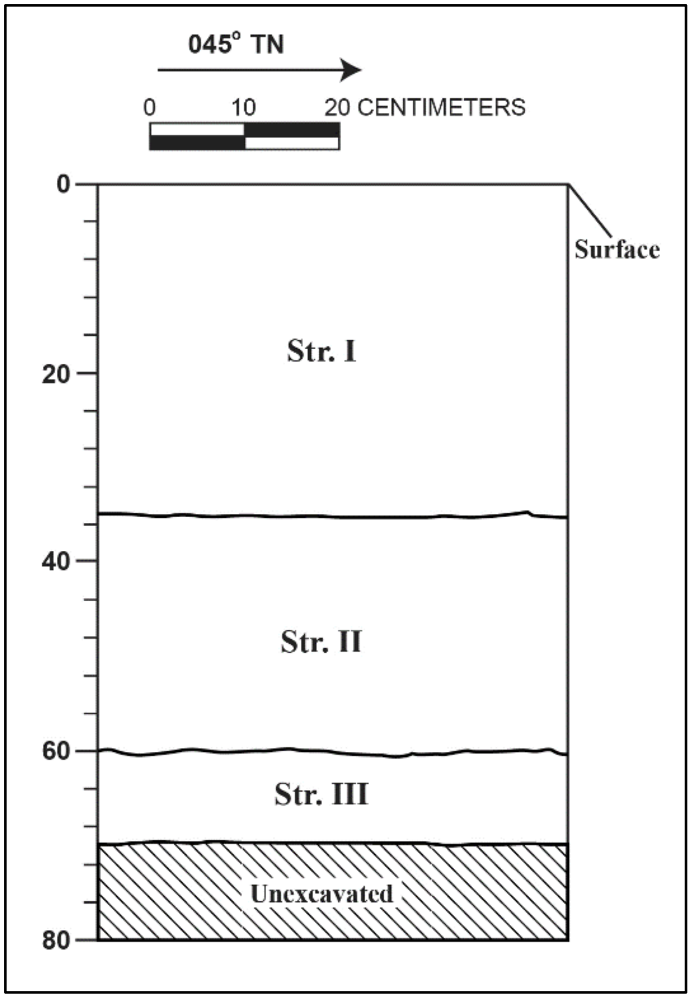


Figure 84. Illustrated stratigraphic profile of ST-1

Table 16. ST-1 Stratigraphic Summary

Stratum	Depth (cmbs)	Description
I	0–35	Natural; 10YR 3/2, dark grayish brown; silt loam; medium to fine size grains with crumb structure; moist, slightly sticky with firm consistence; weak cementation; plastic; terrigenous origin; many, medium size roots; abrupt, smooth lower boundary
II	35–60	Natural; 10YR 4/6. dark yellowish brown; silt loam; medium to coarse size grains with crumb structure; moist, slightly sticky with firm consistence, medium cementation; slightly plastic, terrigenous origin; few fine to medium sized roots, abrupt, smooth lower boundary
III	60–70	Natural; 5YR 5/8, yellowish red; silt loam; medium to coarse size grains with crumb structure; moist, slightly sticky with firm consistence, medium cementation; slightly plastic, terrigenous origin; few fine to medium sized roots, abrupt, rocky lower boundary

4.3.1 Shovel Test 2 (ST-2) Stratigraphic Summary

ST-2 is located on the south section of road segment between Wainiha Bridges 2 and 3 (see Figure 77). ST-2 measures 1.2 m deep by 0.5 m in diameter. The stratigraphic profile of ST-2 consists of dark brown loamy sand (Stratum Ia, 0–4 cmbs), dark brown loamy sand (Stratum Ib, 4–15 cmbs), dark yellowish brown sandy loam (Stratum II, 15–55 cmbs), and grayish brown sandy loam (Stratum III, 55–120 cmbs). The water table was not observed in ST-2. Zero artifacts were recovered from ST-2. Figure 85 through Figure 88 depict the ST-2 situation and stratigraphic profile and Table 17 provides a stratigraphic summary.

Figure 85. ST-2, general vicinity, the ground surface prior to excavation, view to north

Figure 86. ST-2, profile view of the east wall, view to southeast

Figure 87. ST-2, profile view of the south wall, view to south

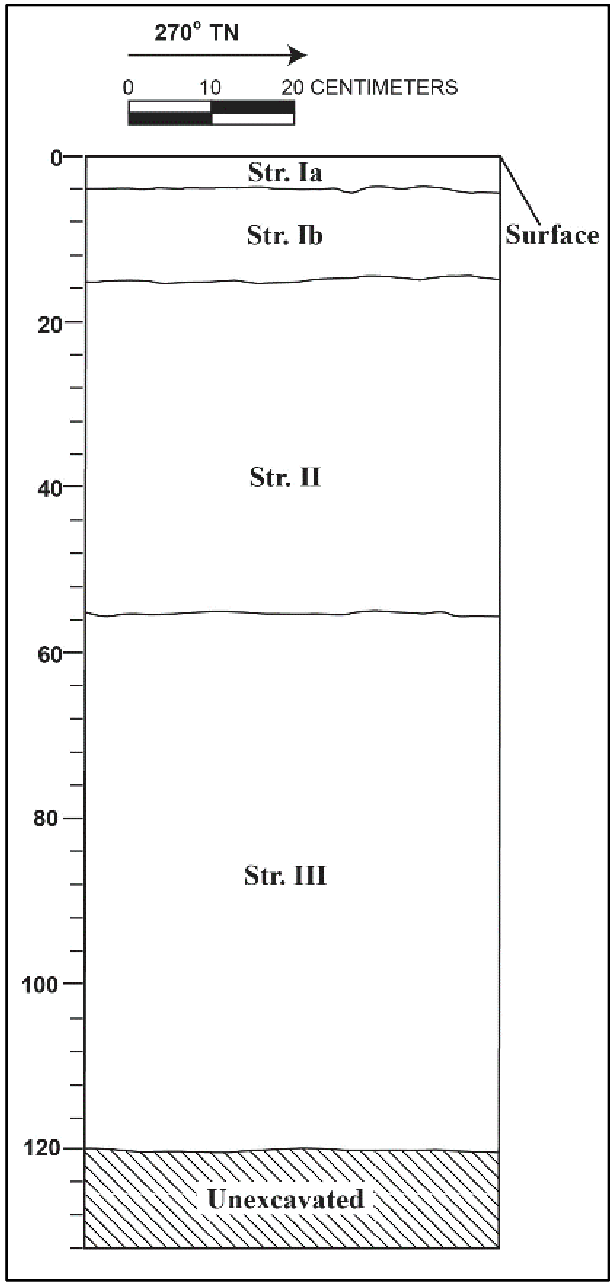


Figure 88. Illustrated stratigraphic profile of ST-2

Table 17. ST-2 Stratigraphic Summary

Stratum	Depth (cmbs)	Description
Ia	0–4	Natural; 10YR 3/3, dark brown; loamy sand; weakly structured with medium size and blocky structure; moist, very friable, slightly sticky consistence; weak cementation; terrigenous origin; many fine size roots; abrupt, smooth lower boundary; 30% quarry gravel; modern A horizon in fill
Ib	4–15	Fill; 10YR 3/3; dark brown; loamy sand; weakly structured with medium size and blocky structure; moist, very friable, slightly sticky consistence; weak cementation; terrigenous origin; many fine size roots; abrupt, smooth lower boundary
II	15–55	Natural; 10YR 3/6; dark yellowish brown; sandy loam; weakly structured with fine size and blocky structure; moist, friable, with weak cementation; terrigenous origin; many fine size roots; abrupt, smooth lower boundary; quarry gravel inclusions
III	55–120	Natural; 5YR 3/2, grayish brown; sandy loam; weakly structured with fine size and blocky structure; moist, friable, with weak cementation; terrigenous origin; many fine size roots; lower boundary not visible

4.3.2 Shovel Test 3 (ST-3) Stratigraphic Summary

ST-3 is located on the *makai* side of the highway in the approach to Wainiha Bridge 2 northbound (see Figure 77). ST-3 measures 0.85 m deep by 0.5 m in diameter. The stratigraphic profile of ST-3 consists of dark brown gravelly silt loam, A horizon formed on fill (Stratum Ia, 0–25 cmbs) and dark reddish silt loam fill (Stratum Ib, 25–85 cmbs). The water table was not observed in ST-3. Zero artifacts were recovered from ST-3. Figure 89 through Figure 92 depict the ST-3 situation and stratigraphic profile and Table 18 provides a stratigraphic summary.

Figure 89. General location of ST-3 in the foreground, east side of Wainiha Bridge 2, view to south

Figure 90. Location of ST-3, prior to groundbreaking, plan view to northwest

Figure 91. ST-3 surface to the base of excavations, profile view to north

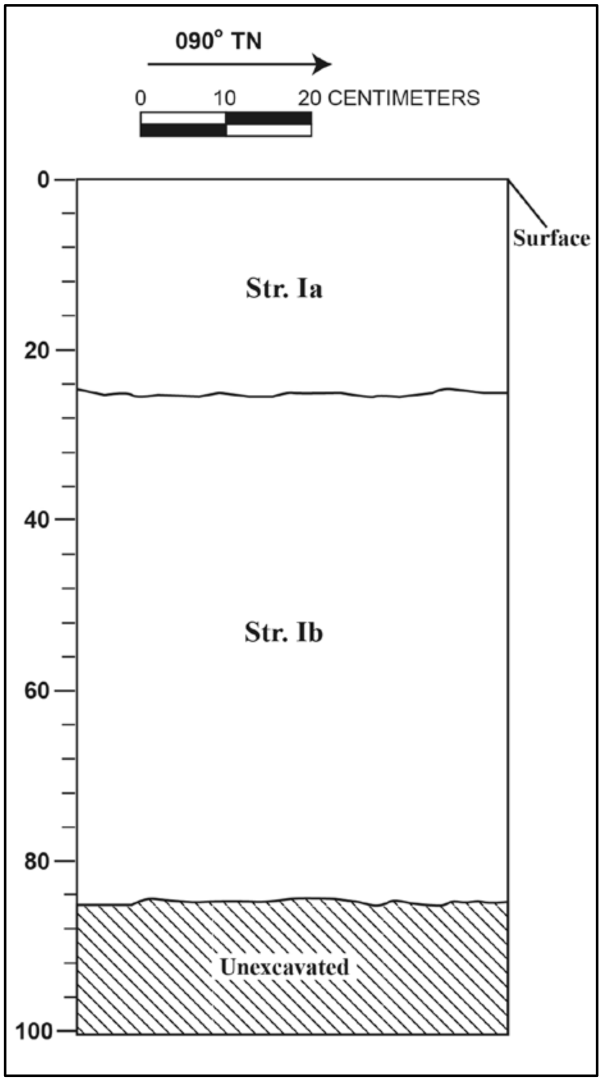


Figure 92. Illustrated stratigraphic profile of ST-3

Table 18. ST-3 Stratigraphic Summary

Stratum	Depth (cmbs)	Description
Ia	0–25	Natural; 10YR 3/3, dark brown; silt loam; weakly structured with medium size and crumb structure; moist, very friable, slightly sticky consistence; strong cementation; terrigenous origin; many fine size roots; abrupt, smooth lower boundary; 20% quarry gravel; modern A horizon on road fill
Ib	25–85	Fill; 5YR 3/3, dark reddish brown silt loam; moderately structured with fine to medium size and blocky structure; moist, very friable, slightly sticky consistence; strong cementation; terrigenous origin; lower boundary not visible; road fill

4.3.3 Shovel Test 4 (ST-4) Stratigraphic Summary

ST-4 is located on the *mauka* side of the highway, on the eastern side of Wainiha Bridge 1 (see Figure 78). ST-4 measures 0.93 m deep by 0.5 m in diameter. The stratigraphic profile of ST-4 consists of grayish brown sandy clay loam (Stratum I, 0–19 cmbs), grayish brown sandy clay loam (Stratum II, 19–37 cmbs), dark brown sandy loam (Stratum III, 37–60 cmbs) and a dark yellowish brown loamy sand (Stratum III, 60–93 cmbs). The water table was not observed in ST-4. Zero artifacts were recovered from ST-4. Figure 93 through Figure 97 depict the ST-4 situation and stratigraphic profile and Table 19 provides a stratigraphic summary. Strata II and III in ST-4 are the deepest terrestrial sand deposits found during subsurface testing. Although no artifacts were observed, Strata II and III in ST-4 also display characteristics of soil development suggesting significantly less disturbance, greater antiquity, and thus greater probability of encountering historic properties within these deposits.

Figure 93. General location of ST-4, on the *mauka* side of Kūhiō Highway on the eastern side of Wainiha Bridge 1, view to west

Figure 94. ST-4 excavation in progress, view to north

Figure 95. ST-4, profile of the south wall; view to south

Figure 96. ST-4, profile of the south wall, view to the south; note base of excavation at 90 cmbs

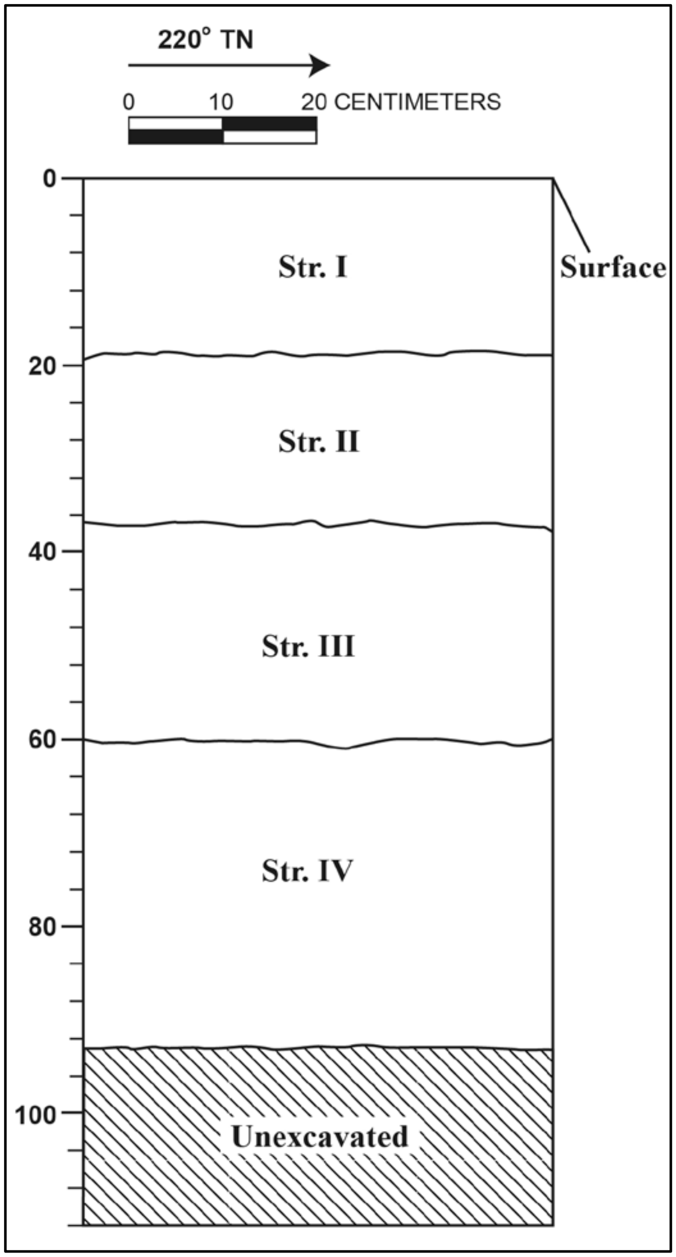


Figure 97. Illustrated stratigraphic profile of ST-4

Table 19. ST-4 Stratigraphic Summary

Stratum	Depth (cmbs)	Description
I	0–19	Natural; 5YR 3/2, grayish brown; sandy clay loam; moderately structured with medium to coarse size and blocky structure; moist, firm, slightly sticky consistence; strong cementation; plastic; terrigenous origin; many fine size roots; clear, smooth lower boundary
II	19–37	Natural; 5YR 3/2.5, grayish brown; sandy clay loam; weakly structured with medium size and blocky structure; moist, friable, slightly sticky consistence; weak cementation; slightly plastic; terrigenous origin; few fine size roots; clear, smooth lower boundary
III	37–60	Natural; 7.5YR 4/4, dark brown; sandy loam; weakly structured with fine size and blocky structure; moist, very friable; non-plastic; mixed origin; few very fine size roots; diffuse, smooth lower boundary; sandy loam grading to loamy sand
IV	60–93	Natural; 10YR 3/6, dark yellowish brown; loamy sand; massive structure; loose consistence; non-sticky; non-plastic; mixed origin; few very fine roots; lower boundary not visible

4.3.4 Shovel Test 5 (ST-5) Stratigraphic Summary

ST-5 is located on the *mauka* side of the highway in a gravel bar of the west flood terrace of Waiʻoli Stream Bridge (see Figure 79). ST-5 measures 0.95 m deep by 0.5 m in diameter. The stratigraphic profile of ST-5 consists of very dark brown sandy loam (Stratum I, 0–25 cmbs) and dark yellowish brown sand (Stratum II, 25–95 cmbs), dark brown sandy loam (Stratum III, 37–60 cmbs) and a dark yellowish brown loamy sand (Stratum III, 60–93 cmbs). The water table was not observed in ST-5. Zero artifacts were recovered from ST-5. Figure 98 through Figure 100 depict the ST-5 situation and stratigraphic profile and Table 20 provides a stratigraphic summary. The marine sand sediments in ST-5 have been reworked by the stream and mixed with alluvium and are a significant distance for the modern shoreline, suggesting these sediments have been here for a long time. This could increase the potential for historic properties to be encountered in any disturbance to existing vegetation and sediments in the vicinity of ST-5.

Figure 98. ST-5, on the west side of the Waiʻole Stream, ground surface prior to excavation, plan view to north

Figure 99. ST-5 at 60 cmbs, profile view to north

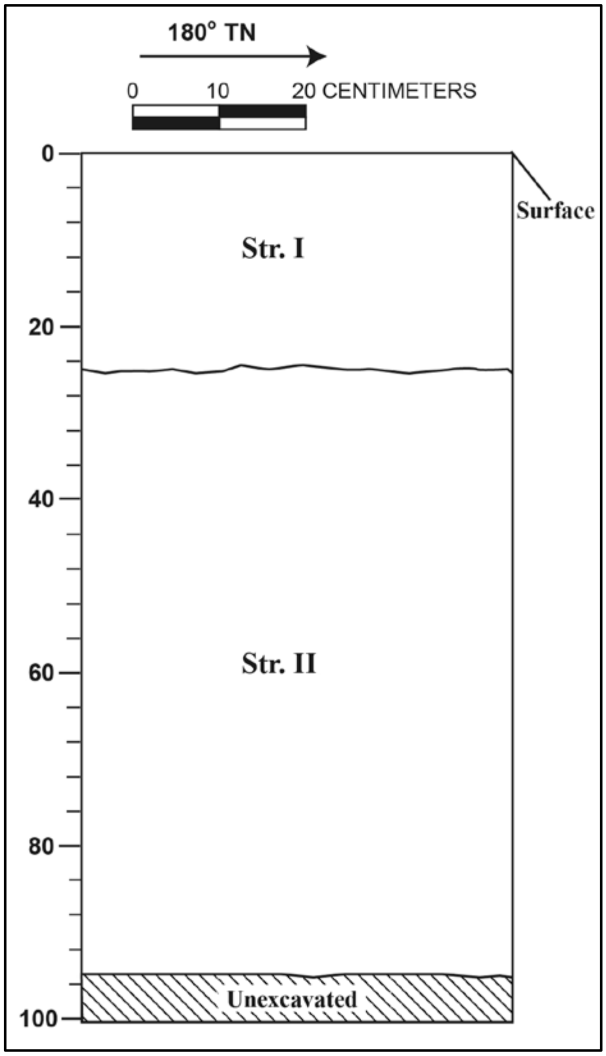


Figure 100. Illustrated stratigraphic profile of Shovel Test 5

Table 20. ST-5 Stratigraphic Summary

Stratum	Depth (cmbs)	Description
I	0–25	Natural; 10YR 2/2, very dark brown; sandy loam; moderately structured with fine size and granular structure; wet, non-sticky consistence; weak cementation; non-plastic; mixed origin; many fine to coarse size roots; very abrupt, smooth lower boundary; fine-grain organic content; A horizon
II	25–95	Natural; 10YR 4/6; dark yellowish brown; sand; single-grain, structureless; wet, non-sticky consistence; non-plastic; marine origin; common medium to coarse roots; lower boundary not visible; C horizon, beach sand; no cultural materials and yet sensitive area for potential archaeology

4.3.5 Shovel Test 6 (ST-6) Stratigraphic Summary

ST-6 is located on the *mauka* side of the highway on the west side of Waipā Stream Bridge 2 (see Figure 80). ST-6 measures 0.95 m deep by 0.5 m in diameter. The stratigraphic profile of ST-5 consists of very dark brown sandy loam fill (Stratum I, 0–27 cmbs), dark reddish brown sandy loam fill (Stratum II, 27–60 cmbs) and a very dark brown; natural sandy loam (Stratum III, 60–95 cmbs). The water table was not observed in ST-6. Zero artifacts were recovered from ST-6. Figure 101 through Figure 104 depict the ST-6 situation and stratigraphic profile and Table 21 provides a stratigraphic summary.

Figure 101. ST-6 ground surface prior to groundbreaking, view to west

Figure 102. ST-6, plan view to east

Figure 103. ST-6, profile view to east at the BOE, 95cmbs

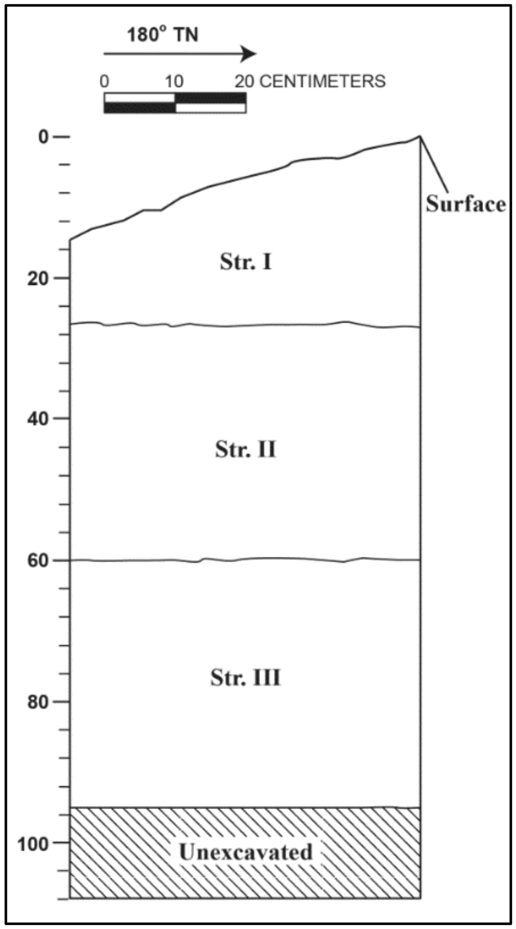


Figure 104. Illustrated stratigraphic profile of Shovel Test 6

Table 21. ST-6 Stratigraphic Summary

Stratum	Depth (cmbs)	Description
I	0–25	Fill; 10YR 2/2, very dark brown; loam; moderately structured with fine size and granular structure; wet, non-sticky consistence; weak cementation; non-plastic; terrigenous origin; many fine to coarse size roots; abrupt, smooth lower boundary; loam with gravel, road-related fill
II	15–60	Fill; 5YR 3/3, dark reddish brown; sandy loam; moderately structured with coarse size and sub-angular blocky structure; wet, non-sticky firm, consistence; weak cementation; plastic; mixed origin; very few, very fine size roots; abrupt, wavy lower boundary; loam with 5% gravel, road-related fill
III	60–95	Natural; 10YR 2/2; very dark brown; sandy loam; moderately structured with fine size blocky structure; wet, non-sticky consistence; weak cementation; non-plastic; mixed origin; few micro size roots; lower boundary not visible; natural sandy loam

Section 5 Summary and Interpretation

At the request of CH2M HILL, CSH has prepared this AIS report for the Wainiha Bridges project, Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa, Haleleʻa District, Kauaʻi, Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD) contract DTFH68-14-D-00012/0007, Multiple TMKs. The proposed bridge replacement project is located along Kūhiō Highway (Route 560), between mile posts 6.4 and 6.7 near the mouth of Wainiha Stream. The project areas encompasses the three Wainiha Bridges (Bridges 1, 2, and 3) and the surrounding areas in Halelea District at the Waioli, Waipa and Waikoko stream bridges along Kūhiō Highway.

CSH archaeologists Johnny Dudoit, B.A., Gerald Ida, B.A, Missy Kamai, B.A., William H. Folk, B.A., and principal investigator Hallett H. Hammatt, Ph.D, completed the AIS fieldwork between 6 October 2014 and 9 October 2014 under archaeological fieldwork permit number 15-03, issued by the Hawaiʻi SHPD per HAR §13-13-282. No cultural resources have been assessed as having traditional cultural significance (HAR §13-275-6 Criterion “e”) within the project area.

The three bridges in Halelea comprise three of the four new historic properties identified in the surface inspection These are SIHP # 50-30-03-2296, the Waiʻoli-Bridge, SIHP # 50-30-03-2297, the Waipā-Bridge, SIHP # 50-30-03-2298, the Waikoko Bridge; the fourth historic property, SIHP # 50-30-02-2299, is a cement drainage culvert running beneath Kūhiō Highway with associated revetments at the road shoulders around the intake and outtake ends of the pipe.

Subsurface testing in the form of six shovel tests provides evidence of potentially undisturbed natural terrestrial or marine sand deposits on either side of each of the bridges at about 50 cm and below. Although no historic properties were identified within the deposits, these sediments have been shown on numerous occasions to contain human burial sites and various other dispersed historic features such as fire pits or house floor deposits.

Two areas of greatest archaeological sensitivity are believed to be the following:

- Wainiha Stream Bridge 1. Strata II and III in ST-4, in addition to being the deepest terrestrial sand deposits found, display characteristics of soil development suggesting significantly less disturbance, greater antiquity, and thus there is greater probability of encountering historic properties within these deposits.
- Waiʻoli Stream Bridge. The marine sand sediments in ST-5 have been reworked by the stream and mixed with alluvium; they are a significant distance from the modern shoreline which suggests these sediments have been here for a long time. This could increase the potential for this area to have been used as a living surface and for historic properties to be encountered in any disturbance to existing vegetation and sediments.

Any construction plans for temporary bridge reinforcement at Waioli, Waipa and Waikoko and the actual Wainiha bridges replacement work, including grubbing for construction activities, should include consideration for archaeological monitoring and the potential for uncovering historic properties that would require mitigation and could cause delays to the construction schedule.

Section 6 Significance Assessments

Cultural resources are generally at least 50 years old, although there are exceptions, and include buildings and structures; groupings of buildings or structures (historic districts); certain objects; archaeological artifacts, features, sites, and/or deposits; groupings of archaeological sites (archaeological districts); and, in some instances, natural landscape features and/or geographic locations of cultural significance.

For a cultural resource to be significant under HAR §13-275-6, it should possess integrity of location, design, setting, materials, workmanship, feeling, and/or association, and meet one or more of the following criterion:

“a” Be associated with events that have made an important contribution to the broad patterns of our history;

“b” Be associated with the lives of persons important in our past;

“c” Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

“d” Have yielded, or is likely to yield, information important for research on prehistory or history; or

“e” Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

Cultural resource significance is also evaluated and expressed as eligibility for listing on the National Register (pursuant to 36 CFR 60.4) and/or the Hawai‘i Register (pursuant to HAR §13-198-8). To be considered eligible for listing on the National and/or Hawai‘i Register, a cultural resource should possess integrity of location, design, setting, materials, workmanship, feeling, and/or association, and meet one or more of the following broad significance criteria:

“A” That are associated with events that have made a significant contribution to the broad patterns of our history;

“B” That are associated with the lives of persons significant in our past;

“C” That embody the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;

“D” That have yielded, or may be likely to yield, information important in prehistory or history;

The current investigation was tasked with the identification of archaeological resources in the vicinity of six bridge locations between mile marker 3 and mile marker 7, a 4-mile stretch along the 10-mile long National and State Registers of Historic Places site (Reference # 03001048 and

SIHP # 50-30-02-9396 respectively) know as the Kauaʻi Belt Road—North Shore section (a.k.a. Kuhiō Highway, Hawaiʻi Route 560). As a NRHP site the Kauaʻi Belt Road, comprising 15 contributiong and two noncontributing resources, was evaluated as meeting significance criteria "A" and "C" for NRHP eligibility and placed on the NRHP in 2003.

CSH observed no evidence of pre-Contact Hawaiian culture, and documented four historic properties: SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, SIHP # 50-30-03-2297, the Waipā Stream Bridge, SIHP # 50-30-03-2298, the Waikoko Stream Bridge, and SIHP # 50-30-02-2299, a reinforced-concrete pipe culvert with supporting basalt and mortar revetments at both ends. The culvert runs beneath Kūhiō Highway, Haena-bound, on the approach to the middle bridge of the three temporary Wainiha Bridges scheduled for replacement by this project.

All six bridges in the approximate 4-mile section of Kauaʻi Belt Road, including the three Wainiha temporary bridge structures scheduled for replacement, are listed in *the Inventory of Contributing and Non-contributing Overlooks, Bridges, and Significant Culverts* of the Kauaʻi Belt Road NRHP Registration Form (Duensing 2002:Sect. 7; 19–20). However, only three of the bridges and the culvert beneath the road on the westward approach to the central Wainiha Bridge are determined significant under HAR §13-275-6. A summary of the identified historic properties for this project and their assessed significance is found in Table 22.

SIHP # 50-30-03-2296, the Waiʻole Stream Bridge, is evaluated to be historically significant under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-6. The bridge crossing has also been previously evaluated (Fung Associates 2013:4) as a significant cultural resource eligible to the National Register and Hawaiʻi Register pursuant to 36 CFR 60.4 and HAR §13-198-8, under Criteria "A" (associated with events that have made a significant contribution to the broad patterns of our history) and "C" (embodies the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction) for its associations with the development of the Kauaʻi Belt Road archaeological district, the Kūhiō Highway system, and the significant role the bridge played in general to "engineering, society history, transportation and commerce" (Fung Associates 2013:3-66) and specifically the history of the Waiʻole Ahupuaʻa.

SIHP # 50-30-03-2297, the Waipā Stream Bridge, is evaluated to be historically significant under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-6. The bridge crossing has also been previously evaluated (Fung Associates 2013:4) as a significant cultural resource eligible to the National Register and Hawaiʻi Register pursuant to 36 CFR 60.4 and HAR §13-198-8, under Criteria "A" (associated with events that have made a significant contribution to the broad patterns of our history) and "C" (embodies the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction) for its associations with the development of the Kauaʻi Belt Road archaeological district, the Kūhiō Highway system, and the significant role the bridge played in general to "engineering, society history, transportation and commerce" (Fung Associates 2013:3-66) and specifically the history of the Waipā Ahupuaʻa.

SIHP # 50-30-03-2298, the Waikoko Stream Bridge, is evaluated to be historically significant under Criteria "a", and "c," of the State of Hawaiʻi significance criteria pursuant to HAR §13-275-

6. The bridge crossing has also been previously evaluated (Fung Associates 2013:4) as a significant cultural resource eligible to the National Register and Hawai‘i Register pursuant to 36 CFR 60.4 and HAR §13-198-8, with high preservation value eligibility status under Criteria “A” (associated with events that have made a significant contribution to the broad patterns of our history) and “C” (embodies the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction) for its associations with the development of the Kaua‘i Belt Road archaeological district, the Kūhiō Highway system, and the significant role the bridge played in general to “engineering, society history, transportation and commerce” (Fung Associates 2013:3-66) and specifically the history of the Waikoko Ahupua‘a.

SIHP # 50-30-02-2299, the reinforced-concrete pipe culvert and supporting basalt boulder and mortar revetments or headwalls at both ends beneath Kūhiō Highway approaching Bridge 2, heading westward toward Haena, is evaluated for significance under Criteria “a”, and “c,” of the State of Hawai‘i significance criteria pursuant to HAR §13-275-6. Although this single culvert is not called out in the NRHP Registration Form *Inventory List of Contributing and Non-contributing Overlooks, Bridges, and Significant Culverts* (Duensing 2002:19-20) it is similar in material and workmanship evident in the revetments at both ends as those described elsewhere in the nomination Narrative Description (Duensing 2002:15). This reinforced-concrete pipe culvert has an apperarance and conveys a feeling of association with the time of road construction. It appears this culvert dates to the early twentieth century and should be included as a contributing element of the Kaua‘i Belt Road historic property.The National Register significance criteria “A” and “C” is therefore applied to the culvert pursuant to 36 CFR 60.4.

Table 22. Significance Criteria for Identified Historic Properties

SIHP # 50-30-	Formal Type	Functional Interpretation	Date of Construction	Significance Criteria
03-2296	Bridge	Transportation	1912	A, C, a. c
03-2297	Bridge	Transportation	1912	A, C, a. c
03-2298	Bridge	Transportation	1912; 1946	A, C, a. c
02-2299	Culvert	Drainage	Post-1917	A, C, a. c

Section 7 Project Effect and Mitigation Recommendations

7.1 Project Effect

In accordance with Federal regulations (36 CFR 800.5), CSH’s project-specific effect recommendation is “No adverse effect.” Under Hawai‘i State historic preservation review legislation, the project’s effect recommendation is “effect with proposed mitigation commitments” (in accordance with HAR §13-13-275-7).

7.2 Mitigation Recommendations

The AIS fieldwork documented sediments surrounding the six bridges within the project areas which, although not found to contain historic properties, do have potential for buried historic properties to be encountered during the project.

The three bridges that are historic properties and part of the NRHP Kaua‘i Belt Road (Waioli, Waipā, and Waikoko) will be avoided during the project work of replacing the three Wainiha bridges. Avoidance will be accomplished by installation of temporary structures bypassing these properties during the project and removal of the temporary structures when the project is complete.

This AIS report has documented the location, extent, function, and age of the reinforced-concrete pipe culvert (SIHP # 50-30-02-2299) on the westward bound approach to the middle Wainiha Bridge. The culvert should be considered a contributing feature to the NRHP Kaua‘i Belt Road. No further archaeological work is recommended for this site.

There is potential to encounter subsurface archaeological deposits or human burials during the installation of temporary bridges over Wailoi, Waipā, and Waikoko steams on the Kaua‘i Belt Road, as well as during the installation of the three new permanent bridges in Wainiha. Based on these potential impacts, CSH recommends on-site archaeological monitoring as a mitigation measure during all ground disturbing activities for the project. Those parts of the Kaua‘i Belt Road affected by the temporary bridge structures should be restored to their prior condition when the structures are removed.

If there is an unexpected impact to the reinforced-concrete pipe culvert or its revetments (SIHP # 50-30-02-2299) during the project it is recommended that materials of the structure be recovered and the structure be reconstructed in the same style manner and workmanship, and of course location.

Section 8 References Cited

Akina, Joseph A.

1904 The Story of the Menehuna. Frances Frazier, translator. Unpublished holographic manuscript in Hawaiian. Private collection.

Alexander, William Patterson

1991 A Tour of Kauai in 1849, Private Journal of William DeWitt Alexander. In *The Kauai Papers*. Kauaʻi Historical Society, Līhuʻe, Kauaʻi.

Armstrong, R. Warwick, editor

1983 *Atlas of Hawaii*. Second edition. University of Hawaii Press, Honolulu.

Beckwith, Martha

1970 *Hawaiian Mythology*. University Press of Hawaii, Honolulu.

Bennett, Wendell C.

1931 *The Archaeology of Kauaʻi*. Bishop Museum Bulletin 80. Bernice Pauahi Bishop Museum, Honolulu.

Bowser, George

1880 *The Hawaiian Kingdom Statistical and Commercial Directory and Tourist Guide, 1880-1881.* George Bowser & Company, Honolulu and San Francisco.

Buke Mahele

1848 In the office of the Commissioner of Public lands. Hawaiʻi State Archives, Honolulu.

Chaffee, David B. and Michael Dega

2005 *An Archaeological Monitoring Report for a 0.25-Acre Property Located in Waipa Ahupuaʻa, Hāʻena District, Island of Kauaʻi, Hawaiʻi [TMK: 5-6-04:15]*. Scientific Consultant Services, Inc. Honolulu.

Chinen, Jon J.

1958 *The Great Māhele, Hawaiʻi's Land Division of 1848*. University of Hawaii Press, Honolulu.

Circuit Court of the Fifth Judicial Circuit

1947 *Report of the Commissioners in the Circuit Court of the Fifth Judicial Circuit, Territory of Hawaii, at Chambers, in Equity, McBryde Sugar Company, Limited Petitioner vs. William P. Aarona, et. al.* Circuit Court of the Fifth Judicial Circuit, Līhuʻe, Kauaʻi.

Clark, John R.K.

1977 *The Beaches of Oʻahu*. University of Hawaii Press, Honolulu.

Cordy, Ross

1978 Archaeological Reconnaissance Survey of Portions of Waiheʻe Valley, Maui, and Lumahaʻi Valley, Kauaʻi. Bishop Museum Ms. 090178. In *Historical Survey: Cultural Reconnaissance of Hydroelectric Power Plant Sites*, by Marion Kelly and Clayton Hee, 1978. Bernice Pauahi Bishop Museum, Department of Anthropology, Honolulu.

Coulter, John Wesley

1931 *Population and Utilization of Land and Sea in Hawaii, 1853*. Bishop Museum Bulletin 88. Bernice Pauahi Bishop Museum, Honolulu.

Coulter, John Wesley and Chee Kwon Chun

1937 *Chinese Rice Farmers in Hawaii*. Bulletin 16:5. University of Hawaiʻi, Honolulu.

Damon, Ethel M.

1931 *Koamalu: A Story of Pioneers on Kauai and of What They Built in That Island Garden.* Privately printed by the Honolulu Star-Bulletin Press, Honolulu.

Dean, Love

1991 *The Lighthouses of Hawaiʻi.* University of Hawaii Press, Honolulu.

DLNR (Department of Land and Natural Resources)

1975 Wainiha Flood Hazard Area [map]. Department of Land and Natural Resources, Honolulu.

Designare Architects

1992 *Hurricane Iniki Damage Assessment of Waioli Huiʻia Church & Meeting Hall*. Designare Architects, Honolulu.

Donn, John M.

1906 Based on 1903 map of "Kauai Hawaiian Islands" by Walter E. Wall with data from private surveys by John M. Donn. Land use as of 1906 added to map. Registered Map 2375. Hawaiʻi Land Survey Division, Department of Accounting and General Services, Honolulu.

Duensing, Dawn E.

2002 *National Register of Historic Places Form for Kauaʻi Belt Road*. United States Department of the Interior, National Park Service.

Dye, Thomas S.

2004 *Archaeological Inventory Survey of Lands in Waipā Ahupuaʻa, Kauaʻi.* T. S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

Earle, Timothy K.

1973 *Control Hierarchies in the Traditional Irrigation Economy of Halelea District, Kauai*. Ph.D. dissertation, Department of Anthropology, University of Michigan.

1978 *Economic and Social Organization of a Complex Chiefdom: The Haleleʻa District, Kauaʻi*. Museum of Anthropology, Anthropology Papers No. 63, Ann Arbor, Michigan.

Emerson, Nathaniel B.

1915 *Pele and Hiʻiaka.* Honolulu Star-Bulletin, Honolulu.

1978 *Pele and Hiiaka: A Myth from Hawaii*. C.E. Tuttle, Rutland, Vermont.

Fong, Jeffrey W.K., Gerald K. Ida, and Hallett H. Hammatt

2006 *Archaeological Monitoring Report for the Approximately 10-mile Stretch of Kūhiō Highway, Route 560 Shoulder Improvements Project, Princeville to Haʻena, District of Haleleʻa, Island of Kauaʻi (TMK 5-, 5-4, 5-5, 5-6, 5-7, 5-8, and 5-9).* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Foote, Donald E., E.L. Hill, S. Nakamura, and F. Stephens

1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii*. U.S. Department of Agriculture, U.S. Government Printing Office, Washington, D.C.

Foreign Testimony

1848-1850 Foreign Testimony of Kuleana Claims to Quiet Land Titles in the Hawaii Islands. State of Hawaiʻi Archives, Honolulu.

Fornander, Abraham

1917-1918 Story of Lonoikamakahiki and Legend of Kuapakaʻa. In *Collection of Hawaiian Antiquities and Folklore*, edited by T.G. Thrum. Memoirs of the Bernice Pauahi Bishop Museum (Vol. IV and V). Bishop Museum Press, Honolulu.

1919 *Fornander Collection of Hawaiian Antiquities and Folklore*. T.G. Thrum, editor. Memoirs of the Bernice Pauahi Bishop Museum (Vol. VI, Part I). Bishop Museum Press, Honolulu.

Fung Associates, Inc.

2013 *Hawaiʻi Statewide Bridge Inventory and Evaluation.* Chapter 3: KAUAI and Appendices of significant persons and historic register nomination forms. Fung Associates, Inc. and MKE Associates LLC, ʻAiea, Hawaiʻi. http://historichawaii.org/library/bridge/SHBIE2014_04_Ch3.pdf, http://historic hawaii.org/library/bridge/SHBIE2014_09_Appendices.pdf (accessed 14 September 2015).

Garden Island

1947 Hui Kūʻai ʻĀina O Wainiha. *The Garden Island*, 25 November.

2015 Article. *The Garden Island*, 12 January.

Gartley, A.

1908 The Wainiha Electric Power Plant. In *Hawaiian Annual*, Thos. G. Thrum, Honolulu.

Google Earth

2013 Aerial photographs of Hawaiʻi. Google Inc., Mountain View, California. Available online at www.google.com/earth.html.

Groza, Randy, David W. Shideler, and Hallett H. Hammatt

2010 *Archaeological Assessment for the Proposed Wainiha Well Project, Wainiha Ahupuaʻa, Hanalei District, Kauaʻi Island*. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Hammatt, Hallett H.

1979 *Archaeological Surface Examination and Subsurface Testing in the Waiʻoli Mission Hall Hanalei, Haleleʻa, Kauaʻi Island, Arch 14-145 I.* Archaeological Research Center Hawaii, Inc., Lawaʻi, Hawaiʻi.

Hammatt, Hallett H. and William H. Folk

1979 *Archaeological Excavations in the Waiʻoli Mission Hall, Haleleʻa, Kauaʻi Island ARCH 14-145 II* (Incomplete Copy). Archaeological Research Center Hawaii, Inc., Lawaʻi, Hawaiʻi.

Hammatt, Hallett H. and William H. Folk

1994a *Archaeological Inventory Survey 30 Acres in Wai‘oli, Halelea District, Kaua‘i (TMK 5-5-6-09)*. Historical and Land Use Sections by Victoria S. Creed. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

1994b *Archaeological Inventory Survey and Subsurface Testing of 2.87 Acres in Waioli, (Hanalei School), Halelea District, Kaua‘i (TMK 5-5-06:por. 9)*. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H. and Gerald K. Ida

1995 *Archaeological Investigation of Land Proposed for Acquisition by County of Kaua‘i at Wainiha, Kaua‘i (TMK 5-8-02:Por. 3)*. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallett H. and David W. Shideler

2003 *Archaeological Monitoring Plan for Renovation and Relocation of a Residence at Coastal Hanalei, Wai‘oli Ahupua‘a, Halele‘a District, Kaua‘i TMK 5-5-04:9&10*. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Handy, E.S. Craighill

1940 *The Hawaiian Planter*, Volume 1. Bishop Museum Bulletin No. 161. Bernice Pauahi Bishop Museum, Honolulu.

Handy, E.S. Craighill and Elizabeth G. Handy

1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Haraguchi, Karol

1987 *Rice in Hawaii: A Guide to Historical Resources.* Compiled and Annotated by Karol Haraguchi. Linda K. Menton, editor. Hawai‘i Humaniteis Program and Hawaiian Historical Society, Honolulu.

Hawai‘i Department of Transportation

2011 *Draft Environmental Assessment: Kūhiō Highway Bypass Road at Lumahai, Kauai*. Online at http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Kauai/2010s/2011-11-23-DEA-Kuhio-Hwy-Bypass-Road.pdf (accessed 2 September 2015).

Hawai‘i TMK Service

1984 Tax Map Keys [4] 5-5-05, [4] 5-5-06, [4] 5-6-02, [4] 5-6-03, [4] 5-6-04, [4] 5-7-03, [4] 5-8-06 and [4] 5-8-07. Hawai‘i TMK Service, Honolulu.

Hoffman, Ellen

1980 *Archaeological Survey and Limited Test Excavations in Waipā and Lumaha‘i Valleys, Island of Kaua‘i*. Department of Anthropology, Bernice Pauahi Bishop Museum, Honolulu.

Ida, Gerald, Hallett H. Hammatt, and Edward D. Duncan

1993 *Archaeological Survey of Proposed Telecommunication Hut for GTE Hawaiian Tel at Wainiha, Kaua‘i (TMK 5-8-02:3).* Cultural Surveys Hawai‘i, Kailua, Hawai‘i.

Jourdane, Elaine

1995 *Inadvertent Discovery of Skeletal Remains at Kobayashi Subdivision, Waiʻoli, Hanalei, Kauai, Site 50-30-03-3014.* State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

Juvik, Sonia P. and James O. Juvik

1998 *Atlas of Hawaiʻi.* Third edition. Department of Geography, University of Hawaiʻi at Hilo. University of Hawaiʻi Press, Honolulu.

Kamai, Missy and Hallett H. Hammatt

2013 *Burial Site Component of an Archaeological Preservation Plan for the Waipā Foundation Community Cultural Center Project, SIHP # 50-30-03-2196, Waipā Ahupuaʻa, Haleleʻa District, Island of Kauaʻi, TMK: (4) 5-6-004:023*. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Kamakau, Samuel Manaiakalani

1961 *Ruling Chiefs of Hawaii*. Kamehameha Schools Press, Honolulu.

Kameʻeleihiwa, Lilikalā

1992 *Native Land And Foreign Desires Ko Hawaiʻi ʻAina a me Na Koi Puʻumake a ka Poʻe Haole Pehea la e Pono ai?* Bishop Museum Press, Honolulu.

Kelley, Marion and Clayton Hee

1978 *Historical Survey: Cultural Reconnaissance of Hydroelectric Power Plant Sites*. Department of Anthropology, Bernice Pauahi Bishop Museum, Honolulu.

Kelley, Marion, Clayton Hee, and Ross Cordy

1978 *Cultural Reconnaissance of Hydroelectric Power Plant Sites, Lumahaʻi Valley, Kauaʻi*. Department of Anthropology, Bernice Pauahi Bishop Museum, Honolulu.

Kikuchi, William K. and Susan Remoaldo

1992 *Cemeteries of Kauaʻi*, Vol. 1. Kauaʻi Community College and University of Hawaiʻi, Puhi, Kauaʻi, Hawaiʻi.

Kikuchi, William K.

1987 The Fishponds of Kauaʻi. In *Archaeology on Kauaʻi*, Vol. 14, No. 1, March. Anthropology Club of Kauaʻi Community College, Līhuʻe, Hawaiʻi.

King, Robert D.

1935 Districts in the Hawaiian Islands. In *A Gazetteer of the Territory of Hawaii*, compiled by John Wesley Coulter. University of Hawaii Research Publications, No. 11. University of Hawaiʻi, Honolulu.

Knudsen, Eric

1946 An account of an 1895 traveller. In *The Kauaʻi Papers*. Kauai Historical Society, Līhuʻe, Kauaʻi.

Liborio, Māhealani and Hallett H. Hammatt

2015 *Cultural Impact Assessment for the Wainiha Bridge Route 560 Kūhiō Highway Project, Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainia Ahupuaʻa, Hanalei District, Kauaʻi Island.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Lydgate, John M.

1913 The Affairs of the Wainiha Hui. In *Hawaiian Annual*. Thos. G. Thrum, Honolulu.

Maly, Kepa and Onaona Maly

2003 *"Hana Ka Lima, ʻAi Ka Waha" A Collection of Historical Accounts and Oral History Interviews with Kamaʻāina Residents and Fisher-People of Lands in the Haleleʻa-Nā Pali Region on the Island of Kauaʻi*. Kumu Pono Associates LLC, Hilo, Hawaiʻi.

Masterson, Ian A., Hallett H. Hammatt, William Folk, and Victoria S. Creed

1997 *Archaeological Monitoring Report for the Hanalei School Waioli, Haleleʻa, Kauaʻi (TMK 5-5-06: 9, 18)*. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

McGerty, Leann and Robert Spear

1999 *An Archaeological Inventory Survey of Waiʻoli Town Park, Waiʻoli, Haleleʻa, Kauaʻi, Hawaiʻi (TMK 5-6-02:5).* Scientific Consultant Services, Honolulu.

McIntosh, James, Kimberly Mooney, and Paul L. Cleghorn

2011 *Archaeological Inventory Survey in the Vicinity of Lumahaʻi: Old Loop Road and Bypass Road Corridor Lumahaʻi Ahupuaʻa, Hanalei District, Island of Kauaʻi [TMK (4) 5-7-003]*. Pacific Legacy, Inc., Kailua, Hawaiʻi.

McMahon, Nancy

1995a Inadvertent Burials Discovery, Malolo Road, Waiʻoli, Hanalei, Kauaʻi TMK:5-5-03:35, State Site 50-30-03-1982. State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

1995b *A Mitigation Report: Burial Treatment for an Inadvertent Burial Site 50-30-03-3014, Located in the Kobayshi Property, Waiʻoli, Halelea, Kauaʻi (TMK: 5-5-6:12).* Exploration Associates, Ltd., Koloa, Hawaiʻi.

Native Register

1847-1853 *Native Register of Kuleana Claims to Quiet Land Titles in the Hawaii Islands.* Hawaiʻi State Archives, Honolulu.

Native Testimony

1847-1853 *Native Testimony of Kuleana Claims to Quiet Land Titles in the Hawaii Islands.* Hawaiʻi State Archives, Honolulu.

OHA (Office of Hawaiian Affairs)

2014 *Papakilo Database.* Office of Hawaiian Affairs cultural and historical database. Electronic document, http://papakilodatabase.com/main/index.php.

Pacific Worlds & Associates

2001 *Hāʻena, Kauaʻi, Hawaiian Islands.* Available online at http://www .pacificworlds.com/haena/index.cfm

Pantaleo, Jeffrey and Scott S. Williams

1991 *Archaeological Reconnaissance Survey of Selected portions of the Port Allen-Wainina Transmission Line Corridor, Kauaʻi*. Bernice Pauahi Bishop Museum, Honolulu.

Pukui, Mary Kawena

1951 *The Water of Kane*. Kamehameha Schools Press, Honolulu.

1983 *ʻŌlelo Noʻeau: Hawaiian Proverbs and Poetical Sayings*, Bishop Museum Special Publication No.71. Bishop Museum Press, Honolulu.

Pukui, Mary K. and Samuel H. Elbert

1986 *Hawaiian Dictionary*. University of Hawaii Press, Honolulu.

Pukui, Mary K., Samuel H. Elbert, and Esther Mookini

1974 *Place Names of Hawaii*. University of Hawaii Press, Honolulu.

Rechtman, Robert B. and Dennis S. Dougherty

2001 *Archaeological Inventory Survey of Two Parcels at Wainiha (TMK: 4-5-8-12:5, 11) Wainiha Ahupuaʻa, Haleleʻa District, Island of Kauaʻi*. Rechtman Consulting, Keaʻau, Hawaiʻi.

Rice, William Hyde

1923 *Hawaiian Legends*. Bishop Museum Bulletin 3. Bernice Pauahi Bishop Museum, Honolulu.

Riznik, Barnes

1987 *Waiʻoli Mission House, Hanalei, Kauai*. Grove Farm Homestead and Waiʻoli Mission House, Līhuʻe, Kauaʻi.

Sandison, John

1956 *Walter Duncan McBryde and Kukuiolono Park*. Kukuiolono Park and Golf Course Guest Brochure, Kauaʻi.

Shepard, F.P., G.A. MacDonald, and D.C. Cox

1950 *The Tsunami of April 1, 1946*. University of California Press, Berkeley and Los Angeles, California.

Shideler, David W., Kristina W. Bushnell, Sallie D.M. Freeman, and Hallett H. Hammatt

2004 *Archaeological Monitoring Plan for the Proposed Kūhiō Highway Shoulder Improvements Project, Princeville to Haʻena, District of Haleleʻa, Island of Kauaʻi, (TMK 5-3, 5-4, 5-5, 5-6, 5-7, 5-8, and 5-9)*. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Spear, Robert L.

1992 *An Archaeological Inventory Survey of St. Williams Church, Hanalei, Island of Kauaʻi (TMK 5-5-02:37), State Site Number 50-30-02-1877.* Applied Planning Services, Lawaʻi, Kauaʻi.

Sullivan, Mary C. and Michael Dega

2003 *Burial Treatment Plan for a 0.25-Acre Property Located in Waipa Ahupuaʻa, Hāʻena District, Island of Kauaʻi, Hawaiʻi [TMK: 5-6-04:15]*. Scientific Consultant Services, Inc., Honolulu.

Territory of Hawaii

1939 *An Historic Inventory of the Physical, Social and Economic and Industrial Resources of the Territory of Hawaii: Planning Board, First Progress Report, Honolulu.* Second edition. Territory of Hawaii, Honolulu.

Thrum, Thomas G.

1906 Heiaus and Heiau Sites Throughout the Hawaiian Islands. *Hawaiian Annual for 1907*. Thos. G. Thrum, Honolulu.

1907 Tales from the Temples. *Hawaiian Annual for 1908*. Thos. G. Thrum, Honolulu.

1907 *Hawaiian Folk Tales, A Collection of Native Legends.* A.C. McClurg & Company, Chicago, Illinois.

1923 *More Hawaiian Folk Tales.* A.C. McClurg & Company, Chicago, Illinois.

1924 Securing the Wainiha Water-Right Lease. In *All About Hawaii. The Recognized Book of Authentic Information on Hawaii, combined with Thrum's Hawaiian Annual and Standard Guide*. Honolulu Star-Bulletin, Honolulu.

UH SOEST

1950 UH SOEST Hanalei Bay Coast Aerial Photograph. University of Hawaiʻi at Mānoa School of Ocean and Earth Science and Technology–Coastal Geology Group. Online at http://soest.hawaii.edu/

U.S. Department of Agriculture

2001 Soil Survey Geographic (SSURGO) database. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/ (accessed September 2015).

(USGS) U.S. Geological Survey

1910 Hanalei and Kilauea USGS 7.5-minute topographic quadrangles. USGS Information Services, Denver, Colorado.

1963 Hanalei USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1965 Haena USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1991 Haena USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1996 Hanalei USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

Waihona ʻAina

2000 *Māhele Database.* Online at www.waihona.com. (site accessed September 2015)

Waipā Foundation

2012 Waipā Foundation website. Online at http://www.waipafoundation.org/ (accessed September 2015)

Wall, W.E.

1914 *Wall Map of Waioli and Hanalei*. Government Tracts, HTS Plat 3040. Land Survey Division, State of Hawaiʻi Department of Accounting and General Services, Honolulu.

Wheeler, Momi, David W. Shideler, and Hallett H. Hammatt

2013a *Archaeological Literature Review and Field Inspection of a Portion of Lumahaʻi, Lumahaʻi Ahupuaʻa, Haleleʻa District, Island of Kauaʻi TMK parcel (4) 5-7-002:001 por.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

2013b *Archaeological Reconnaissance Survey and Literature Review of a Portion of Waipā, Waipā Ahupuaʻa, Haleleʻa District, Island of Kauaʻi TMK parcel (4) 5-6-003:001 por.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Wichman, Frederick B.

1985 *Kauai Tales*. Bamboo Ridge, Honolulu.

1998 *Kauaʻi Ancient Place-Names and Their Stories*. University of Hawaiʻi Press, Honolulu.

Wilcox, Elsie Hart

1991 Hanalei in History. *The Kauai Papers*. Kauai Historical Society, Līhuʻe, Hawaiʻi.

Yorck, Jesse and Hallett H. Hammatt

2004 *Archaeological Monitoring Report for Renovation and Relocation of a Residence at Coastal Hanalei, Waiʻoli Ahupuaʻa, Haleleʻa District, Kauaʻi TMK 5-5-04:9&10*. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Appendix A Makaihuwaʻa (From *Kauaʻi Tales* – Wichman 1985:35-42)

MA-KA-IHU-WAʻA

Every night Menehune fishermen took their canoes from sheds under the hala trees and carried them across the beach at Hanalei. They launched their outrigger canoes and paddled swiftly across the bay and over the reef to the ocean beyond.

Once safely out to sea, some fishermen scattered west to Hāʻena or east to Kilauea to secret fishing grounds. Here they tossed overboard their weighted lines tied with many hooks. A good fisherman knew where the fish lived and what it ate and baited his hooks with the right foods. Leaving their lines firmly tied to a float, these off-shore fishermen moved from place to place. Here they dropped off other lines, each hook baited with cooked sweet potato, a favorite food of the ʻopelu fish. There they caught squid by dancing a shiny cowry shell in the dark waters, a lure no squid could resist. Then the fishermen would return and gather up their lines. If the fisherman was skillful, every hook would hold a fish. At last these fishermen rode the waves into Hanalei bay and added their catch to the store of food that would feed all the Menehune at their daily feast that finished just before daybreak.

The deep-sea fleet searched for schools of fish which the fishermen caught in basket traps. They would dump basket after basket of glittering fish into their canoes until the canoes were so full they sank dangerously close to the water line. Often, following the schools of fish, the Menehune fleet would sail far out to sea where the fishermen could no longer see the dim outline of the island. Then they used the stars to guide them back to shore. They knew where the traveling stars were at any time of year, those stars, like Nā-holoholo that moved about the skies and appeared just before dawn in the east, warning the fishermen of the coming sun. The Menehune also used the fixed stars, like the seven stars of Nā-hiku that walked the same path night after night.

Even during cloudy nights the Menehune launched their canoes to fish. They were careful not to paddle so far out they could not find their way back. The clouds hid the stars and often hid the land from them.

But it was the stormy nights that were worst, those nights when the wind blew strongly, driving the waves like frightened birds in front of it. The rain would pour down in a never-ending sheet that hid the island from the Menehune. The wind-driven waves would climb taller and taller, sending the canoes on wild rides

36

up and down those mountainous walls that seemed alive with all the dangerous demons of the ocean. There was no time to look for the land then. The fisherman had to concentrate on the waves to keep his canoe from swamping or from getting caught by a breaking wave that would upset the canoe and send it to the bottom. The waves and wind roared and only when it was almost too late the roar changed tone when the wave angrily smashed on the reef, and the fishermen had to paddle frantically to stand farther out to sea. In the middle of the waves, wind and rain, it was hard to remember how to find one's way back to shore, for there was nothing to be seen of the dark island. Yet the Menehune went out to catch what fish they could on such nights. There was never enough fish to satisfy the great appetites of the Menehune people.

After one such terrible night as the fishermen cleaned their meager catch, their chief came to visit them. Before him walked two men carrying torches. Behind him came two more torchbearers. The chief was still young, his beard bushy and brown, but he was wise. He saw the skimpy catch. He saw the frustration in his fishermen's eyes. He saw them shivering in the misty rain that still blew down from the cold mountains. He knew his fishermen were proud of their skills and of their cunning, proud to bring much food to the common table.

The chief gestured to the heavy clouds overhead, to the ocean muttering along the reef, to the canoes empty of fish. "A good catch, considering the night," he said.

One of the fishermen, an owl-eyed, bow-legged man who was afraid of no shark or man either for that matter, refused the kindly words.

"No, it isn't a good catch," he said boldly. "There's not enough fish for us all. We'll have to eat some dried fish tonight. We can't catch fish on such a night as this."

To mark his words, the rain goddess Ka-hale-lehua threw down a burst of heavy rain drops that put out one of the torches surrounding the chief. Its bearer attempted to relight his torch at another, but his clumsiness only managed to extinguish another torch.

"The night grows dim indeed," the chief joked, trying not to laugh at the antics of his torchbearers.

The owl-eyed fisherman had not finished. "The farther from shore, the darker the night. We can't go out to where the fish are. There is nothing to guide us back when the sky is covered with rain-filled clouds."

"That is the problem of these stormy nights," the chief agreed. "We must find a way for you to fish on cloudy nights. Or you must not go out at all."

The fishermen groaned at the suggestion that they not fish at all.

"I will think about this," the chief promised. "Perhaps the gods will help me find an answer."

Just then the rain goddess emptied her water bowls. Heavy, fat drops of water fell like a river directly from the sky to the earth. The remaining two torches that lit the chief's way went out.

"Like us," the fishermen laughed, "you must return home in the dark."

"Nevertheless, you have done well," the chief said, "to go out at all on such a night. Each mouthful will be more delicious because we know the courage it took to bring back even this much from the sea."

The fishermen cheered him and finished their chores with lighter spirits.

The chief strained his eyes to see the path on this dark, rainy night, and stumbled over roots and stones. His torchbearers followed him, tripping over vines, banging into branches, and stumbling over each other, trusting their chief to lead them back to safety again.

The rest of that night the chief thought deeply about his fishermen's problems. He understood their pride to provide enough fish to feed their friends and family. He understood that some nights were stormy. That is why he had, long ago, ordered that fish be dried and set aside under cover so that there would be seafood in times of need. He could simply order the men to stay ashore on stormy nights when the clouds covered the sky and most of the mountains, too. In that case, he would need something for them to do. The difficulty was that dark and stormy nights weren't very useful to anybody. Rain and wind made all work more difficult to do.

There was no question of waiting for daylight and returning to shore then. Sunlight was fatal to a Menehune. A ray of sunshine could turn him to stone instantly. There were many stones scattered over Kauai that had once been living people.

What about ropes? One canoe would stop while the land could still be seen. A rope would be tied to that canoe and passed to a second one which would paddle farther out, pass a new rope to a third canoe, and so on. No, the chief decided, that would not do either. The canoes would not be free to follow the fish. Windy and stormy nights brought large waves that would break the ropes. Would it even be possible for ropes to be made long enough and strong enough?

As darkness came again and the fishermen were gathering their nets and baiting their hooks, the chief still continued to think. The night was dark again and the clouds hid the stars and mountains. A lamakū was set ablaze and stuck in the sand beside the chief. A lamakū is made of strings of oily kukui nuts tied together with a twine made of dried banana leaves. Ten strings are woven around a short pole, forming a cylinder six inches across and four feet tall. The bottom kukui is set on fire and, like a candle, feeds on oil released by the heat. The flame slowly passes from nut to nut, giving off bright light and dense smoke.

The chief twisted the ends of his beard and stared at the lamakū with unfocused eyes. Suddenly his eyes widened and he began laughing, a deep booming laugh that brought his torchbearers eager to share in the joke. As the chief saw their puzzled faces, he laughed all the harder. He had suddenly realized that, even in the dark night, he could see. It was night. It was dark. The flames gave a light. Many lamakū would give a lot of light.

"There will be lights to guide our fishermen to shore," the chief told his torchbearers. "If we prepare a lot of lamakū, we can stick them in the sand. The fishermen will see the light and know where their landing place is."

The chief called all his people together who were not directly farming or gathering food. He ordered them—old women, old men, young mothers and younger children—to gather every kukui nut of the right size from the trees and to cut off leaves from banana plants and braid them into cord. Once these were gathered, the kukui nuts were shelled and woven into the cylinders that became lamakū. A lamakū burned for several hours, so in the early hours of the morning, the chief ordered all the lamakū that were ready to be placed on the beach and set afire.

The clouds still covered sky and mountain. Ka-hale-lehua was busy emptying out her water bowls. There was nothing to guide the fishermen back to shore except their own sense of direction and the changeable currents of the sea. But now there was also a line of lamakū burning and sputtering along the beach.

When the canoes returned before dawn, the chief was waiting beside the cluster of torches. Eagerly he questioned them, "Did this light help you?"

The fishermen nodded, but there was no outburst of enthusiasm, which the chief had expected. He looked at his fishermen one by one, his stern eye causing them to drop their heads and shuffle their feet in the sand.

At last the owl-eyed fisherman spoke up. "Chief," he said, "the light does help. A little. A very little. When we saw the light, we paddled farther out. But we still cannot go where the deep sea fish swim in great schools."

"That is too bad," the chief said, unhappy and discouraged.

The owl-eyed fisherman, who was afraid of no shark or man for that matter, spoke up again. "The idea is good. The lights are good. But they need to be higher."

"Higher?" asked the chief. "You mean, put the lamakū on top of the coconut trees?"

Everyone laughed at the silly idea. The coconut trees themselves would flame up in giant torches. In one night the trees would be lost. So would a supply of food.

"Higher than that," answered the fisherman, quite unworried that people were laughing at him. "Much higher than tree tops." He pointed his hand toward the west.

Everyone turned to look. They saw the beach, the line of coconut and hala trees, and beyond that there was the flat plain of Hanalei through which Waioli stream and Hanalei river cut meandering paths to the sea. Beyond that, there were the ridges that stretched taller and taller until they melted into the great mountains of Maunahihi and Nā-molokama. But most of the view beyond the trees was out of sight, behind clouds and mist and fog. Only the lowest ridge could be seen where it started up from the edge of Waioli stream.

The chief nodded, delighted with the suggestion made by his owl-eyed fisherman. "Yes, we shall place lamakū there on that ridge," he said. "Just below the clouds, far above the trees."

There was almost no time left before the sun would climb over the Anahola mountains, so the chief ordered the Menehune to finish up what chores they could and rest. He slept soundly that day, knowing the night would be a busy one.

Once again the night was stormy and dark. Clouds scudded low over Hanalei. The rain goddess sent a steady rain that the wind blew this way and that, as though pulling aside curtains to peer through a window at the busy Menehune. But the fishermen pushed out to sea with lighter hearts than usual. The chief ordered lamakū to be made and brought to him. With a crew of workers, including his torchbearers, he climbed up the ridge. When he could look out over the tree tops and the clouds swirled just above his head, the chief struck the ground with his heel. "Here we must dig out a platform from the edge of the ridge, large enough to place all the lamakū we need to light our fishermen home again."

The Menehune went about the chore with their usual good sense, sound engineering, and the knowledge that many hands working together make any chore easier and quicker. A small platform dug out of the side of a hill was a simple chore compared to many others they had done in years past. There was no trouble organizing work groups. One group dug away the dirt and formed the platform. Another group formed a line reaching to the river beds of Waipa‘a and Waikoko and passed smooth stones hand to hand to the worksite. Before half the night was gone, the platform was finished and paved with the stones. All that time the torchbearers were busy trying to keep their torches lit. The wind was strong but the flames were stronger, enjoying their dance. However, the rain sometimes fell so hard that the flames sputtered and danced away so far they became lost and went out.

The chief sat farther up the ridge where he could see the work, and his voice shouting instructions could be heard. He listened to the songs that the workers sang as they worked. He laughed at his torchbearers as they ran here and there trying to relight their torches as their torches were put out by the goddess Kahale-lehua as she emptied out the water that always collected in her bowls. He laughed but he realized that the lamakū that would guide the fishermen would also be put out by the rain.

"Build a roof over the platform," he yelled into the stormy night. "It must be higher in front than in back. It must protect the torches from the rain. It must also be high enough so the roof won't catch on fire."

No sooner said than the work started. One group cut logs for the uprights and the roof frame. Another group went for banana leaves which, laid down carefully, made a waterproof cover. Soon a flat roof with no walls had been built over the platform. The lamakū were set in place and lit. For the rest of the night the

MA-KA-IHU-WAʻA

flames sputtered and danced and poured a beacon of light into the dark and stormy night.

The canoes came swooping into shore on the backs of waves that threatened to swamp the small canoes that were so deeply filled with fish. As the owl-eyed fisherman lifted his paddle, all the fisherfolk gave a great cheer. "We have caught enough fish for two nights," the owl-eyed fisherman said. "With this light we can sail far out to sea and find our way back, no matter what the weather."

The Menehune lifted their chief onto their shoulders and paraded back to their eating house, cheering and laughing happily. The fishermen saw to it that the chief got the tastiest bits from their catch, those treats they usually held back for themselves or ate while still in the canoes. Just as delighted, the chief ordered that the next night would be spent in games and enjoyment.

That is how the Menehune invented a lighthouse. The platform they had made for the lamakū was named Ma-ka-ihu-waʻa, "At the canoe's prow." The platform is gone now, like the Menehune, but the ridge where it had been is still named Ma-ka-ihu-waʻa and the ridge still dips its toes into the happy waters of Waioli stream.

Appendix B Boundary Commission Testimonies ca. 1873-1882 [Waihona ʻAina]

No. 13
Boundary of the Ahupuaa of Waipaa [Waipā]

Received the following petition
Honbl. D. McBryde
Comm of Boundaries
for the Island of Kauai
Wahiawa August 21st 1873

Sir: For and on behalf of Her Excellency, R. Keelikolani,
I beg to apply to you for the rectification of the boundaries
of Ahupuaa of Waipaa, District of Hanalei on said Island.
Waipaa is bounded on the south by the Govrn. land of
Waioli, and on the North by the *Ahupuaa* of Waikoko, now owned
by Mr. Albert Wilcox.

I have the honor to be
Your Most obedient servant
H.A. Widemann

Thereupon appointed the 7th day of October A.D. 1873 at the
Court house Hanalei for the hearing of said petition and caused
notice to be served on the Owners of the adjoining lands or their
agents to appear and attend to their interests.

Court opened at 10 AM.
Mr. James Gay appeared for the petitioner and called the
following witness and others.

Pupu Sworn
The Eastern boundary commences at the sea
there at a stone called Kalapa thence to a place on river bank called Kapuoa
thence across river to stone at bottom of ridge, Makaihuoa
" to top of ridge same named Makaihuoa
" up ridge to peak Peapea Kapalikea to junction with Lumahai at Neki
" to hill or peak, Puuhoonauwekia down to Kolopuu continuing down ridge
to Kaooa down small ridge along Waikoko boundary to
a small hill called Kuahua and thence down the east side of the bank of the
stream to sand beach at Keahu and thence to a stone in sand beach called
Pohakuopio, and thence round to place of commencement.
From the above evidence and that of several other natives which

was precisely similar, the following decision was rendered.

Decision

The Northeastern Boundary of this land commences in the sea at a stone called Kalapa and from thence runs to a place on the river bank called Kapuoa, thence across stream to a stone at foot of ridge called Makaihuoa; thence to top of ridge at a place called by the same name, Makaihuoa, thence up ridge to a peak called Peapea. Thence up ridge to a place called Kapalakea, thence up ridge to junction with Lumahai at a place called Neki and thence to spur or peak, Puuhoonauwikia and thence down to Kolopuu continuing down ridge to Kaooa, where there is an Orange tree, the Junction of Waipaa with Waikoko, thence following down a branch ridge along the boundary of Waikoko to a place called Kuahua, from thence down the east side of the Waikoko stream to sand beach at Kuahu, thence along the beach to a large stone on the sand called Pohakuopio and from thence to place of commencement. [Waihona ʻAina. Duncan McBryde, Commission of Boundaries, Island of Kauai:60- 61]

Appendix C Historic Bridge District, Kaua‘i Belt Road Map (North Shore Section) (Fung Associates 2103:3-13)

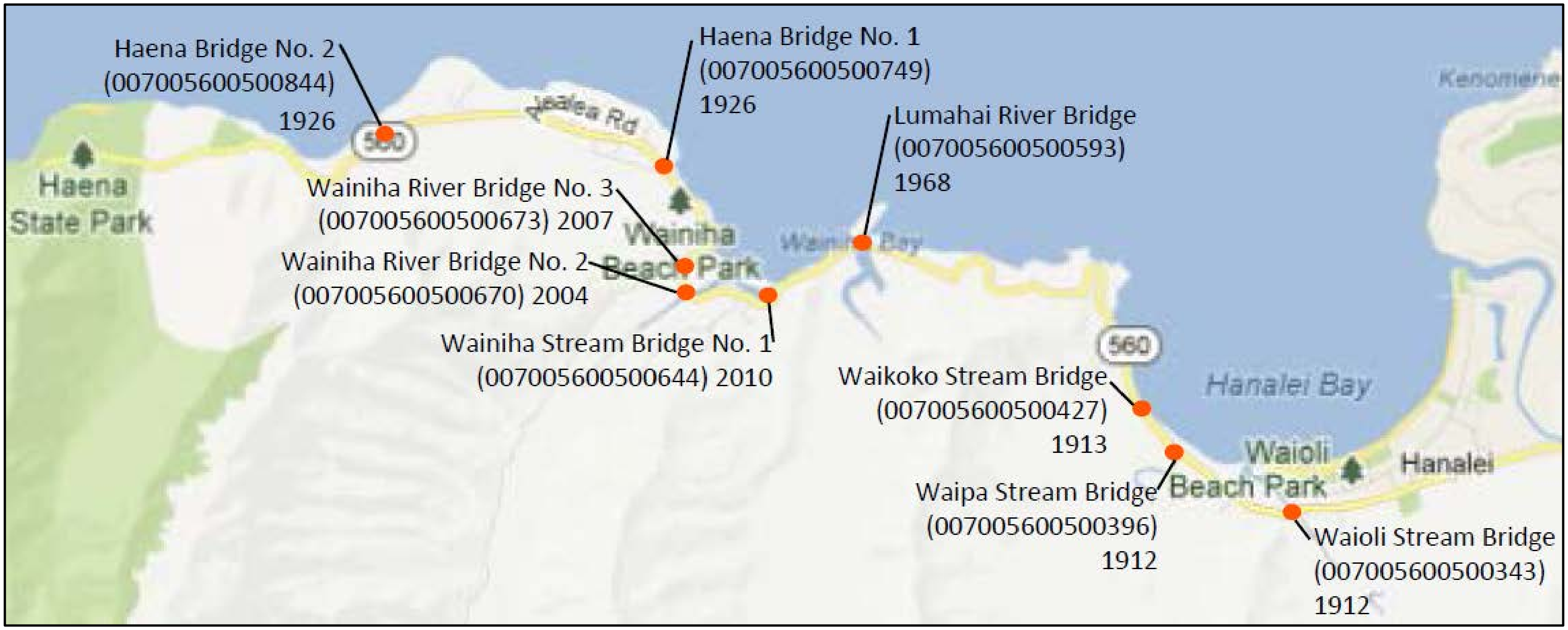


Figure 105. Historic Bridge District, Kaua‘i Belt Road Map (North Shore Section) (Fung Associates 2013:3-13)

Appendix D Table of Tax Map Keys (TMK) in Project Areas

TMK	Major Owner	Bridge
4 5-5-005:005	Watari	Waioli Stream Bridge
4 5-5-005:007	Angulo Family Trust	Waioli Stream Bridge
4 5-5-005:021	Govt. State	Waioli Stream Bridge
4 5-5-005:028	Bendele	Waioli Stream Bridge
4 5-5-005 (Kuhio Highway ROW)	Govt. State	Waioli Stream Bridge
4 5-5-006:014	Ching Family Partnership	Waioli Stream Bridge
4 5-5-006 (Kuhio Highway ROW)	Govt. State	Waioli Stream Bridge
4 5-6-002:002	Kobayashi et al.	Waioli Stream Bridge
4 5-6-002:004	Kobayashi et al.	Waioli Stream Bridge
4 5-6-002 (Kuhio Highway ROW)	Govt. State	Waioli Stream Bridge
4 5-6-003:002	Waikoko Land Corp.	Waikoko Stream Bridge
4 5-6-003 (Kuhio Hwy ROW)	Govt. State	Waikoko Stream Bridge
4 5-6-004 (Kuhio Highway ROW)	Govt. State	Waikoko Stream Bridge
4 5-6-004:014	Blair Family Trust	Waipa Stream Bridge
4 5-6-004:022	BP Bishop Trust	Waipa Stream Bridge
4 5-6-004:023	BP Bishop Trust	Waipa Stream Bridge
4 5-6-004 (Kuhio Highway ROW)	Govt. State	Waipa Stream Bridge
4 5-7-003:003	BP Bishop Trust	Potential Staging Area 1-2
4 5-7-003 (Kuhio Highway ROW)	Govt. State	Potential Staging Area 1
4 5-8-002 (Kuhio Highway ROW)	Govt. State	Wainiha Stream Bridge No. 1
4 5-8-002:002	Robinson	Wainiha Stream Bridge No. 1
4 5-8-006:030	Govt. County of Kauai	Wainiha Stream Bridge No. 1
4 5-8-006:031	Kennelly Trust	Wainiha Stream Bridge No. 1

TMK	Major Owner	Bridge
4 5-8-006:032	Fireweed Trust, LLC	Wainiha Stream Bridge No. 1
4 5-8-006:033	Pfeffer	Wainiha Stream Bridge No. 1
4 5-8-006:046	March	Wainiha Stream Bridge No. 1
4 5-8-006:060	Howard/Patey	Wainiha Stream Bridge No. 1
4 5-8-006 (Kuhio Highway ROW)	Govt. State	Wainiha Stream Bridge No. 1
4 5-8-006:009	Ching Family Partnership and Estate of Lawrence Ching	Wainiha Stream Bridge No. 2-3
4 5-8-006:011	Foster & Barbanell	Wainiha Stream Bridge No. 2-3
4 5-8-006:017	Branowicki	Wainiha Stream Bridge No. 2-3
4 5-8-006:018	Mahuiki	Wainiha Stream Bridge No. 2-3
4 5-8-006:019	Gelman	Wainiha Stream Bridge No. 2-3
4 5-8-006:030	County of Kauai	Wainiha Stream Bridge No. 2-3
4 5-8-006 (Kuhio Highway ROW)	Govt. State	Wainiha Stream Bridge No. 2-3
4 5-8-007:023	Hannah Meyer and others	Wainiha Stream Bridge No. 2-3
4 5-8-007:024	Ching Family Trust	Wainiha Stream Bridge No. 2-3
4 5-8-007:031	Rohn	Wainiha Stream Bridge No. 2-3
4 5-8-007:032	Rohn	Wainiha Stream Bridge No. 2-3
4 5-8-007 (Kuhio Highway ROW)	Govt. State	Wainiha Stream Bridge No. 2-3

Appendix F
Draft Cultural Impact Assessment for the Wainiha Bridges Project

Draft

Cultural Impact Assessment for the Wainiha Bridge Route 560 Kūhiō Highway Project, Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha Ahupua‘a, Halele‘a District, Kaua‘i TMKs: Multiple

Prepared for

CH2M HILL

And on behalf of the

Federal Highway Administration (FHWA)
Central Federal Lands Highway Division (CFLHD)

Prepared by
S. Māhealani Liborio, B.A.,
Nicole Ishihara, B.A.,
Victoria S. Creed, Ph.D.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: WAINIHA 10)

March 2016

O‘ahu Office		Maui Office
P.O. Box 1114		1860 Main St.
Kailua, Hawai‘i 96734	www.culturalsurveys.com	Wailuku, Hawai‘i 96793
Ph.: (808) 262-9972		Ph.: (808) 242-9882
Fax: (808) 262-4950		Fax: (808) 244-1994

Management Summary

Reference	Cultural Impact Assessment for the Wainiha Bridge Route 560 Kūhiō Highway Project, Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha Ahupua‘a, Halele‘a District, Kaua‘i, TMKs: Multiple (Liborio et al. 2016)
Date	Marchz 2016
Job Code	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: WAINIHA 10
Agencies	Federal Highway Administration/Central Federal Lands Highway Division (FHWA/CFLHD), State Historic Preservation Division (SHPD)
Land Jurisdiction	State Department of Transportation (HDOT); Private; and Public
Project Proponent	FHWA/CFLHD, HDOT
Project Funding	FHWA/CFLHD
Project Location	The project areas encompasses the three Wainiha Bridges (Bridges 1, 2, and 3) and the surrounding areas of the bridges, which includes portions of Kūhiō Highway, public lands, and private lands. Also included as part of the proposed project are three one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges) located at Wai‘oli, Waipā, and Waikoko streams in the event temporary structures may be needed to accommodate loads during construction and two potential staging areas in Lumaha‘i Ahupua‘a. The project areas exist within the following TMKs: Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; Waikoko Bridge: [4] 5-6-003:002, [4] 5-6-004:023, 999 por.; Wainiha Bridge 1: [4] 5-8-002:002 por., [4] 5-8-006:021, 022, 031, 032, 033, 034, 035, 037, 045, 046, 060, and 999 por.; Wainiha Bridges 2 and 3: [4] 5-8-006:009, 011, 017, 018, 019, 025, 030, 999 por., [4] 5-8-007:023, 024, 031, 032, 999 por.; Wai‘oli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por., [4] 5-5-006:014, 888 por., [4] 5-6-002:002, 003, 004, 999 por.; Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.
Project Description	The FHWA and the HDOT propose the replacement of three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) on the north side of the island of Kaua‘i. The bridges are located between mile posts 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge 2 suffered permanent damage and Bridges 1 (the southernmost bridge) and 3 (the northernmost bridge) were determined to be structurally deficient. The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured.

	The three bridges are owned and maintained by HDOT. FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. Also included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges), located at Waiʻoli, Waipā, and Waikoko streams. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges. The existing temporary ACROW bridges at the Wainiha project site would be shifted *makai* (toward the ocean) to accommodate traffic during construction of the new bridges. All temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumahaʻi Ahupuaʻa are also included in the area of potential effects (APE). Staging also may occur at each bridge location.
Project Acreage	Project acreage includes Potential Staging Area 1: 0.12 hectares (0.296 acres), Potential Staging Area 2: 0.09 hectares (0.221 acres), Wainiha Stream Bridge 1: 0.64 hectares (1.603 acres), Wainiha Stream Bridges 2 and 3: 1.40 hectares (3.466 acres), Waiʻoli Stream Bridge: 0.51 hectares (1.256 acres), and Waipā Stream Bridge: 0.59 hectares (1.449 acres) for a total of 3.36 hectares (8.30 acres).
Document Purpose	This cultural impact assessment (CIA) was prepared to comply with the State of Hawaiʻi's environmental review process under Hawaiʻi Revised Statutes (HRS) §343, which requires consideration of the proposed project's potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project's potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control's *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawaiʻi significance criterion "e," pursuant to Hawaiʻi Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance criterion "e" refers to historic properties that "have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity" (HAR §13-275-6 and §13-284-6). The document will likely also support the project's historic preservation and environmental review under HRS §6E-8 and HAR §13-275 and §13-284.

Results of Background Research	Background for this project yielded the following results (presented in approximate chronological order): 1. *Kaʻao* (fictional story) and *moʻolelo* (narrative about a historical figure) throughout Haleleʻa Moku correlate and validate cultural practices of the area. In the tale of *Hiʻiakaikapolipole and Malaehaʻakoa*, Hiʻiaka comes across the fisherman, Malaehaʻakoa. The *moku* (district) of Haleleʻa is known for its aquacultural resources such as fishing. The story validates the abundance of resources in the area then and now. It was Malaehaʻakoa who also notified Hiʻiaka of her sister's (Pele, the fire goddess) lover's (Lohiau from Hāʻena Ahupuaʻa) death. 2. The *ahupuaʻa* (land division spanning from the mountain to the sea) of Lumahaʻi and Wainiha were known for their tales of the *menehune*, a legendary race of small people who were responsible for the construction of building fishponds, roads, and *heiau* (pre-Christian place of worship) in the evenings. Some say the *menehune* and the *mū* (legendary people of Lāʻau-haela-mai, Kauaʻi) were the original inhabitants of Kauaʻi until they were driven to the *mauka* (upland) sections of the island by the arrival of Hawaiians. 3. A census in Wainiha Ahupuaʻa during the time of Kaumualiʻi listed 65 men of Lāʻau as *menehune*. The census also listed the following villages to be inhabited by *menehune*: Naue, Pāʻieʻie, Maunaloa, Paliʻeleʻele, Maunahina, Pōhakuloa, Opaikea, Hōmaikalani, and Lāʻau. 4. According to Land Comission Award (LCA) documentation, the *moku* was heavily farmed in taro *loʻi* (irrigated terrace). Waiʻoli Ahupuaʻa yielded 154 *loʻi* along the Waiʻoli Stream. *Kula* (plain) lands were planted in sweet potatoes, yams, bananas, and sugarcane. Several claims included fishponds. Data taken concludes that the area was very productive agriculturally. 5. A number of burials have been found throughout the Haleleʻa Moku coastline. State Inventory of Historic Properties (SIHP) # 50-30-03-1982 yielded three burials (McMahon 1995a, b); SIHP # -1988, consisted of three burials and five isolated human remains (Masterson et al. 1997); SIHP # -355 yielded two burials and isolated skeletal remains (Sullivan and Dega 2003); SIHP # 361, did not yield human remains, but a cultural layer which contained pre- and post-Contact artifacts (Chafee and Dega 2005). However, cultural layers have been known to also yield human remains. In 1992, SIHP # -1878 yielded 31 pre-Contact burials along with cultural deposits with fire pits, postholes, and an *imu* (underground oven) (Spear 1992). In 2003, monitoring was conducted and 11 burials were found

	along with a cultural layer containing ash, fire-cracked rock, charcoal, stone and coral tools, and partial remains of a pig (SIHP # 1837) (Monahan 2003). 6. Rice farming began in the mid-1860s and ended in the 1920s when California rice began to take over the market. Hanalei Valley led the Hawaiian rice market in most acreage planted in rice.
Results of Community Consultation	CSH attempted to contact Native Hawaiian Organizations (NHOs), agencies, and community members. Consutlation was received from the following community members: 1. Mike Ching, Hanalei business owner and *kama'āina* (native-born) 2. Alan Fayé, Princeville Community Association 3. David Helder, resident of Wainiha 4. Julian Helder, resident of Wainiha 5. Samson Mahuiki, President of the Waipā Foundation 6. Barbara Robeson, long-time resident of Wainiha 7. Jonathan Wichman, *kama'āina* of Halele'a Moku
Impacts and Recommendations	Based on information gathered from the cultural and historic background, the proposed project may potentially impact Native Hawaiian burials and subsurface cultural layers. CSH identifies these potential impacts and makes the following recommendations: 1. There is a very high possibility of *iwi kūpuna*, or ancestral bones, that may be present based on previous cultural, historical, and archaeological research that was conducted as well as via community consultations. The community has voiced knowledge of burials being found on the beaches and dune lands. Some of the currently proposed project areas are situated on soils classified as Beaches, a preferred sediment for the interment of the dead. Land disturbing activities during construction may uncovered presently undetected burials and/or other cultural finds. 2. Personnel involved in the construction activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. Should burials (or other cultural finds) be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies be notified pursuant to applicable law, HRS §6E.

Table of Contents

List of Figures

List of Tables

Section 1 Introduction

1.1 Project Background

At the request of the Federal Highway Administration, Central Federal Lands Highway Division (FHWA), and the State of Hawaiʻi Department of Transportation (HDOT), Cultural Surveys Hawaiʻi Inc. (CSH) has conducted a cultural impact assessment (CIA) for the Wainiha Bridges project, Waiʻoli, Waikoko, Waipā, Lumahaʻi, and Wainiha Ahupuaʻa, Haleleʻa District, Kauaʻi. Tax Map Keys (TMK) and corresponding acreage are listed below:

- Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; 0.517 acres
- Waikoko Bridge: [4] 5-6-003:002, 999 por.; 0.715 acres
- Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por.; 0.669 acres
- Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por.; 2.272 acres
- Waioli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por.; 0.913 acres
- Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.; 0.916 acres

The FHWA and the HDOT propose the replacement of three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) on the north side of the island of Kauaʻi. The bridges are located between mile posts 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge 2 suffered permanent damage and Bridges 1 (the southernmost bridge) and 3 (the northernmost bridge) were determined to be structurally deficient. The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by HDOT. FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. Also included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges), located at Waiʻoli, Waipā, and Waikoko streams. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges. The existing temporary ACROW bridges at the Wainiha project site would be shifted *makai* (toward the ocean) to accommodate traffic during construction of the new bridges. All temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumahaʻi Ahupuaʻa are also included in the area of potential effects (APE). Staging also may occur at each bridge location. Figure 1 is a composite of all project areas on a U.S. Geoglogical Survey (USGS) map. Figure 2 through Figure 7 are aerial photographs of the project areas. Figure 8 through Figure 10 depict the project areas on corresponding Tax Map Keys (TMK).

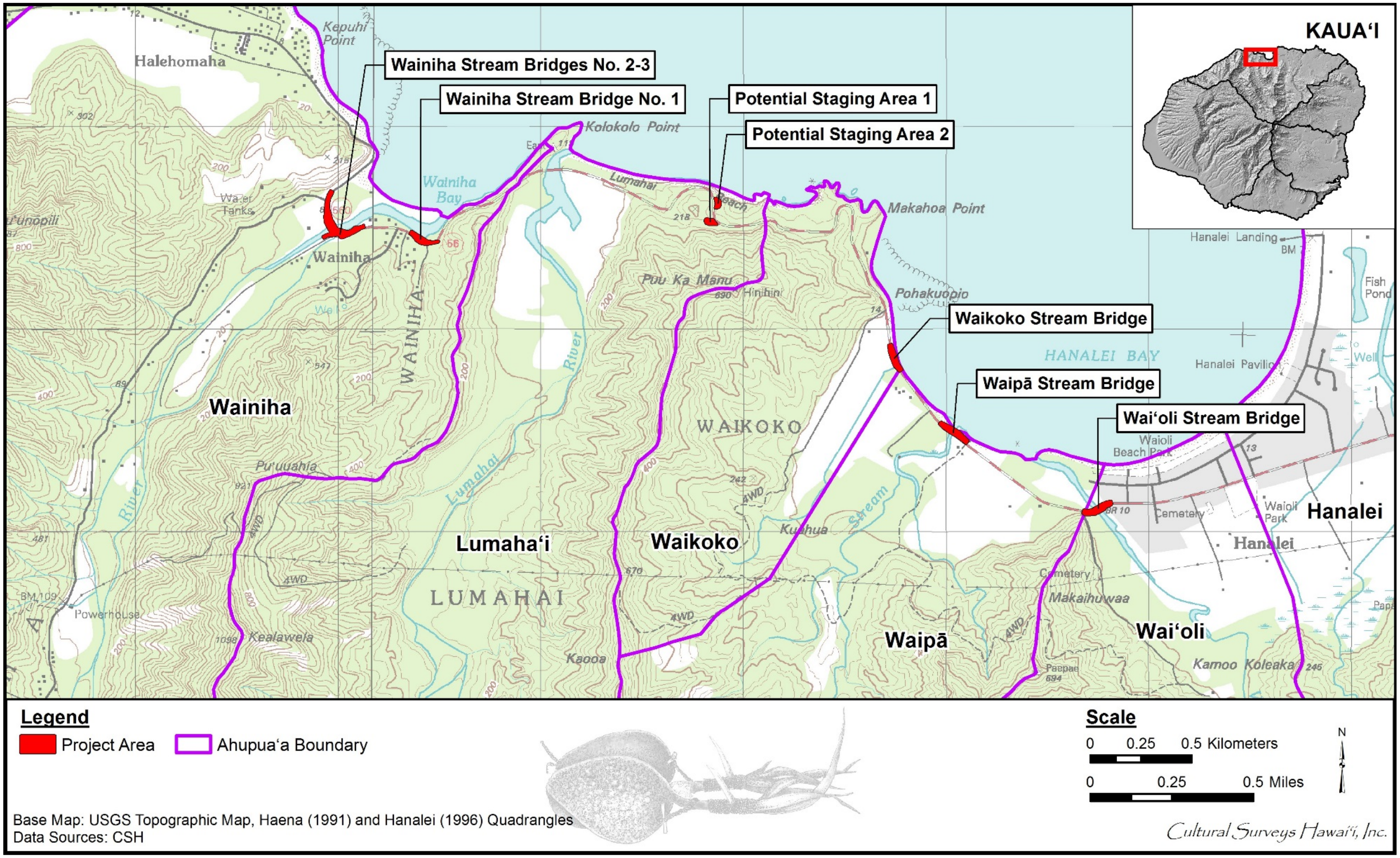


Figure 1. 1991 Haena and 1996 Hanalei USGS topographic quadrangles with all Wainiha Bridges project areas

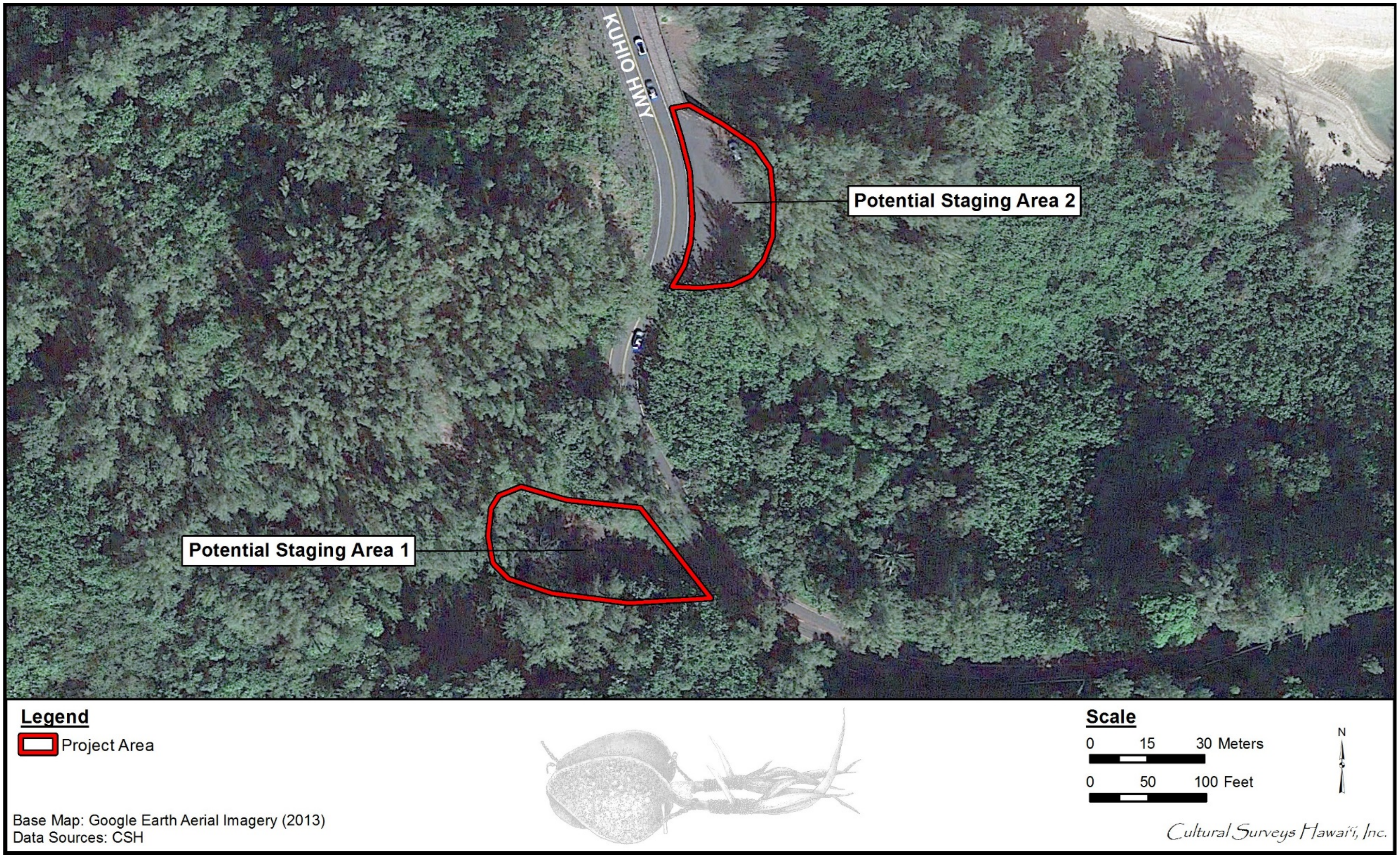


Figure 2. 2013 Google Earth Aerial Imagery with Potential Staging Area 1 and Potential Staging Area 2 project areas

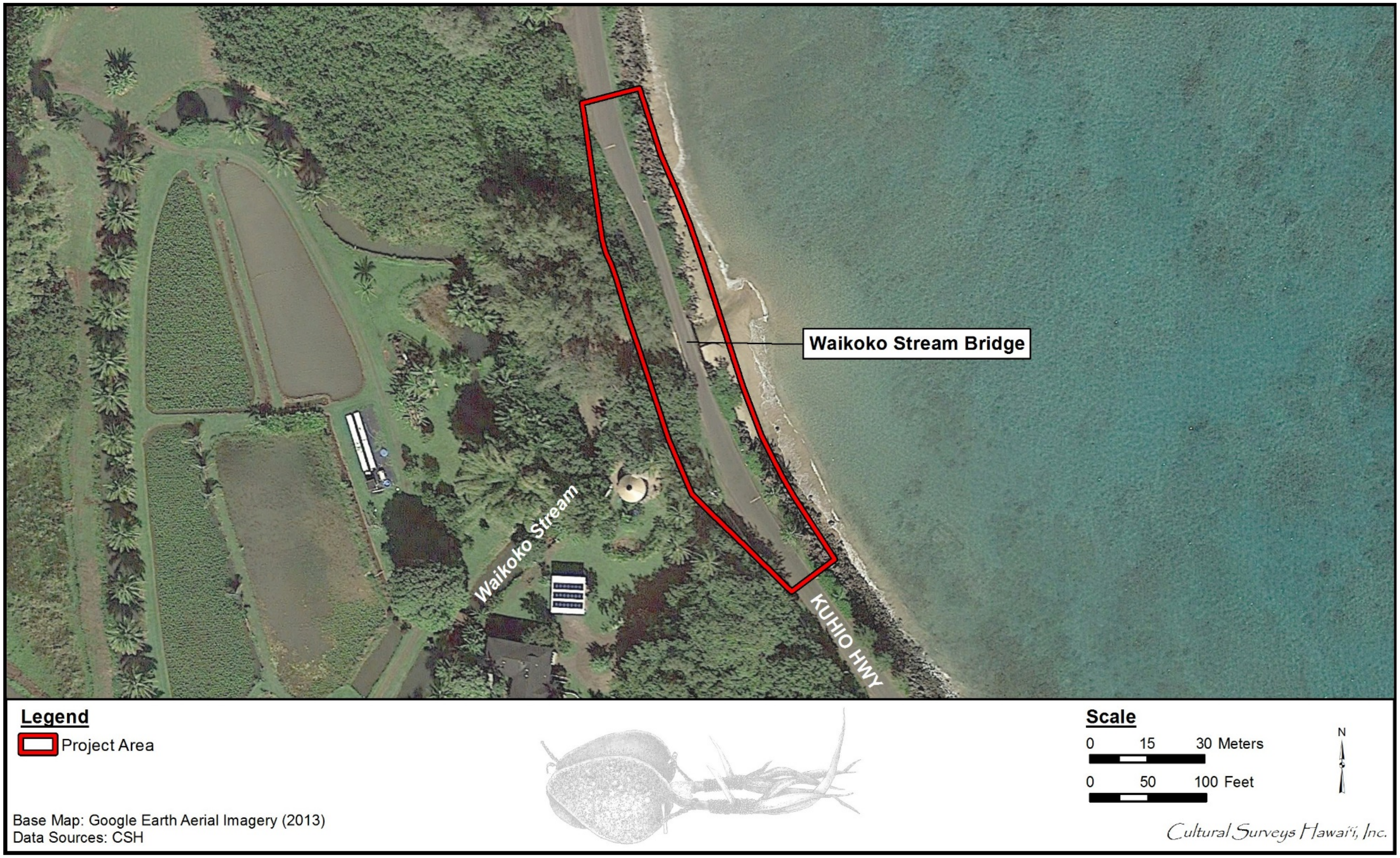


Figure 3. 2013 Google Earth Aerial Imagery with Waikoko Stream Bridge project area

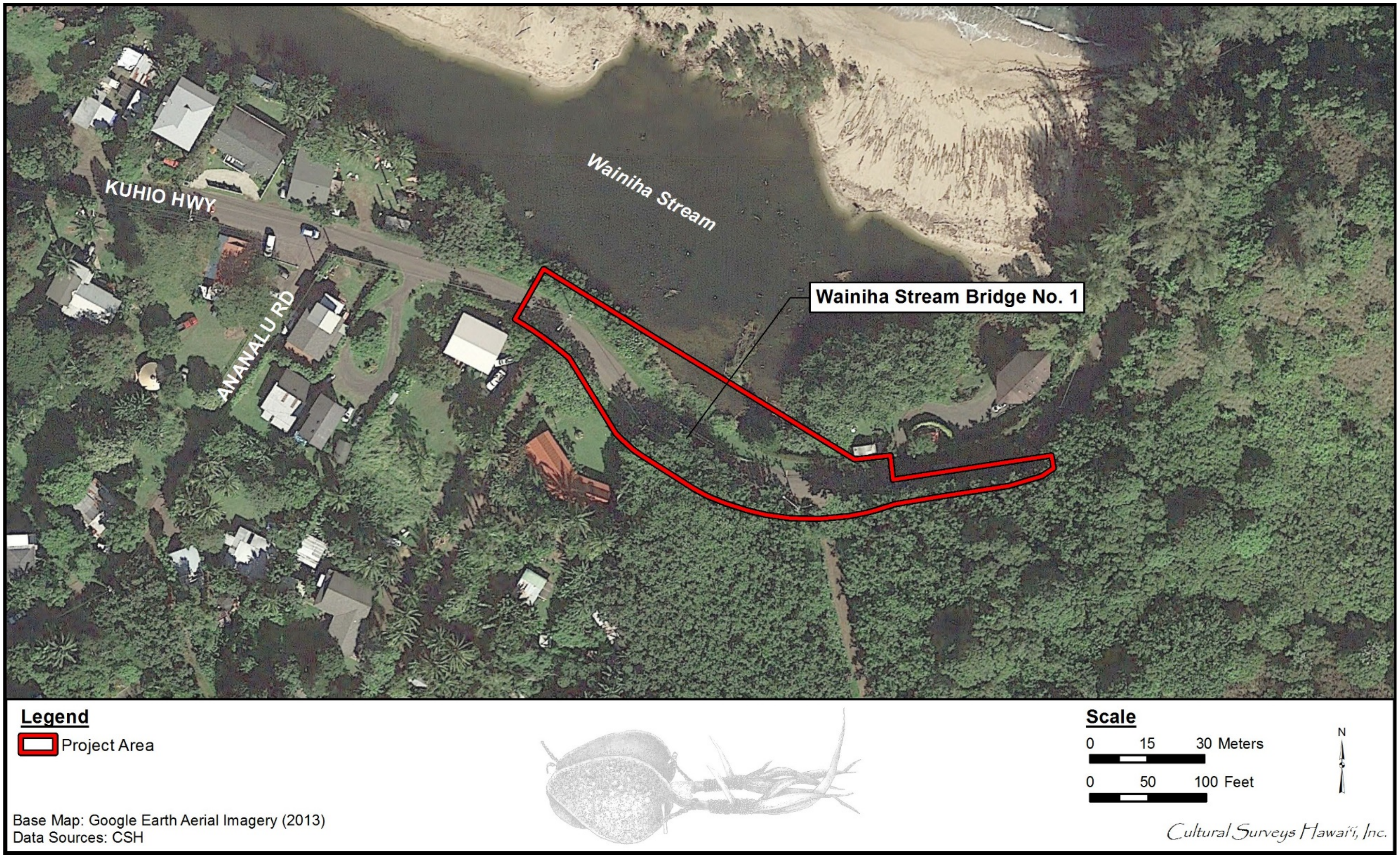


Figure 4. 2013 Google Earth Aerial Imagery with Wainiha Stream Bridge 1 project area

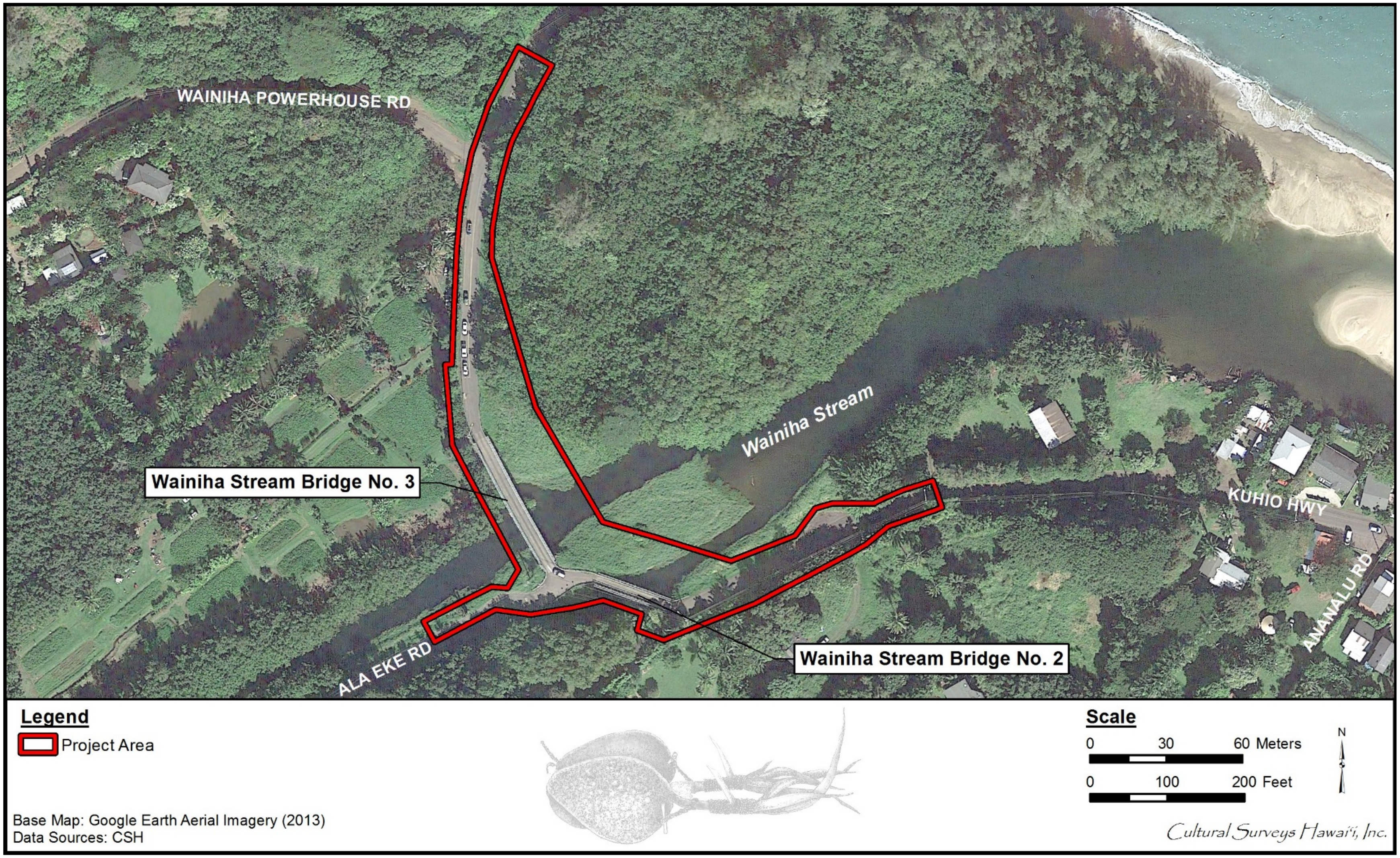


Figure 5. 2013 Google Earth Aerial Imagery with Wainiha Stream Bridges 2 and 3 project areas

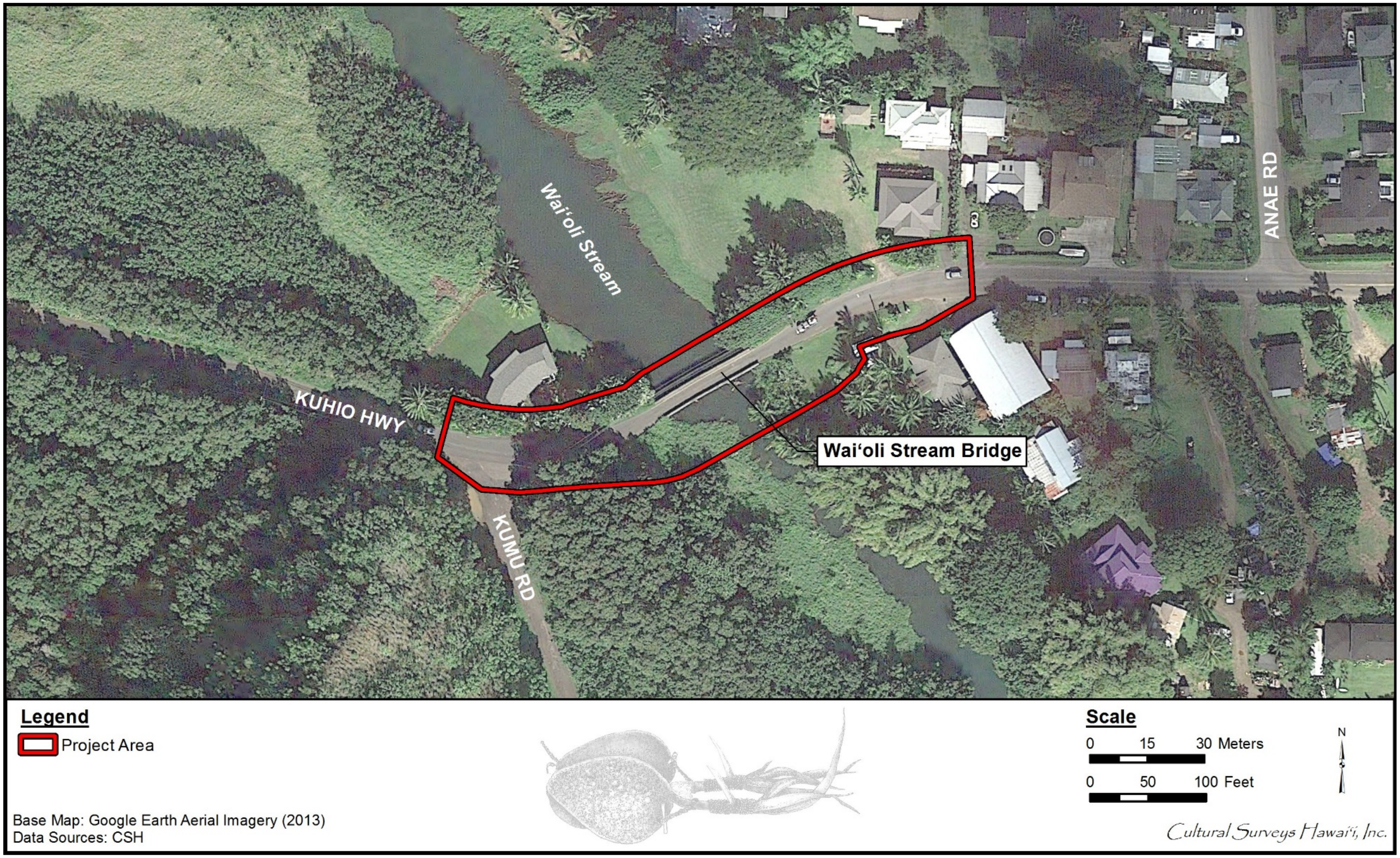


Figure 6. 2013 Google Earth Aerial Imagery with Waiʻoli Stream Bridge project area

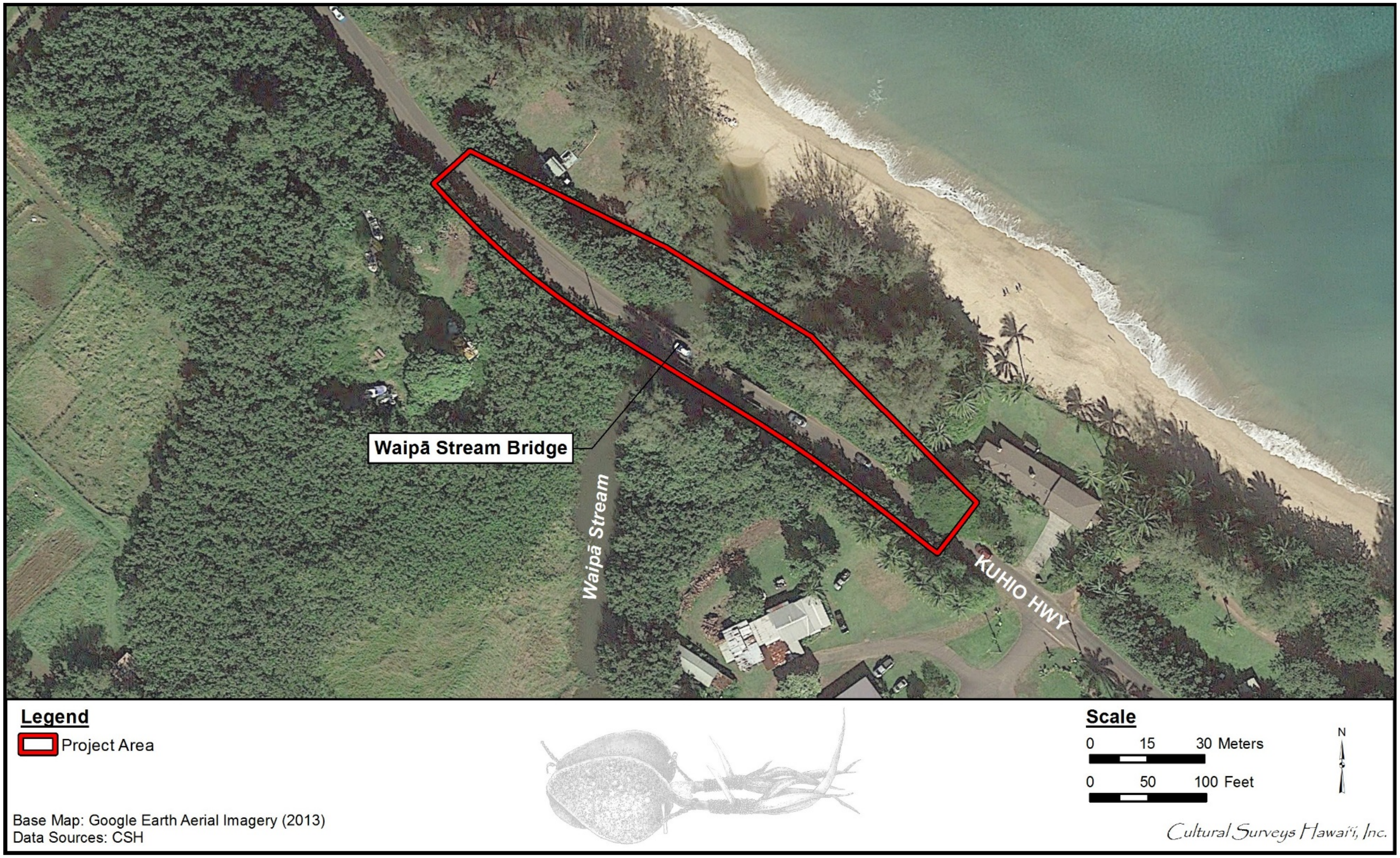


Figure 7. 2013 Google Earth Aerial Imagery with Waipā Stream Bridge project area

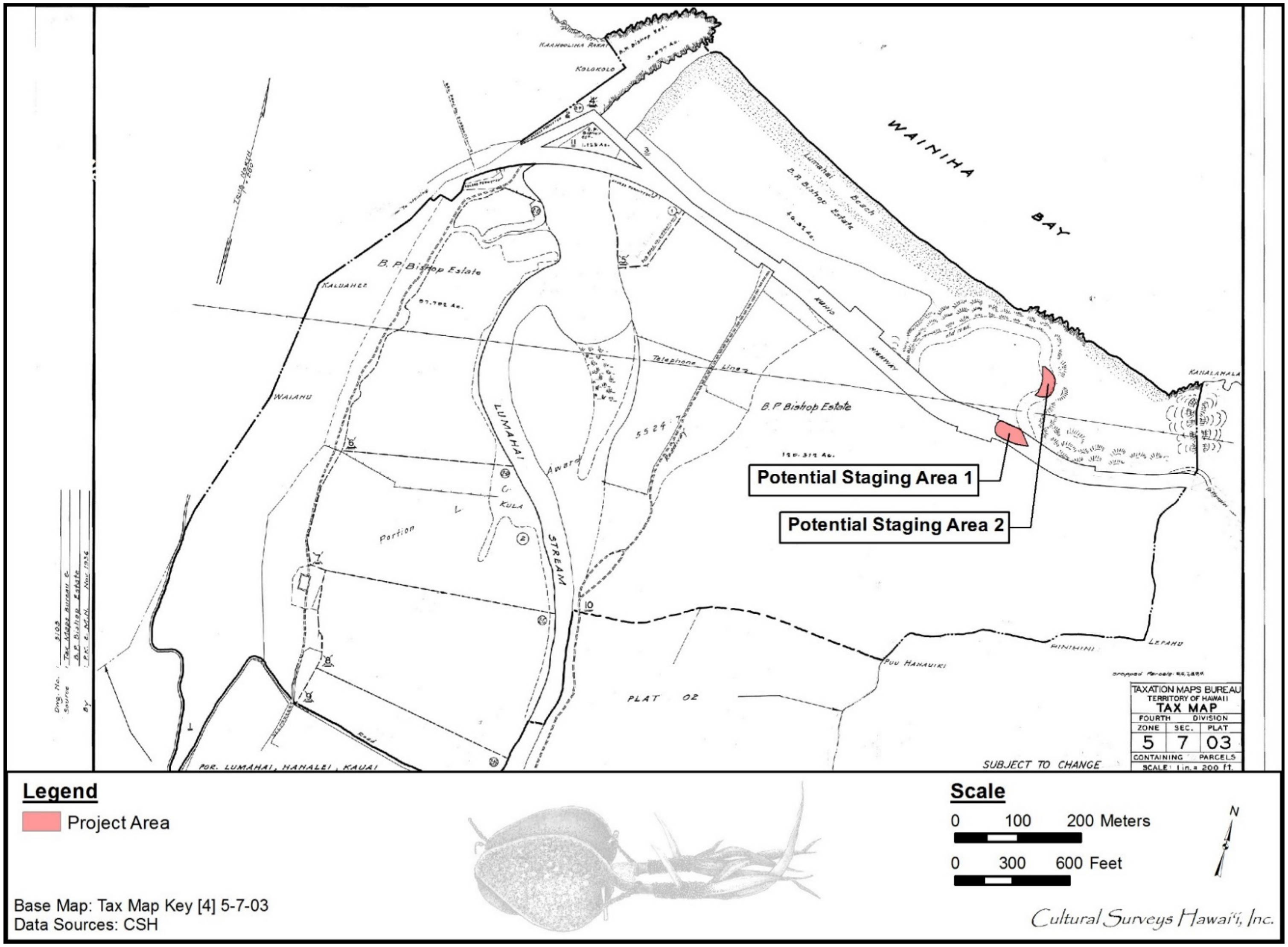


Figure 8. Tax Map Key (TMK) [4] 5-7-03 with Potential Staging Area 1 and Potential Staging Area 2 project area (Hawai‘i TMK Service)

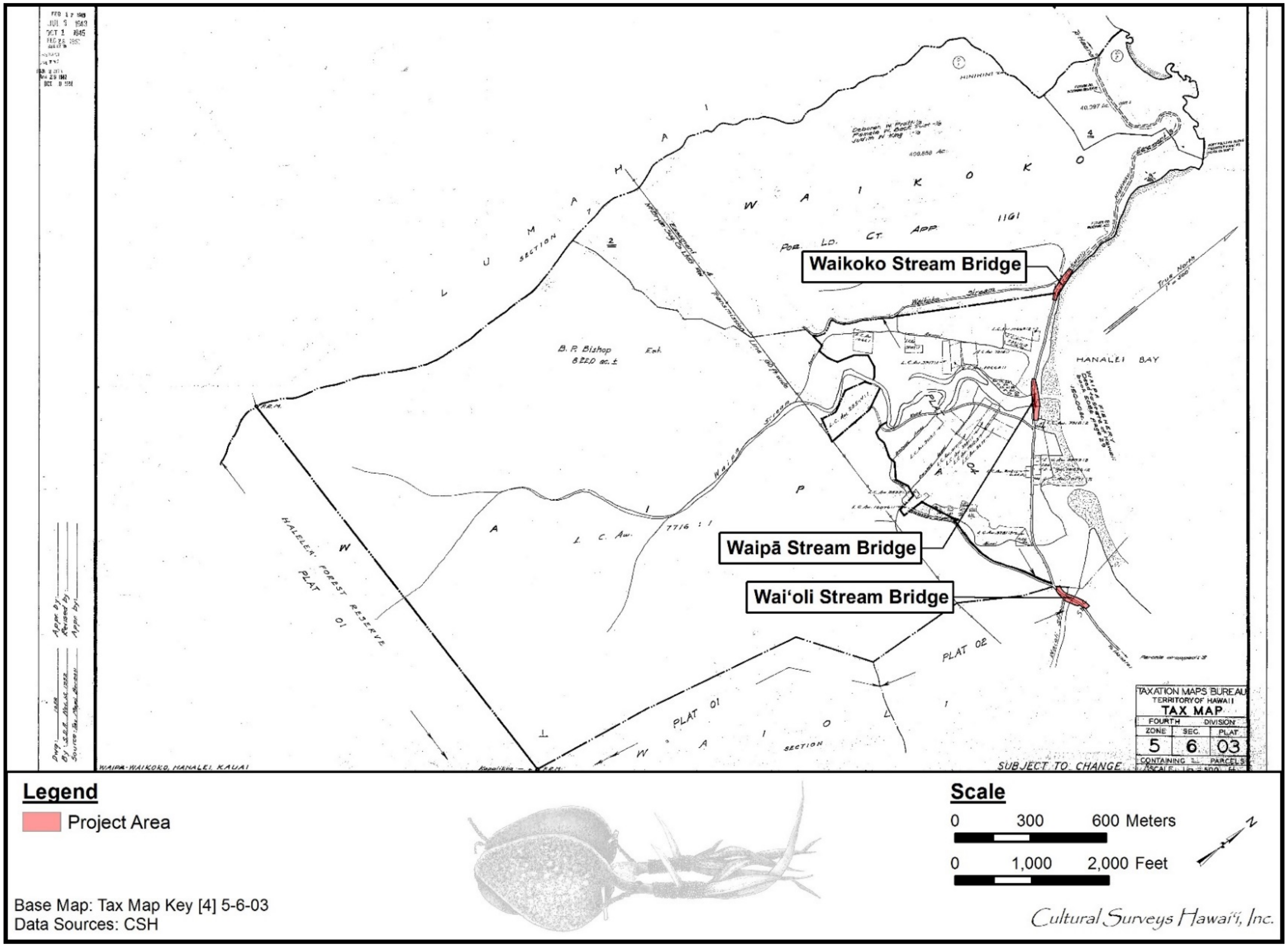


Figure 9. TMK [4] 5-6-03 with Waikoko Stream Bridge, Waipā Stream Bridge, and Wai‘oli Stream Bridge project areas (Hawai‘i TMK Service)

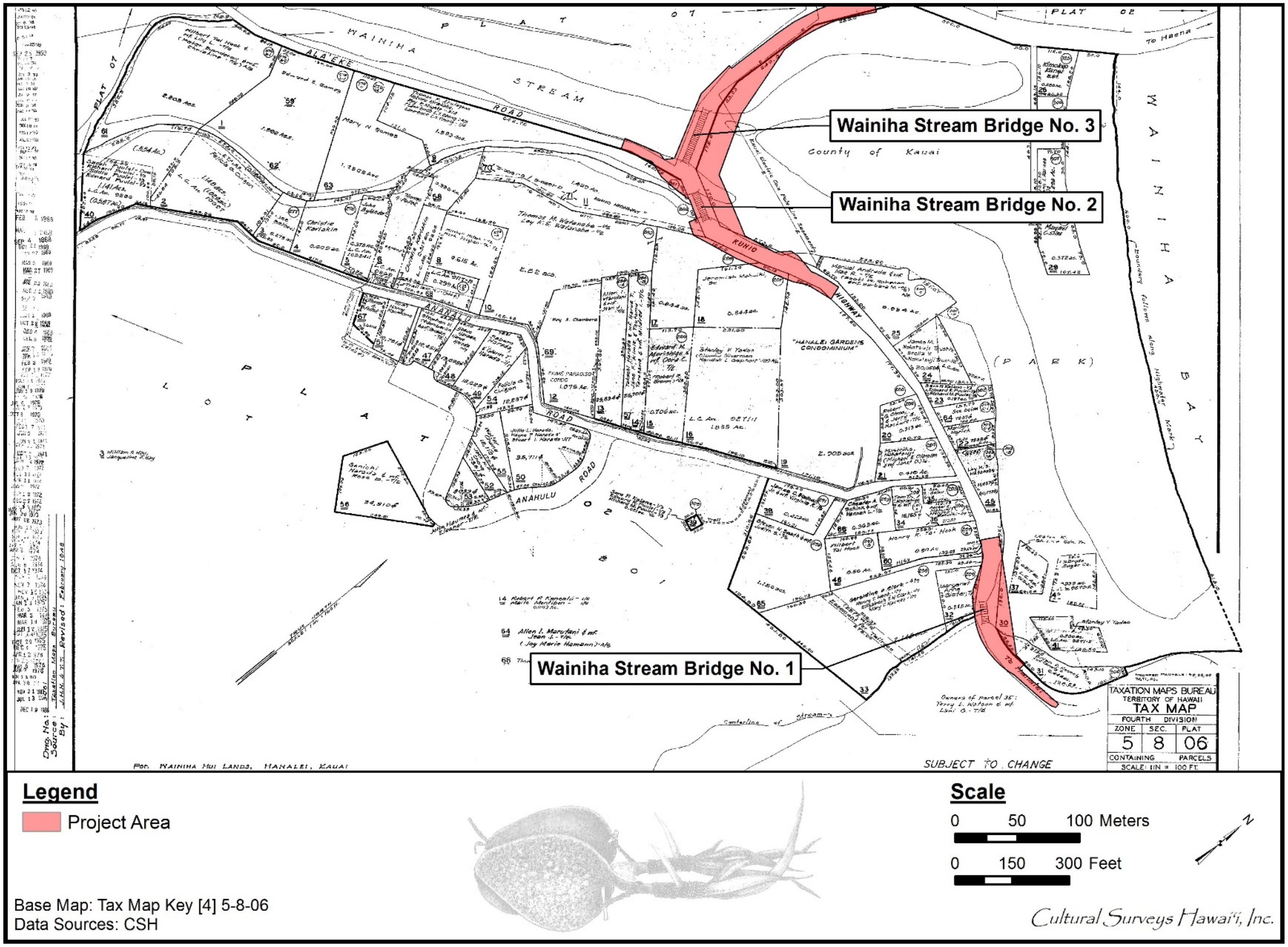


Figure 10. TMK [4] 5-8-06 with Wainiha Stream Bridges 1, 2, and 3 project areas (Hawaiʻi TMK Service)

1.2 Document Purpose

The purpose of this CIA is to comply with the State of Hawaiʻi's environmental review process under Hawaiʻi Revised Statutes (HRS) §343, which requires consideration of the project's potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project's potential impacts on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control's *Guidelines for Assessing Cultural Impacts*), which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawaiʻi significance criterion "e," pursuant to Hawaiʻi Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance criterion "e" refers to historic properties that "have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity" (HAR §13-275-6 and §13-284-6). The document will likely also support the project's historic preservation and environmental review under HRS §6E-8, HAR §13-275, and §13-284.

Due to federal funding, this project is a federal undertaking, requiring compliance with Section 106 of the National Historic Preservation Act, the National Environmental Policy Act, and Section 4(f) of the Department of Transportation Act.

1.3 Scope of Work

The scope of work for this CIA includes the following:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

1.4 Environmental Setting

1.4.1 Vegetation

The project sites, the study areas, and the potential staging areas are located in five *ahupuaʻa* (land division usually extending from the uplands to the sea) on the north side of Kauaʻi: Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha. Kūhiō Highway traverses many types of terrain including the large stream of Waiʻoli, stretches of coastal sands along precipitous cliffs on the boundaries of Waikoko, Lumahaʻi, Wainiha, and Hāʻena. Modern vegetation is extremely diverse, including *pū hala* trees (pandanus; *Pandanus odoratissimus*), *naupaka* (*Scaevola taccada*), *koa*

(*Acacia koa*), melastoma (*Melastoma malabathricum*), bamboo (*Bambuseae*), yellow foxtail (*Setaria geniculata*), *hau* (*Hibiscus tiliaceus*), lantana (*Lantana camara*), false staghorn fern (*Gleichenia linearis*), lace fern (*Sphenomeris chusana*), spathoglottis (*Spathoglottis* sp.), paspalum (*Paspalum* sp.), rhodomyrtus (*Rhodomyrtus tomentosa*), silver oak (*Greviliea robusta*), guava (*Psidium guajava*), Java plum (*Syzygium cumini*), mangrove (*Bruuiera gymnorhiaa*), and scrubby *ʻōhiʻa lehua* (*Metrosideros collina*). The nearest temperature tracking station, located in Kīlauea (317 feet [ft] elevation) records an average (mean) minimum of 66 degrees Fahrenheit to an average maximum of 84 degrees Fahrenheit (Armstrong 1983). Given the project sites' and study areas' proximity to the coast, the average temperature ranges may be a few degrees higher. Rainfall averages around 80 inches per year (Juvik and Juvik 1998:56). Earle (1978) describes the Haleleʻa District surrounding the project area in terms of the natural topography and stream catchments as they relate to *ahupuaʻa:*

> Halelea is divided into nine *ahupuaʻa*, the boundaries of which were determined by topographic features. The four largest *ahupuaʻa*—Wainiha, Lumahai, Hanalei, and Kalihiwai—are each based on the catchment basin of a single large stream. The catchment areas of these streams are separated from each other by the dramatic ridges which form the political boundaries between ahupuaʻa . . . these boundaries deviate from the dominant, natural divisions so as to divide sections of critical resources between ahupuaʻa. The five smaller ahupuaʻa—Haʻena, Waikoko, Waipā, Waiʻoli, and Kalihikai—are based on the catchment areas of one or more smaller, permanent streams. [Earle 1978:25]

1.4.2 Soils

Although there is some rock outcrop (rRO) where Waipā meets Waiʻoli Ahupuaʻa, the majority of the soil within this portion of the project area consists of Hihimanu silty clay loam with occasional slopes of 40 to 70% (HMMF) (Foote et al. 1972). Soils underlying the highway are as diverse as the landscapes it traverses. Beginning in Waiʻoli, the soils are identified as Mokuleia series and distinct variants stretch through Waiʻoli and along the entire plain of Waipā into Waikoko, interrupted only once by the volcanic ridge of Makaihuwaʻa that borders the highway just west of Waiʻoli Stream. The soils of this area are typical of the Hihimanu series. This soil underlies the highway until just after the Lumahaʻi Lookout where it again descends into the coastal flats and the associated Mokuleia sands. Beyond the Lumahaʻi Bridge, the highway ascends into soils identified as Rough Broken Lands (rRR) that extend to just west of Wainiha. According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), Mokuleia soils are described as follows:

> . . . well-drained soils along the coastal plains on the islands of Oahu and Kauai. These soils formed in recent alluvium deposited over coral sand. They are shallow and nearly level. Elevations range from nearly sea level to 100 feet. The annual rainfall amounts to 15 to 40 inches on Oahu and 50 to 100 inches on Kauai. The mean annual soil temperature is 74° F. Mokuleia soils are geographically associated with Hanalei, Jaucas, and Keaau soils. The soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of *kiawe, klu, koa haole,* and Bermuda

> grass in the drier areas and napier grass, guava, and *joee* in the wetter areas. [Foote et al. 1972:95]

Hihimanu soils are described as follows:

> . . . well-drained soils on uplands on the island of Kauai. These soils developed in material weathered from basic igneous rock and colluvium at the base of slopes. They are very steep. Elevations range from 100 to 2,000 feet. The annual rainfall amounts to 70 to 120 inches. The mean annual soil temperature is 69° F. Hihimanu soils are geographically associated with Hanalei and Hanamaulu soils. These soils are used for water supply, pasture, wildlife habitat, and woodland. The natural vegetation consists of *koa*, melastoma, yellow foxtail, lantana, false staghornfern, paspalum, *hala*, guava, *ohia*, and associated shrubs and grasses. [Foote et al. 1972:40]

Rough Broken Lands (rRR) are described as follows:

> . . . consists of very steep land broken by numerous intermittent drainage channels. In most places it is not stony. It occurs in gulches and on mountainsides on all the Islands except Oahu. The slope is 40 to 70 percent. Elevations range from nearly sea level to about 8,000 feet. The local relief is generally between 25 and 500 feet. Runoff is rapid, and geologic erosion is active. The annual rainfall amounts to 25 to more than 200 inches. These soils are variable. They are 20 to more than 60 inches deep over weathered rock. In most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones, and soil slips are common . . . This land type is used primarily for watershed and wildlife habitat. In places it is used also for pasture and woodland. The dominant natural vegetation in the drier areas consists of guava, lantana, Natal redtop, bermuda grass, *koa haole*, and molasses grass. *Ohia*, *kukui*, *koa*, and ferns are dominant in the wetter areas. Puakeawe, *aalii*, and sweet vernal grass are common at the higher elevations. [Foote et al. 1972:119]

Soil types in the project areas are shown in Figure 11 and Figure 12.

1.4.1 *Makani* (Prevailing Winds)

Northeasterly trade winds prevail throughout the year, although their frequency varies from 80 to 95% of the time during the summer months, when high-pressure systems tend to be located north and east of the Hawaiian Islands. During the winter months, the high pressure systems are located farther to the south, decreasing the occurrence of the trade winds to about 50 to 80% of the time (WRCC 2010). For more on winds specific to *ahupuaʻa*, see Section 3.4.

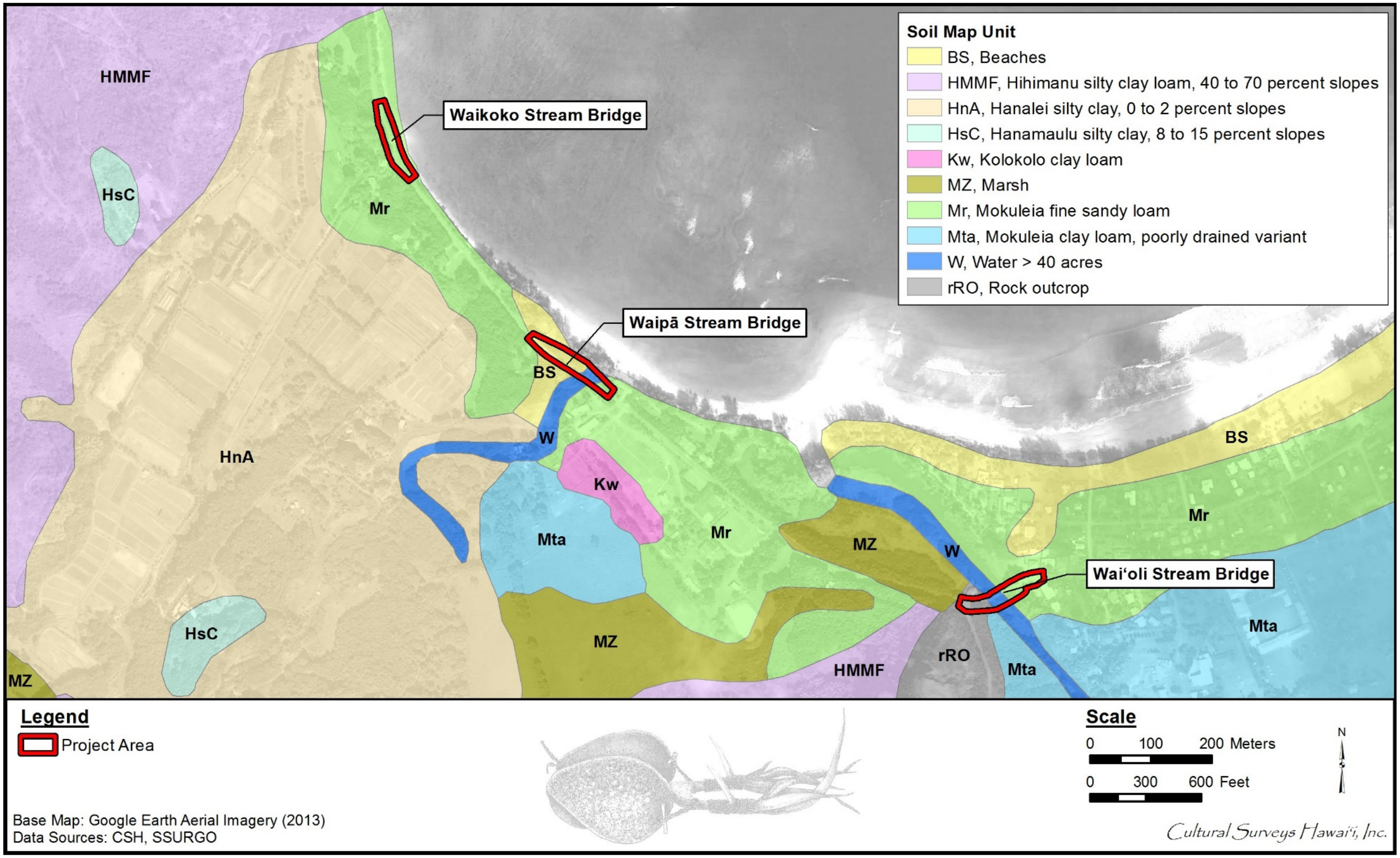


Figure 11. 2013 Google Earth Aerial Imagery with soil survey overlay for the Waikoko Stream Bridge, Waipā Stream Bridge, and Wai‘oli Stream Bridge project areas

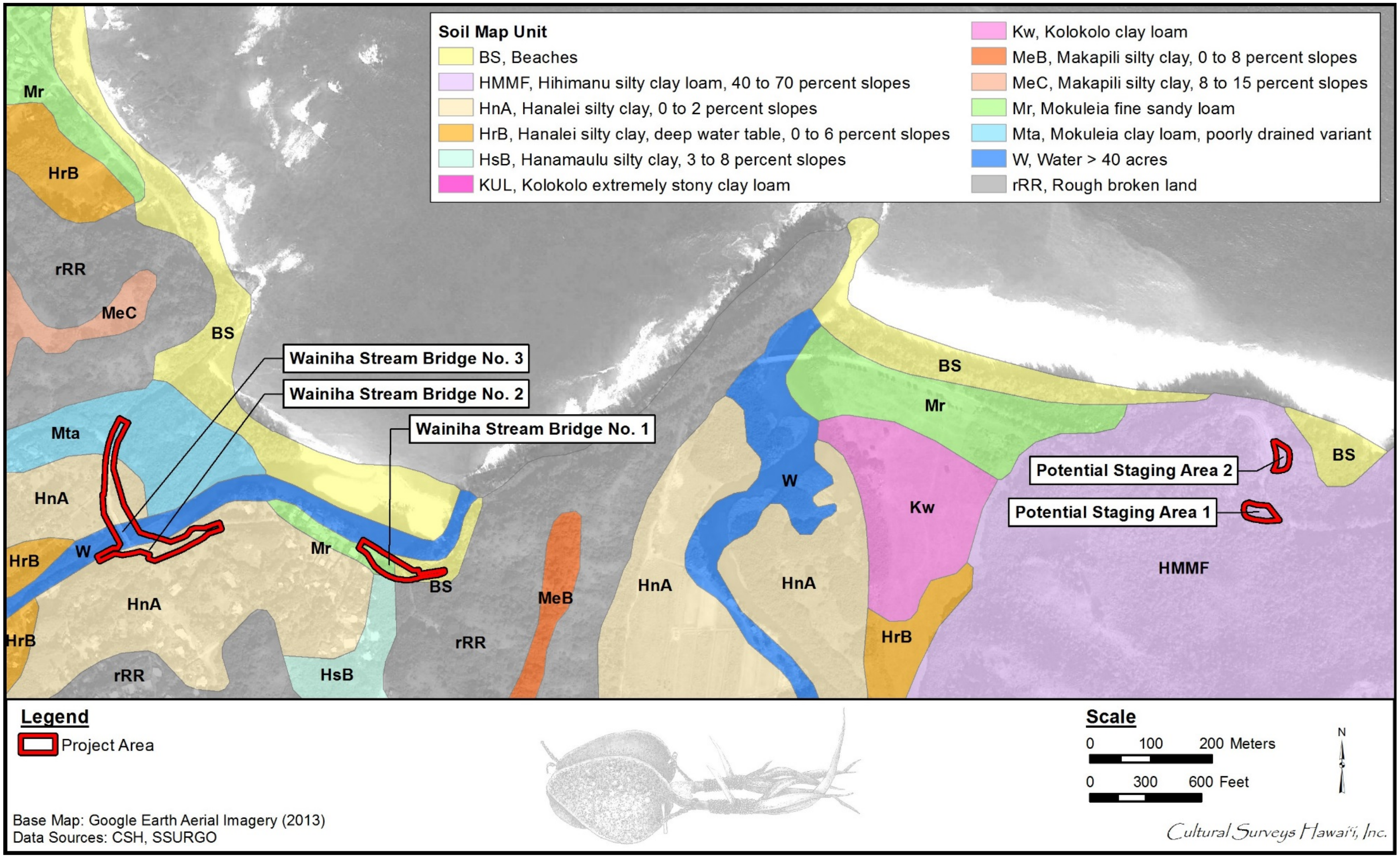


Figure 12. 2013 Google Earth Aerial Imagery with soil survey overlay for the Wainiha Stream Bridges 1 through 3 and Potential Staging Areas 1 and 2 project areas

1.4.2 *Ua* (Precipitation)

Precipitation is a major component of the water cycle, and is responsible for depositing *wai* (fresh water) on local flora. Pre-Contact *kānaka maoli* (Native Hawaiians) recognized two distinct annual seasons. The first, known as *kau* (period of time, especially summer) lasts typically from May to October and is a season marked by a high-sun period corresponding to warmer temperatures and steady trade winds. The second season, *hoʻoilo* (winter, rainy season) continues through the end of the year from November to April and is a much cooler period when trade winds are less frequent, and widespread storms and rainfall become more common (Giambelluca et al. 1986:17). Typically the maximum rainfall occurs in January and the minimum in June (Giambelluca et al. 1986:17). These North Shore areas get an average of 50 inches of rain per year.

1.4.3 Surf

Reef structure and a related sand bar at the mouth of the Waiʻoli Stream creates a small estuary, naturally backing water *mauka* (inland, toward the mountains) of the Waiʻoli Stream Bridge. The surf break off the sand spit at the mouth of the Waiʻoli Stream is known as "Grandpa's." Manolau is the name of the inhabited first terrace *mauka* of Grandpa's and the steep ridgeline of Makaihuwaʻa Ridge marks the boundary of Waiʻole and Waikoko. Headed westerly along Kūhiō Highway toward the Waipā and Waikoko stream bridges, one enters Waipā Ahupuaʻa, just seaward of Makaihuwaʻa Ridge, and passes over the western portion of the Hanalei Plain at elevations of 6 m (20 ft) or less above sea level, to the border with Waikoko Ahupuaʻa to the west. Timothy K. Earle (1978) provides the following summation of Waipā Ahupuaʻa:

> The *ahupuaʻa* of Waipā is relatively small (6.8 square kilometers) but it includes several good areas for irrigated agriculture. Waipā has a coastal strip on Hanalei Bay, but no coral reefs. The boundaries extend inland to include the catchment area of the Waipā stream. This stream travels through a narrow valley until, 0.8 kilometers (km) from the sea, it enters a flat alluvial plain about 1.2 km across. The westerly 0.2 km of this plain is divided off as part of the *ahupuaʻa* of Waikoko. In addition to the dominant stream called Kīwaʻa which empties into the same alluvial flat. Discharge from this second stream has made the central and eastern parts of the flatland quite marshy . . . [Earle 1978:33]

The Waikoko Stream Bridge crossing exists immediately *mauka* of the Pohakuopio reefs, also known as the surf break "Waikokos" at the foot of Pohakuopio Ridge. The portions of the project area identified as Staging Areas 1 and 2 exist as switchback pull-out areas along Kūhiō Highway on Pohakuopio Ridge, a *makai* (seaward) extension of Puʻu Ka Manu, "the bird hill," or Puʻu Hinihini at an elevation of 210 m (690 ft) above sea level. The broad expanse of Lumahaʻi Beach exists downslope *makai* and to the west of these staging areas, punctuated by Kolokolo Point, where the mouth of the Lumahaʻi River creates an estuary similar to that of Waiʻoli. Timothy K. Earle (1978) provides the following overview for Lumahaʻi Ahupuaʻa:

> Lumahaʻi is a large *ahupuaʻa* (36.9 square kilometers) including the catchment area of the major stream, Lumahaʻi. Like Wainiha, the Lumahaʻi Stream starts in a deep valley thrusted into the central mountains of Kauaʻi. The upper part of the stream is joined by numerous tributaries, which rush down the steep valley slopes. About 1.5 kilometers (km) from the sea, the stream enters a compact alluvial plain

> bounded on either side by the valley ridges and on the sea by low sand dunes. The coast is 1.2 km long with no significant reefs. [Earle 1978:32]

Continuing westward on Kūhiō Highway, crossing Kolokolo Point to Wainiha Valley and the portion of the project area at Wainiha Stream Bridge 1 and Wainiha Stream Bridges 2 and 3. These portions of the project area cross the mouth of the Wainiha River at the Wainiha Beach Park, where a substantial sand bar extends across the river mouth to create a small estuary similar to those found at Waiʻoli and Lumahaʻi.

1.4.4 Built Environment

The overall project area including project site, potential staging areas, and environmental study areas consists of a portion of the Kūhiō Highway known as Route 560, a stretch of highway just east of Hanalei known as Waiʻoli and traverses to the north of Wainiha Bridge 3.

> Kuhio Highway is the only link to the main urban facilities of Kauai for residents westward beyond the project area on the north shore. Residents, the community and businesses depend entirely on the highway for access for the transportation of goods, visitors, travel to and from schools, stores, the airport, hospitals and places of work. [Hawaiʻi Department of Transportation 2011:3]

Kūhiō Highway enters Waipā Ahupuaʻa on the east just seaward of Makaihuwaʻa Ridge (just west of Waiʻoli Stream) and passes over the western portion of the Hanalei Plain at an elevation below 20 ft to the border with Waikoko Ahupuaʻa (to the west). On the eastern banks of the Waipā Stream crossing, *mauka* of Kūhiō Highway, the Waipā Foundation has built its facilities for a non-profit organization working to restore Waipā as a Native Hawaiian learning and community center. At the Wainiha River crossing is the Wainiha Beach Park and a small community of single family residences, vacation rentals, and the Wainiha General Store, a small family-owned grocery store. Generally speaking, the entire project area exists in a relatively undeveloped and serene portion of the north shore of Kauaʻi, between the extensive preserves of Kamehameha School, Honoonāpali Natural Reserve, the Alakaʻi Wilderness Preserve and the Halelea Forest Reserve.

> After crossing Waipā Bridge, the road follows the beach along the west shore of Hanalei Bay. The road then winds up and around the mountain ridge as it proceeds to Lumahaʻi Valley. As it winds over the ridge, the road reaches an elevation of nearly 16' above sea level. Descending into Lumahaʻi Valley, the road again follows the beach before crossing Lumahaʻi Bridge and leaving the valley. Another mountain ridge is traversed before entering Wainiha Valley, where the road crosses the three Wainiha Bridges and passes through the small village of Wainiha. [Fung Associates 2013:10]

Section 2 Methods

2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), traditional *mo‘olelo* (stories), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (chants), *mele* (songs), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, previous archaeological reports, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH Library. Other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau.org 2014), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (OHA 2014), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015).

2.2 Community Consultation

2.2.1 Scoping for Participants

We begin our consultation efforts with utilizing our previous contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kama‘āina* (native born), cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior’s NHO list), and community groups. We also contact agencies such as SHPD, OHA, and the appropriate Island Burial Council where the proposed project is located for their response to the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

2.2.2 “Talk Story” Sessions

Prior to the interview, CSH cultural researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their *‘ike* (knowledge) and *mana‘o* (thought, opinion) will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

“Talk Story” sessions range from the formal (e.g., sit down and *kūkā* [consultation, discussion] in participant’s choice of place over set interview questions) to the informal (e.g., hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, interviews are recorded and transcribed later.

CSH also conducts group interviews which range in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on interviewee’s answers. Group interviews are always transcribed and notes are taken. Recorded interviews assist the cultural researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) providing missing details to *mo‘olelo*.

CSH seeks *kōkua* (assistance) and guidance in identifying past and current traditional cultural practices of the study area. Those aspects include general history of the *ahupua‘a*; past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka‘ao* and *mo‘olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

2.2.3 Completion of Interview

After an interview, CSH cultural researchers transcribe and create an interview summary based on information provided by the interviewee. Cultural researchers give a copy of the transcription and interview summary to the interviewee for review and ask them to make any necessary edits. Once the interviewee has made those edits, we incorporate their *‘ike* and *mana‘o* into the report. When the draft report is submitted to the client, cultural researchers then prepare a finalized packet of the participant’s transcription, interview summary, and any photos that were taken during the interview. We also include a thank you card and honoraria. This is for the interviewee’s records.

It is important to CSH cultural researchers to cultivate and maintain community relationships. The CIA report may be completed, but CSH researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *‘ohana* (family). CSH researchers feel this is an important component to building relationships and being part of an *‘ohana* and community.

“I ulu no ka lālā i ke kumu—the branches grow because of the trunk,” an *‘ōlelo no‘eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: “Without our ancestors we would not be here” (Pukui 1983:137). As cultural researchers, we often lose our *kūpuna* but we do not lose their wisdom and words. We routinely check obituaries and gather information from other informants if we have lost our *kūpuna*. CSH makes it a point to reach out to the *‘ohana* of our fallen *kūpuna* and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference.

Section 3 *Kaʻao* (Legends) and *Moʻolelo* (Stories)

Storytelling is better heard than read for much becomes lost in the transfer from the spoken word to the written word. Hawaiian storytellers of old were greatly honored. Their stories were a major source of entertainment and contained teachings while interweaving elements of Hawaiian life-styles, genealogy, history relationships, arts, and the natural environment. *Kaʻao* are often full of hidden and double meanings (Pukui 1995:ix).

Beckwith notes that Hawaiians use the term *kaʻao* "for a fictional story or one in which fancy plays an important part"; *moʻolelo* is "a narrative about a historical figure, one which is supposed to follow historical events. Stories of the gods are *moʻolelo*." In reality, the distinction between *kaʻao* as fiction and *moʻolelo* as fact cannot be "pressed too closely. It is rather in the intention than in the fact" (Beckwith 1970:1). Thus a so-called *moʻolelo*, which may be enlivened by fantastic adventures of *kupua* (supernatural beings), "nevertheless corresponds with the Hawaiian view of the relation between nature and man" (Beckwith 1970: 1). A *kaʻao*, on the other hand, is "so consciously composed to tickle the fancy rather than to inform the mind as to supposed events" (Beckwith 1970:1).

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the project area. These originate before the time of the first Hawaiian to an age of mythical characters whose epic adventures inadvertently led to the Hawaiian race of *aliʻi* (chief) and *makaʻāinana* (commoner) alike. The *kaʻao* in and around the project area shared below are some of the oldest Hawaiian stories that have survived and still speak to the characteristics and environment of the area and its people. The *moʻo* (lizard, water spirit) tales are usually cautionary tales, especially in regard to caring for the land. The *wahi pana* are storied places, but particularly places which Hawaiians feel are embued with special *mana* or spiritual power. The *ʻōlelo noʻeau* are a collection of sayings collected and translated by Mary Pukui Kawena (1983). *Mele* are songs, athems, or chants of any kind tha are poetic. However, *oli* or chant, was not danced to. Chants were prolonged phrases in one breath, often with a trill at the end of each phrase. Both *mele* and *oli* possess themes and hidden meanings (Pukui 1986:245, 284).

3.1 *Kaʻao*

3.1.1 Legend of Pakaʻa – Haleleʻa

Given by his mother "a finely polished calabash containing the bones of his grandmother Loa, who in her life had controlled the winds of every district from Hawaii on the east of Kaula on the west of the group . . . [and taught] how to open the calabash and call the name of whatever wind he desires" (Beckwith 1970:86). Pakaʻa passed this lore on to his son, Kuapakaʻa, who had occasion to use it when the chief Keawenuiaumi came to Molokaʻi in search of Pakaʻa (Dye 2004a:6). In order to bring about a storm that will drive Keawenuiaumi's canoes ashore, Pakaʻa tells Kuapakaʻa to call for the winds of Kauaʻi and Niʻihau:

> *. . . He luha ko Hanalei*
> *He waiamau ko Waioli*
> *He puunahele ko Waipa*
> *He haukolo ko Lumahai*
> *He lupua ko Wainiha . . .*

[Translated]
. . . The luha is of Hanalei
The waiamau is of Waioli
The puunahele is of Waipa
The haukolo is of Lumahai
The lupua is of Wainiha . . . [Fornander 1918:96–97]

Wichman (1998) relates traditions of fabulous birds (both particularly associated with the *Legend of Aukele*) related to two places at Waipā, Halulu and Kīwa‘a:

> Halulu was the bird that the great god Kāne sent to the four directions of chaos to announce that he was about to create the world. *Halulu* was also the man-eating bird that could take on human form when he wished...Kīwa‘a was Halulu’s sister...The *Kīwa‘a* is also the pilot bird that leads a navigator through the surf to the canoe shed at the landing place. [Wichman 1998:114]

3.1.2 Legend of the Kamapua‘a Family

The adventures of the hog-man, Kamapua‘a, born to Hina include a section about his struggles on Kaua‘i, first with chief Makali‘i then his own father, Kahiki-ula, who is ruling under Makali‘i and then a rival chief on behalf of his father-in-law: **“**He was occasionally worshiped as a god, if the report is correct that at Wainiha, Kauai, was a small paved heiau [pre-Christian place of worship] which had Kamapua‘a for its deity” (Beckwith 1940:203).

3.1.3 Hi‘iakaikapoliopele and Malaeha‘akoa

Emerson narrates the journey of Hi‘iakaikapoliopele as she comes across the fisherman, Malae-ha‘a-koa, lame, guileless, innocent of all transgressions, meanwhile, sat and fished. Wainiha is briefly mentioned as the place where Malaeha‘akoa, the lame fisherman and seer, was raised. When Hi‘iaka arrived on Kaua‘i during her mission to bring Pele’s lover Lohi‘au back to the island of Hawai‘i, it was Malaeha‘akoa who met her at Hā‘ena and eventually told her of Lohi‘au’s death (Emerson 1978:109–131). Hi‘iaka:

> He had cast the comminuted [broken up] fragments of the shrimps whose bodies baited his hooks and, as he waited for a bite he chanted a song (to the god of good luck) that reached Hiiaka’s ear:

Pa mai ka makani o ka lele wa‘a, e:
Makani kai ehu lalo o ka pali o Ki-pu.
I malenalena i Wai-niha i ka‘u makau:
He i‘a, he i‘a na ka lawaia, na Malae-ha‘a-koa, e!

TRANSLATION
A wind-squall drives the canoes in flight,
Dashing the spray ‘gainst the cliff of Kipu.
Peace, waves, for my hook at Wai-niha:
Come, fish, to the hook of the fisher.
The hook of Malae-ha‘a-koa.

Hiiaka's answer to this was a song:

Malae-haʻa-koa, lawaia o ka pali,
Keiki lawaia oe a Wai-niha,
Mo'opuna oe a Ka-nea-lani,
Lawaia ku pali o Haena;
Au umauma o ke ala haki;
He iʻa na ka lawaia,
Na Malae-haʻa-koa, e.

Translation
I hail thee, Malae-haʻa-koa,
Thou fisherman of the cliffs.
As a youth you fished at Wai-niha;
Grandson thou to Ka-noa-lani,
Fishing now ʻneath the bluffs of Haena,
Sometime breasting the steep mountain ladder.
Send fish, O Heaven, to this fisherman;
Send fish to Malae-haʻa-koa.

As if obedient to the charm of Hiiaka's incantation, the breeze sank to a whisper and the ruffled surface of the ocean took on a calm that brought fish to the fisherman's hooks. [Emerson 1915:110–111]

3.1.4 Pele, Hiʻiakaikapoliopele, and Malaehaʻakoa

Wichman offers a similar story to Emerson, but details the two sisters:

> . . . met Malaehaʻakoa at Naue as he was fishing. He was crippled and unable to walk. He recognized Hiʻiaka and prepared a feast for her. The fisherman and his wife led the dancing and chanting of a long song recounting Pele's story, much to Hiʻiaka's delight, and in return she restored his ability to walk. [Wichman 1998:124]

3.2 Moʻolelo

3.2.1 Ka-nē-loa Seeks a Bride and the *Kapa* of Waiʻoli

A romantic narrative of unknown origin called *Waiʻoli* is retold by Frederick B. Wichman in *Kauai Tales* (1985:44–60). This legend tells of the god Ka-nē-loa coming to Kauaʻi and landing at Manolau/Monolau, a place where Waiʻoli Stream enters the ocean, where canoes would be moored to seek a bride. This visit brings the rainbow to Kauaʻi. The legend describes the making of different colored tapa and associates the sources of the dyes with specific place names in Waiʻoli. Specific reference is made to a number of materials used for tapa making including *noni* (Indian mulberry; *Morinda citrifolia*), *ʻalani wai* (*Pelea wailealae*), *ʻōlena* (turmeric; *Curcuma domestica*), *māmaki* (*Pipturus* spp.), *ʻukiʻuki* (*Dianella sandwicensis*) berries, sea urchins, *hala*, *kalili* (native violet; *Viola kauaensis*), burned sugarcane, coconut milk, and *maile* (*Alyxia* *olivaeformis*). Waiʻoli was a center of tapa arts. Charles Wilkes, Commander of the United States exploring expedition who attended Rev. William Alexander's church in Waiʻoli in 1840 remarked,

> They were all much struck with the dress of the native women, its unusual neatness and becoming appearance. It seemed remarkable that so many of them should be clothed in foreign manufacture, and that apparently of an expensive kind; but on closer examination, the dressed proved to be *tapas*, printed in imitation of merino shalls, ribands. [Riznik 1987:10]

Manolau/Monolau where Waiʻoli Stream enters the ocean was inhabited and is a place where tapa was traditionally produced.

3.2.2 Lonoikamakahiki

Kamakau and Fornander tell of Lono-i-ka-makahiki, a son of Keawe-nui-a-ʻUmi who goes crazy and wanders for a long time on Kauaʻi. When he regains sanity, his faithful attendant sings a song reminding him of the places they wandered, especially on Kauaʻi, and one of the lines recalls, "Ka ua hoʻopala ʻohiʻa o Waiʻoli—The rain that ripened the mountain apples of Waiʻoli" (Kamakau 1961:52; Fornander 1919:4(2):358–359).

Fornander's account of Keawe-nui-a-ʻUmi, who lived sometime in the sixteenth century, in the *Story of Lonoikamakahiki* gives the same interpretation (Fornander 1917-1918:4(2):358–359).

Ka-iki-lani-kohe-panaiʻo wanders through the wilderness of Kauaʻi with his companion, Kapa-ʻihi-a-hilina, out of his mind with grief for having killed his wife (Dye 2004a:7). Ka-iki-lani-kohe-panaiʻo composed a chant of affection for the chief, recounting their wanderings in the wilderness of Kauaʻi mostly on the North Shore:

. . . He kaʻupu e Lono e,	A friend [was I] O Lono,
He kanaka au no ka ua iki,	A server was I in the light rain,
Ina hoʻi ha he hoa au no ka ua iki la paʻia,	I was your companion in the light rain of the forest,
He hoa i ka nahele lauhala loloa,	A companion in the long-leafed pandanus groves,
Mai Kilauea a Kahili la,	[That extend] from Kilauea to Kalihi,
O ka hala i ʻaina kepa ʻia e ka manu	The pandanus [whose fruit] is pecked by the birds,
O Poʻoku i Hanalei la.	[The pandanus] of Poʻoku in Hanalei.
Hala ia mao a ka ua e ka hoa e,	There we were till the rain ceased falling,
He hoa i ka makani lauwili Poʻaihele,	O my companion, My companion in the hurrying whirlwind,
Mauka o Hanalei iki a Hanalei nui,	In the uplands of lesser Hanalei, of greater Hanalei,
Mauka mai hoʻi kekahi ua,	[In] the rain that came from the uplands,
Makai mai hoʻi kekahi ua,	Rain that came from the lowlands,
Ma naʻe mai hoʻi kekahi ua,	Rain that came from the east,
Malalo mai hoʻi kekahi ua,	Rain that came from the south,
Maluna iho hoʻi kekahi ua,	Rain that came from the above,
Malalo aʻe hoʻi kekahi ua,	Rain that came from below,
Ma ka lae hala o Puʻupaoa,	Along the cape of Puʻupaoa, over-grown

	with pandanus,
Ilaila ka ua kike hala,	There was the rain that pelted the pandanus fruit,
Hoʻowalea ike one ʻai a ke kinaʻu,	Drenching the sand where the sand eels fed,
He kiaʻu ʻai hala o Mahamoku,	The eels that ate the pandanus of Mahamoku,
Ka ua hoʻopala ʻohiʻa o Waiʻoli…	The rain that ripened the mountain apples of Waiʻoli . . . [Kamakau 1992:48–51]

3.2.3 Damming of the Waters of Waipā

Wichman (1998) refers to a tradition behind the periodic damming of the waters of Waipā by a sand bar at the coast:

> This, according to legend, was caused by a chief named Lauhaka. His mother left her husband, Kalākānehina, the ruling chief of Waimea, during the time of the kona kingdom because of his cruelty. Lauhaka was raised in the mountains by his uncle, a bird catcher. Learning that two bird catchers were catching the forbidden *ʻuaʻu*, the dark-rumped petrel, Kalākānehina sent some warriors to kill them. Lauhaka stationed himself on the steep path where only one man at a time could come toward him. As Lauhaka killed the soldiers the bodies fell into the stream and dammed up the river. [Wichman 1998:114]

Wichman (1998) also connects the naming of Waikoko to this story:

> When Lauhaka was damming up the neighboring stream, the blood from the soldiers flowed into this stream and colored it red. In Ancient times, however, an aquatic plant grew in this stream that dyed the water red, but these plants disappeared when rice began to be grown here. [Wichman 1998:115]

3.2.4 ʻŌlohe

Wichman (1998) retells a tale of brigands associated with Makahoa Point and an adjacent beach Kahalahala:

> Ka-puʻaʻa-pilau and two friends lived here, robbers well trained in the art of *lua* (bone-breaking). They were *ʻōlohe* (robbers who removed all the hair from their head and body and kept their skin well-oiled and slippery). An *ʻōlohe* inherited a fearsome reputation, usually well deserved. One of his friends watched from the ridge. If several travelers came together, the lookout called out, ʻHigh tide!ʼ and they were not attacked. However, if a single traveler, well-laden with goods came along, the look-out called, ʻLow tide!ʼ and the traveler was attacked, killed, and his body placed in a hole in the tongue of lava at the foot of Makahoa Ridge. In time, the body was taken out to sea by the waves and brought ashore onto the sands. The *konohiki* [headman of an *ahupuaʻa* land division under the chief] of Wainiha was disturbed that so many bodies were coming ashore and sent a man to spy on the situation. This man saw and heard what was happening and reported back to his chief. The chief and his warriors successfully killed the three robbers, and their bodies were thrown into the pit where they had disposed of their own victims. [Wichman 1998:115–116]

3.2.5 *Mo‘olelo* about the *Menehune*

The *mo‘olelo* we have collected for Lumaha‘i and Wainiha relate to the *menehune* (legendary race of small people who worked at night, building fishponds, roads, and temples) and therefore appear below.

Perhaps the most popular mention of Wainiha in the folklore of Hawai‘i is as the home of the legendary *menehune* and *mū* (legendary people of Lā‘au-haele-mai, Kaua‘i) people. Described as shy and small in stature, some say they were the original inhabitants of Kaua‘i, driven to the interior of the island by the arrival and flourishing of the Hawaiians. A census of Wainiha taken by the *konohiki* (overseer) of the *ahupua‘a* during the time of Kaumuali‘i lists 65 men of Lā‘au as *menehune* (Lydgate 1913:126). J.H. Kaiwi, Thrum’s informant for the “Story of the Race of Menehunes,” says his grandparents became familiar with the *menehune* while spending time collecting sandalwood in an area called Waineki in the Alaka‘i Swamp, overlooking Wainiha (Thrum 1923:219).

The upper reaches of the valley were also where the bird-catchers or *po‘e hahai manu* practiced their skill at collecting the colorful feathers of forest birds which adorned capes, helmets, *lei* (garland), and other objects usually associated with the *ali‘i* (chiefly) class. In “A maiden from the Mu,” Pukui (1951:67–75) relates the tribulations of Kiamanu, a bird-catcher of Wainiha, who marries a *mū* girl. Wainiha bird-catchers also figure in the tales of “Kanaloa-huluhulu” and “Lau-haka” by Wichman (1985:114–124). Many of these stories mention a well-traveled trail from Waimea on the southwest coast of the island, up through Kōke‘e and across the Alaka‘i Swamp, finally dropping down into Wainiha. In historic times, politician and outdoorsman Eric Knudsen (1946:202) traversed the island along this ancient trail on an annual basis. Knudsen describes an 1895 passage from Hanalei to Hā‘ena as following little more than a trail (Fung 2013:12).

3.2.5.1 The Bird Catcher’s Daughter

High in the uplands along the Wainiha River a bird catcher was caught in the rain and couldn’t return home because the river was rushing so hard (Figure 13). He found refuge in the forest village of the *mū* people, “a tribe of the *menehune* perhaps” (Pukui and Curtis 1951:67). Kia, the bird catcher, found himself staying in the village far after the weather had improved. Eventually, he fell in love with a maiden of *mū* and they had a daughter. Eventually Kia began to miss his childhood environment and the smells of the beach and he found himself along the shore. While he was there a young chief spoke with him and after hearing of the beauty of his daughter, the young chief proclaimed that he wished to marry her. Kia told the young chief his daughter would not marry him, and that she was scared of strangers and he warned “no man can being a forest bird to dwell beside the ocean” (Pukui and Curtis 1951:72). Regardless of the warning, the young chief came to the village of the *mū* people and waited for the frightened *mū* people to return, specifically the daughter of Kia. Eventually the daughter felt safe enough to come back into the home, and as she entered, the young chief sprang from his hiding place and blocked the door so that she could not run out. “She married the young chief and lived with him content. The forest bird was happy by the ocean, tamed by love” (Pukui and Curtis 1951:75).

Figure 13. Photo of Wainiha River and Valley, n.d. (Hawai‘i State Archives)

3.2.5.2 Menehune Lighthouse at Makaihuwaʻa – Waiʻoli

Makaihuwaʻa Ridge, the steep prominence overlooking the Waipā and Waikoko Stream Bridges includes three excavated pits on its ridgeline, a nearby village where tapa was traditionally produced, a taro *loʻi* (irrigated terrace), and *heiau* at its base. These significant cultural properties are discussed briefly below and further in Section 3.5. The Menehune Lighthouse at Makaihuwaʻa is a reference to excavated pits in the steep ridgeline face on the western margin of Waiʻoli, just *mauka* of Kūhiō Highway (Wheeler et al. 2013b).

Once, at the northwest base of Makaihuwaʻa Ridge, Kupakoili Heiau stood; It no doubt was used by the people of Manolalu village. It also had a canoe mooring in the estuary which was created by the sand bar at the mouth of the Waipā Stream. It is at Manolau/Monolau that canoes were moored and, in the Waiʻoli story, tapa was beaten. Manolau was probably a preferred landing and staging area and, at least at times, fires would burn on Makaihuwaʻa Ridge to guide canoes into this estuary.

Makaihuwaʻa is translated, *maka-ihu-waʻa*, "eye (prominence or mark) nose canoe"; perhaps it is a reference either to the signal fires in Wichman's tale of Makaihuwaa, or perhaps the phosphorescent glowing water at night. It is possible that from the ridgeline one could view phosphorescent algae glow seen in the water at night. Or, it may be that the name references the vision one may have had when they were paddling near shore looking at the nose of their canoe and saw these reflections of glowing signal fires or of the phosphorescent algae in the water. That is, the lights in the water were seen at the nose of the canoe because the canoe was breaking the water and agitating the algae, causing them to glow. Regarding Makaihuwaʻa Ridge, Wichman relates the following:

> Makaihuwaʻa, 'eyes for the canoe prow,' is a ridge rising from the Waiʻoli River. Menehune fishermen complained that on dark nights they could not find their way back to land when fishing on the deep ocean. Their chief devised a plan. He ordered his men to dig out a platform halfway up the ridge and place large torches there. On a dark night the light from these torches could easily be seen from outside the bay. In this way the first lighthouse in Hawaiʻi was built. [Wichman 1998:113]

The original source for this account is cited as "Akina, Joseph A., The Story of the Menehune People," an unpublished holographic manuscript in Hawaiian, translated by Frances Frazier (1904). A longer account is provided by Wichman (1985:35–42) in *Kauai Tales.* This account provides information about the fishermen, scattered from Hāʻena to Kīlauea, operating out of Hanalei Bay. An undercurrent of the story is that *menehune* proverbially had to complete their work at night which would require *menehune* fishermen getting back to shore in the pre-dawn in order to "feed all the *menehune* at their daily feast that finished just before daybreak" (Wichman 1985:36). In the Wichman (1985) account it is the concern of a *menehune* chief for the welfare of his people that leads him to ponder a solution to the Menehune fishermens' problem. As he moves about at night his attendants carry torches and *lamakū* (*kukui* nuts strung on a midrib; signal fires). He gets the idea to use such *kukui* nut torches as an aid to navigation and in the pre-dawn set "a line of *lamakū* burning and sputtering along the beach." The experiment helped a little but the light could not be seen from far off shore. The leader of the fishermen (described as owl-like) relates, "The idea is good. The lights are good. But they need to be higher" (Wichman 1985:40). Thus:

> The chief . . . climbed up the ridge. When he could look out over the treetops and the clouds swirled just above his head, the chief . . . [said] 'Here we must dig out a platform from the edge of the ridge, large enough to place all the *lamakū* we need to light our fishermen home again.' The Menehune went about the chore with their usual good sense, sound engineering, and the knowledge that many hands working together make any chore easier and quicker. A small platform dug out of the side of a hill was a simple chore compared to many others they had done in years past. . . . One group dug away the dirt and formed the platform. Another group formed a line reaching to the river beds of Waipa'a and Waikoko and passed smooth stones hand to hand to the work site. Before half the night was gone the platform was finished and paved with stones. All that time the torchbearers were busy trying to keep their torches lit . . . the rain sometimes fell so hard that the flames sputtered and danced away so far they became lost and went out. The chief sat farther up the ridge where he could see the work, and his voice shouting instructions could be heard. 'Build a roof over the platform' he yelled into the stormy night. 'It must be higher in front than in back. It must protect the torches from the rain. It must also be high enough so the roof won't catch on fire.' No sooner said than the work started. One group cut logs for uprights and the roof frame. Another group went for banana leaves which, laid down carefully, made a waterproof cover. Soon a flat roof with no walls had been built over the platform. The *lamakū* were set in place and lit. For the rest of the night the flames sputtered and danced and poured a beacon of light into the dark and stormy night. [Wichman 1985:41–42]

3.2.5.3 Ka'alele of the Red Rocks – Lumaha'i

Rice (1923) gives the following account:

> One day as the Menehunes were bathing at Lumaha'i, one of them caught a large *ulua*. The fish tried to escape, but the little man struggled bravely, and finally killed it. The man was so badly wounded, however, that his blood flowed over the spot and turned the earth and stones red. This place is still called Ka-'a-le-le, from the name of the wounded man. [Rice 1923:44–45]

Wichman (1998:117) indicates the "Rocks called *Ka'alele*, 'messenger', near the river mouth are noted for their redness."

3.2.5.4 Ka-'ī-li-o-pā-'ia Heiau – Lumaha'i

Rice (1923) gives the following account:

> On the plain above the Lumahai River the Menehunes made their homes for a time. There one of the small men began to build a *heiau* which he called Ka-'ī-li-o-pā-'ia. As he was working, the big owl of Kāne came and sat on the stones. This bird was large enough to carry off a man, and, naturally, it frightened away the little workman. He returned next day, only to see the huge bird flying over the spot croaking. He also saw the great monster dog Kū-'ilio-loa, My-Long-Dog, running about the *heiau*. These evil omens caused the Menehune to believe that the *heiau* was polluted, so he gave up his work. [Rice 1923:44–45]

Regarding the construction of this *heiau*, Wichman (1998) tells of an omen interpreted as a fear that the people of the *ahupuaʻa* might be punished by a chief for some real or imaginary offense by imposing a tax so heavy as to be almost impossible to pay:

> The *heiau* that a Menehune named Māʻihi-lau-koa began soon after the Menehune arrived at Lumahaʻi. First he marked the edges of the *heiau* with stakes of *hau* wood. Then he began to construct rock walls around a platform of coral. Before the work could be finished, a huge owl named Pueo-nui-o-Kāne, also known as Ka-ʻā-ʻaia-nuʻu-nui-a-Kāne, flew overhead. This was a fearful omen and gave rise to a saying: *Papapau kākou he ʻāʻaia kō ka hale* The Legendary bird strikes at everyone. [Wichman 1998:120]

3.2.5.5 Kealahula Point – Lumahaʻi

Rice (1923) gives the following account:

> At the point of Kealahula, at Lumahaʻi, these wonderful men made a small hill on the seashore, by cutting off part of the point. You can still see the bare place on the ridge, where the earth was sliced off. At the base of this small hill the Menehunes placed a large stone, which they used as a jumping-off place. The hill is called Ma-ka-ihu-waʻa, the Landing Place of the Canoes. [Rice 1923:44–45]

3.2.6 *Moʻo* Accounts

3.2.6.1 Hoʻohila

Wichman (1998) tells a traditional tale of Ka-hulaʻana, “a cliff point at the seashore where one must swim around to the beach on the other side of the cliff,” which is probably related to the following Hiʻiaka account below:

> When Hiʻiaka and Wahine-ʻōmaʻo came, Hoʻohila, the *moʻo* who guarded Kahulaʻana, caused the waves to smash high against the cliff. She came out of her cave to see what Hiʻiaka would do. Wahine-ʻōmaʻo scooped up a handful of sand and flung it into the *moʻo*’s eyes. Hoʻohila retreated into her cave, her spell forgotten. The waves died down and Hiʻiaka and her friend continued on their way. [Wichman 1998:115–116]

This path washed out anytime there was a storm, which meant travelers had to return home to wait until the path had been repaired or swim around it in dangerous waters.

3.2.6.2 Kōleaka

The hill Ka-moʻo-kōlea-ka was once a dangerous *moʻo* who lured the unwary to their deaths with a show of friendliness (Wichman 1985:49).

A chief from Wainiha was the object of the affections of this *moʻo*. In olden times, Wai-a-ka-Palaʻe Cave (“water of the lace fern”) in Hāʻena was said to be the hair of a beautiful *moʻo* maiden who would comb her hair near the entrance to the cave. She fell in love with a chief from Wainiha and they both disappeared for some time. When she reappeared she said the chief had died (Pacific Worlds 2004).

3.3 Wahi Pana

Hawaiian historian Mary Kawena Pukui defines each *ahupuaʻa* name. Waipā literally translates to "touched water" (Pukui et al. 1974:227). Waikoko translates to "blood water" (Pukui et al. 1974:223). Wainiha is defined as "unfriendly water" (Pukui et al. 1974:226). While Waiʻoli translates to "joyful water" and is also the name of a portion of a valley located in Hanalei. Waiʻoli is also the name of a river (Emerson 1965:155). Lumahaʻi is defined as "a certain twist of the fingers in string fingers" and is also a medicine (Pukui 1983).

The district of Haleleʻa ("joyful house") encompasses all of these *ahupuaʻa* listed above (Pukui 1983:37). In addition, the mountain range that spans the district is known as Nāmolokama ("the interweaving bound fast") (Pukui 1983:162).

A special category of names is associated with the *menehune.* The *menehune* are said to have lived in these villages as recent as 1820. The names of the *menehune* villages include Naue, Pāʻieʻie, Maunaloa, Paliʻeleʻele, Maunahina, Pōhakuloa, Opaikea, Hōmaikalani, and Lāʻau were villages mentioned in Lydgate's 1913 report of the *konohiki* census during Kaumualiʻi's time (1794-1825). A compilation of *wahi pana* with descriptions of sites and any other information pertaining to the site can be found in Appendix A.

3.3.1 The Bird Man

A stone was placed "near the mountain of Maunahina in a little brook, above Wainiha, where to this day, natives leave offerings of *lehua* branches to the *kupua*, or demi-god, of the locality. On this stone, Lahi and his son lived, after Lahi had been defeated in Waimea" (Rice 1923:36).

> Lahi, or Lauhaka, as he is sometimes called, lived in Wainiha valley. From childhood he had refused to eat any food but the meat of birds . . . Lahi and his uncle had moved to the head of a very narrow valley through which flowed a small stream. If anyone stepped into this stream at any place in its course, the water at the source would ripple. In this way a warning of the coming of friend or foe was always given . . . One day, as they were roasting birds, the boy saw the water rippling and called out his warning . . . they saw the king and his four hundred men advancing . . . [Rice 1923:36]

The pass was so narrow that only one man could ascend at a time. And so the boy killed the soldiers, one by one, as they attempted to come up, until the four hundred were thrown over the cliff. The last one to come up was the king. He recognized the boy as his own son and begged, "Give me life in the name of your mother!"

Lahi therefore spared his life (Rice 1923: 47–48). However, the king still planned to kill Lahi, but Lahi found out and killed his father and his faithless subjects. Lahi then became king.

3.3.2 Kalauheʻe

Wichman (1998) retells an account associated with the place known as Kaʻaluheʻe ("sagging one"; known also as Kalauheʻe, "slippery leaf"), a tributary stream on the east side of the Wainiha River:

> On its banks, a lonely young woman beat her *kapa*. She was disfigured with birthmarks and people teased her by saying she was really a *loli* (seaslug). One day,

> as she beat her *kapa*, a *he‘e mākoko* (deep ocean octopus) swam up the stream and settled on a rock near her. She was so lonely that she began to talk to the octopus. After many days the *he‘e* revealed that he was a demi-god who could assume the form of a man. He assumed his human form and his face too, was marked as hers. Loli fell in love. She left her *tapa* soaking too long in the stream while they dallied. Her scandalized parents tried to separate the lovers, but Loli jumped off the nearby cliff. She was changed into a *he‘e mākoko* to be united forever with her lover. [Wichman 1998:123]

3.3.3 Ka‘umaka (Kaūmaka)

Another storied place at Wainiha is Ka‘umaka (also known as Kaūmaka). Wichman (1998) describes two accounts both involving a pair of fishermen and a shark’s eye(s):

> Ka‘umaka-a-Mano’s grandfather had united the island into one kingdom and his father Mano-kalani-pō, had been able to enlarge the cultivated lands. Hunting for the man-eating shark along Nāpali was popular. Ka‘umakaamano went shark fishing, and that episode became the basis of the tales told of this point that bears his name.
>
> Two brothers, Wa‘awa‘a-iki-na‘auao and Wa‘awa‘a-iki-na‘aupō, were fishing. The older, who didn’t want to clean fish, said that all fish with two eyes belonged to the younger brother, while he, the older, owned all the fish with only one eye. A shark with only one eye (the other was blind and bulged out like a nipple, hence Kaūmaka, ‘nipple,’ a variation on the name) was caught by the younger brother, who immediately turned the line over to his older brother. The shark towed Wa‘awa‘aikina‘auao out to sea where, with great difficulty, he escaped from the shark and returned to land.
>
> Another story of this point concerns two male *kupua* named Ka‘u-maka, ‘my eye,’ and Ka‘u-weke ‘my weke fish.’ They were fishing at this cape, but all the small fish had disappeared. They saw a shark and Ka‘umaka jumped into the water and fought with it. Ka‘umaka was very strong and killed the shark. Ka‘uweke was able to catch *weke* (goatfish) from the headland once the shark was gone. The two feasted that evening. Ka‘uweke on his favorite fish and Ka‘umaka enjoying dining on the shark’s eyes. [Wichman 1998:123]

Literary sources give an incomplete picture of the aboriginal settlement of Wainiha, but a degree of insight may be gained from their examination. Lydgate (1913), as mentioned before, reported on a census taken by the *konohiki* of Wainiha during Kaumuali‘i’s time. Kaumuali‘i was the reigning chief of Kaua‘i from 1794-1825 (Kamakau 1961:169, 265). At this time “upward of 2,000 souls” resided in the valley in the villages of (listed *makai* to *mauka*) Naue, Pā‘ie‘ie, Maunaloa, Pali‘ele‘ele, Maunahina, Pōhakuloa, Opaikea, Hōmaikalani, and Lā‘au. Lydgate (1913) goes on:

> . . . Laau, the hamlet farthest *mauka* in the depths of the mountains, where the valley contracts to a narrow gorge, with a brawling stream running white in the bottom . . . All along up the river, wherever the encroaching *pali*s on either side leave the least available space, the land has been terraced and walled up to make ‘*lo‘is*.’ And so

> the whole valley is a slowly ascending stairway of steps, broad in tread and low in the rise, all the way to Laau, where the last available space was won, if not by dwarfs, at least by someone who understood this kind of agricultural engineering. These artificial lands have long since reverted to the wilderness from which they came, and it is only by chance that the traveler stumbles upon them, beating his way through the jungle. But they bear witness to a large population . . . [Lydgate 1913:126]

Bennett (1931:136), during his survey of Kauaʻi in 1928-1929, observed the remains of many terraced house sites and irrigated fields at Maunahina Ridge (Site 153), about 4½ miles from the sea. Interestingly, Maunahina is said to be the location of the ancient trail (Wichman 1985:114) that leads out of Wainiha, up to Kilohana at the north edge of the Alakaʻi Swamp, through Kōkeʻe and down to Waimea on the southwest side of the island. Undoubtedly, the trail was used to take advantage of the resources of Alakaʻi and as a shorter (however, more difficult) overland alternative route to Waimea. The use of this trail tempers the perception of Wainiha as simply a high-walled valley, open only at the shoreline, and perhaps was at least part of the incentive for habitation and development in the valley's upper reaches.

3.4 Other Cultural References

3.4.1 Rain Names of Waiʻoli

The rain that ripened the mountain apples of Waiʻoli (*Ka ua hoʻopala ʻohiʻa o Waiʻoli*) is referred to in the Lonoikamakahiki traditions (Kamakau 1961:52; Fornander 1919:4(2):358–359).

Wichman's (1985:49) account of *Waiʻoli* associates Lani-huli with the yellow rain called Ua-lena. Wichman (1998:113) relates that the rain associated with the massive mountain range of Nāmolokama is "Ua-lani-pili" ("rain of the near heavens").

3.4.2 Wind Names of Waiʻoli

Accounts of the *Legend of Kuapakaʻa* name the wind of Waiʻoli as "Waiamau" (*He waiamau ko Waiʻoli*) (Fornander 1917-1918:5(1):96-97). *The Epic Tale of Hiʻiakaikapoliopele* lists several winds of the area. Pele tells Lohiʻau "this is an area here on Kauaʻi with myriad winds. The land here on Kauaʻi with the most winds, however, is Wainiha. . . . Wainiha has thirty-two . . ." (Hoʻoulumāhiehie 2008:18).

> The wind of Nāmalokama is an Ualanipili
>
> The wind of Waiʻoli is a Huiwaiamau
>
> The man-smiting moss of Manuʻakepa is slick
>
> and slippery
>
> A wind of the sandy stretches of Manolau
>
> The wind of Kūpākoili is a Makaihuwaʻa
>
> The wind that takes hala blossoms, food of
>
> the kīnaʻu eel, is a Kalena
>
> 60. Urging on the people of the land

Here is Māpuana, taking all

And swimming off in the sea, sparing that land

The fish is a kīna ‘u eel

The wind of Waipa is an ‘Ōma‘okaulehua

The wind of Waikoko is a Māpuholo

The wind of Kiimaku‘u is a Moapali

The wind of Kalualanoho is a Kaupaku‘ole

The wind of Kahalahala is a Polipumehana

The wind of Kealahula is a Kaiko‘o

The wind of Pu‘uhinahina is a Kuhia

The wind of Kēwā is a Mahinakēhau

The wind of Lumaha‘i is a Haukōloa

The wind of Kuamaui is a Palekēwai

Floating on the windblown watercourses of Wainiha’s highlands

The water surges forth, rushing along with the wind

The winds of La‘a go amid the wild hē‘ī banana in the gulches

Over the streams rushing to the sea

The woman is of the shore, the woman is of the uplands

The winds of Lumahaa are doubly-blustering at the bays

High is the flight of the clouds in the heavens

Raised up by the winds of the land

Beloved land of Lumahaa, there beyond.

And finally the myriad winds of Wai‘niha

Here below are the winds as they were named by Pele, and it truly is a small land to be so buffeted

by winds, as will be seen.

The wind of Wainiha is a Ho‘opulukēwai

The wind of Wainiha is a Waianu

The wind of Wainiha is a Kuamauna

The wind of Wainiha is a Ka‘awakiki

The wind of Wainiha is a Pāpala‘ā

The wind of Wainiha is an Ākeakea

> The wind of Wainiha is a Paio
> The wind of Wainiha is a Māluali
> The wind of Wainiha is a Nihipali
> The wind of Wainiha is a Pāweo
> The wind of Wainiha is a Luluʻupali
> The wind of Wainiha is a Lehualāʻau
> The wind of Wainiha is a Hanakaipo
> The wind of Wainiha is a Peʻa
> The wind of Wainiha is a Maunahina
> The wind of Wainiha is a Puna
> The wind of Wainiha is a Kalalea
> The wind of Wainiha is a Hukia
> The wind of Wainiha is a Malama
> The wind of Wainiha is a Pueo
> The wind of Wainiha is an ʻAlihiwai
> The wind of Wainiha is a flying Lele wind
> The wind of Wainiha is a Kapaia
> The wind of Wainiha is an Amoa
> The wind of Wainiha is a Hīhīmanu
> The wind of Wainiha is a Likenōalike
> The wind of Wainiha is a Limunui. [Hoʻoulumāhiehie 2008:20–22]

3.4.3 Winds of Lumahaʻi

Accounts of the "Legend of Kuapakaʻa" name the wind of Lumahaʻi as "Haukolo" (Fornander 1917-1918:5(1): 96–97). Wichman (1998) reports that at Lumahaʻi:

> A special wind was *Kalena ka makani lawe pua halaʻai a ke kīnaʻu*, ʻ*Kalena* is the wind that strews the pandanus fruit eaten by *kīnaʻu* eels.ʼ The *kīnaʻu*, a small white eel, ate the *hala* fruit and in turn were eaten themselves. [Wichman 1998:117]

3.4.4 Terms of the *Mauka* Regions

There are many terms for rains in the *mauka* regions of the area. The cold weather, fog, and mist are also accompanied with rain patterns. Terms include *kiʻowao*, *koʻiawe, ʻawa, kēhau, kilihune*, *lelehune*, *noekolo, and uakoko,* which would apply to the terms of Wainiha Mauka (Pukui and Elbert 1986). These terms also apply to wet areas around the Hawaiian archipelago as well.

3.5 *ʻŌlelo Noʻeau*

Mary Kawena Pukui is known as one of the greatest contributors to the preservation of the Hawaiian language, a scholar, and ethnographer. Hawaiian knowledge was shared by way of oral history and many often competed in poetic battles of wit to see who could ascribe the most *kaona* to the simplest phrase. The following section draws from Pukui's knowledge of Hawaiian folk tales, proverbs, and sayings to describe the *ʻāina* (land) in the project area. The *ʻōlelo noʻeau* is first described, followed by the Hawaiian phrase and English translation.

3.5.1 *ʻŌlelo Noʻeau* of Waiʻoli Ahupuaʻa

3.5.1.1 Proverb #2860

When Kamehameha dreamed of his conquest of Kauaʻi, he mentioned the southernmost boundary of Waiʻoli, Namolokama, as one of the places he wished to enjoy:

> *E holo a inu i ka wai o Wailua, a hume i ka wai o Nāmolokama, aʻai i ka ʻanae ʻau of Kawaimakua i Hāʻena, a lei hoʻi i ka pahapaha o Polihale, a laila, hoʻi mai a Oʻahu, ʻoia ka ʻāina e noho ai*
>
> Let [us] go and drink the water of Wailua, wear a loincloth in the water of Nāmolokama, eat the mullet that swim in Kawaimakua at Hāʻena, wreathe [ourselves] with the seaweed of Polihale, then return to Oʻahu, the land to dwell upon. [Pukui and Elbert 1986:271]

Another saying is: "ʻUʻina ka wai o Nāmolokama," [The water of Nāmolokama falls with a rumble] because because Nāmolokama Falls, Kauaʻi is famous in chants and songs (Pukui 1983:313).

3.5.2 *ʻŌlelo Noʻeau* of Waipā Ahupuaʻa

3.5.2.1 Proverb #1107

The following proverb describes the wind of the area:

> *Hoopāpā i Waipā ka Lūpua.*
>
> **The Lūpua wind touches at Waipā.**
>
> Said of one who cannot refrain from touching or pawing. Waipā is the name of a wind and location on Kauaʻi. [Pukui 1983:118]

3.5.3 *ʻŌlelo Noʻeau* of Lumahaʻi Ahupuaʻa

3.5.3.1 Proverb #1778

The following proverb describes shells native to Kauaʻi island used for the craft of hat bands:

> *Ke one lei pūpū o Waimea.*
>
> **The sand of Waimea, where shells for lei are found.**
>
> Waimea, Oʻahu, and Lumahaʻi, Kauaʻi, were the two places where the shells that were made into hat bands were found. Those on Oʻahu were predominantly white and those on Kauaʻi, brown. Not now seen. [Pukui 1983:191]

3.5.4 *ʻŌlelo Noʻeau* of Hanalei Ahupuaʻa

3.5.4.1 Proverb #404

The following *ʻōlelo noeau* discusses a *moʻolelo* concerning the *aliʻi* of Hanalei and his land:

> *Haehae ka manu, ke ʻale nei ka wai.*
>
> **Tear up the birds, the water is surging.**
>
> Let us hurry, as there is no time for niceties. Kaneʻaloha and his son lived near the lake of Halulu at Waiʻaleʻale, Kauaʻi. They were catchers of *ʻuwaʻu* birds. Someone falsely accused them of poaching on land belonging to the chief of Hanalei, who sent a large company of warriors to destroy them. The son noticed agitation in the water of Halulu and cried out a warning to his father, who tore the birds to hasten cooking. [Pukui 1983:50]

3.5.4.2 Proverb #1442

This *ʻōlelo noʻeau* discusses the *limu* of Hanalei:

> *Ka limu kā kanaka o Manuʻakepa.*
>
> **The man-throwing algae of Manuʻakepa.**
>
> Hanalei, Kauaʻi, was known for its pouring rain. A slippery algae grows among the grasses on the beach, and when carelessly stepped on, it can cause one to slip and fall. This algae is famed in songs and chants of that locality. [Pukui 1983:156]

3.5.4.3 Proverb #1584

The following describes the rain of the *ahupuaʻa*:

> *Ka ua loku o Hanalei.*
>
> **The pouring rain of Hanalei.** [Pukui 1983:170]

3.5.4.4 Proverb #1787

This proverb describes the deameanor of a person as well as a *wahi* (place) in Hanalei Valley:

> *Kiʻekieʻe Kaupoku-o-Hanalei.*
>
> **High up is Kaupoko-o-Hanalei.**
>
> Said of the haughty, conceited, or willful. Kaupoku-o-Hanalei is a ridge behind Hanalei Valley, Kauaʻi. [Pukui 1983:192]

3.5.4.5 Proverb #2034

The proverb below describes an expression related to the rain of Hanalei:

> *Luʻuluʻu Hanalei i kaua nui; kaumaha i ka noe o Alakaʻi.*
>
> **Heavily weighted is Hanalei in the pouring rain; laden down by the mist of Alakaʻi.**

And expression used in dirges and chants of woe to express the burden of sadness, the heaviness of grief, and tears pouring freely like rain. Rains and fogs of other localities may also be used. [Pukui 1983:219]

3.5.4.6 Proverb #2151

The following *ʻōlelo noʻeau* is an expression related to Hanalei Ahupuaʻa:

Meʻe uʻi o Hanalei.

The handsome hero of Hanalei.

Said of one who is attractive. [Pukui 1983:234]

3.6 *Mele Oli*

3.6.1 *He Oli*

The following *mele oli* describes a part of a rainy valley within Hanalei Ahupuaʻa, which neighbors Waiʻoli Ahupuaʻa to the east:

He Oli

Halau Hanalei i ka nini a ka ua;
Kumano ke poʻo-wai a ka liko;
Naha ka opi-wai a Wai-aloha;
O ke kahi koe a hiki i Wai-oli.
Ua ike ʻa.

<u>Translation</u>
A Song

Hanalei is a hall for the dance in the pouring rain;
The stream-head is turned from its bed of fresh green;
Broken the dam that pent the water of love—
Naught now to hinder its rush to the vale of delight.
You've seen it.
[Emerson 1965:155]

3.6.2 Waipā

Waipā is the *ahupuaʻa* that extends from the *mauka* areas of the Haleleʻa Forest Reserve in the Hanalei district to the *makai* access to the sea (Pukui et al. 1974:226). The following is a poetic verse describing the fragrant *hala* which grows along the banks of the stream in Waipā.

Hoohiki oe a hihi
I lei kohu no neia kino.
Ahea oe hiki mai?
Akau ka La i na pali;
Ka huli a ka makani Wai-a-mao,
Makemake e iki ia ka Hala-mapu-ana,
Ka wai halana I Wai-pā.

Translation
Entwine them into garland,
Fit emblem and crown of our love.
And what the hour of your coming?
When stands the Sun o'er the pali,
When turns the breeze of the land,
To breathe the perfume of hala,
While the currents swirl at Wai-pā.
[Emerson 1965:133–134]

3.7 Mele

There are several *mele* that concern or mention the various *ahupuaʻa* in Haleleʻa Moku, presented below.

3.7.1 Lumahaʻi

The following *mele* by Alfred Alohikea, transports the reader to the beaches of Kauaʻi and describes the areas via proverbs and poetical phrases. The third verse is about Lohiʻau, the prince of Kauaʻi who resides in Hāʻena Ahupuaʻa and was the lover of the fire goddess, Pele. Pele's youngest sister, Hiʻiaka, was sent to Kauaʻi to escort Lohiʻau back to her sister on Hawaiʻi Island. The seaspray represents the hardships encountered on the voyage as well as Lohiʻau's changing attitude between the two sisters.

Hanohano Hanalei i ka ua nui
He pakika i ka limu o Manuʻakepa

ʻAuʻau i ka wai ʻo Lumahaʻi
Ka lehua maka noe o Luluʻupali

Eʻena Hāʻena i ka ʻehu kai
A he aha la o ka hana Lohiau ipo

Haʻina ʻia mai ana ka puana
He pakika i ka limu o Manuʻakepa

Translation

Famous is Hanalei for much rain
Slippery the seaweed of Manuʻakepa

Bathed in the water of Lumahaʻi
Is the misty-faced lehua of Luluʻupali

Haʻena is fearful, because of the seaspray
And what is Lohiau ipo's work

The story is told

Slippery the seaweed of Manuʻakepa
[Huapala 2015]

3.7.2 Nāmolokama

The *mele* in manuscript below by Alfred Alohikea was found in Hilo. Nāmolokama is the name of a waterfall in the Nāmolokama Mountains located within Hanalei Valley.

Kani ʻuʻina lā
Ka wai aʻo Nāmolokama
Nākolo e oeoe nei i
Ke alo o nō pali
Hoʻohākuʻi ana i ka pae ʻōpua
Hoʻohihi wale aku nō wau i laila

Hui:
ʻUʻina ʻuʻina ʻuʻina
Ka wai aʻo Nāmolokama

ʻUʻina ʻuʻina ʻuʻina
Nākolo e, nākolo lā
Nākolo e, nākolo lā

<u>Translation</u>
Rumbles
The waterfall of Nāmolokama
It roars before
The face of the cliffs
The sound reaches the cloud banks
How I long to be there again

Chorus:
Rumbles, rumbles, rumbles
the waterfall of Nāmolokama rumbles
Rumbles, rumbles, rumbles
Roars, roars,
Roars, roars
[Huapala 2015]

Section 4 Historical Accounts

4.1 The Māhele and the Kuleana Act

In the mid-1800s (1845 and 1846), through the Organic Act, Kamehameha III decreed a division of lands called the Māhele which introduced private property into Hawaiian society (Chinen 1958). In 1848, lands were divided into three portions: crown lands, government lands, and lands set aside for the chiefs. Individual plots, called *kuleana* (Native Hawaiian land rights) awards, were granted within these divided lands to native inhabitants who lived on and farmed these plots and came forward to claim them. The population during this time period is unknown. A population distribution map by Coulter (1931) (Figure 14) indicates estimates for the population of Kauaʻi ca. 1853, "concentrated chiefly on the lower flood plains and delta plains of rivers where wet land taro was raised on the rich alluvial soil" (Coulter 1931:14). Table 1 summarizes the Land Commission Awards (LCA) in the Haleleʻa District.

Maly and Maly (2003) provide information regarding *Māhele ʻĀina* of Waipā Ahupuaʻa:

- James Kanehoe the son of John Young, foreign advisor to Kamehameha I, Kanehoa accompanied Liholiho to England and was his translator. He was *konohiki* [land overseer] of Waipā at about 1839.
- Koukou *konohiki* under Kanehoa in the 1840s; and
- Kamokuhina *konohiki* at the time of LCAs.

> DISPOSITION OF LANDS: THE MĀHELE ʻĀINA AND DEVELOPMENT OF FEE-SIMPLE PROPERTY AND FISHERY RIGHTS (CA. 1846-1855) By the middle 1840s, the Hawaiian system of land tenure was undergoing radical alteration, and the Hawaiian system of land and fishery rights being defined and codified. The laws set the foundation for implementing the Māhele ʻĀina of 1848, which granted fee-simple ownership rights to the *hoaʻāina* (common people of the land, native tenants). The records of the Māhele are of great importance, as they identify families associated with lands; describe practices on the land; and some, also identify fishery resources. During the Māhele at least 251 claims were registered for *kuleana* (by native tenants) and *ahupuaʻa* (by *aliʻi* or *konohiki*) in the Haleleʻa District; of those claims, 194 were awarded. Thus, 57 applicants either withdrew their claims (many died in the process), or had their claims rejected as not being justified (Hawaii State Archives (HAS) Interior Department digitized records of claims in the collection of Kumu Pono Associates LLC and Hawaii Board of Commissioners Indices of Awards 1929). Only two claims were located for land in the Nāpali District. One being made by Hawele, for a parcel at Wailaulau (not awarded), the *ahupuaʻa* name not being given; and the other, being one-half of the ahupuaʻa of Hanakoa, awarded to Mokuohai (Buke Mahele 1848:76); who was also a resident landlord in the Kēʻē vicinity. [Maly and Maly 2003:6, 8, 18, 20, and 27–28]

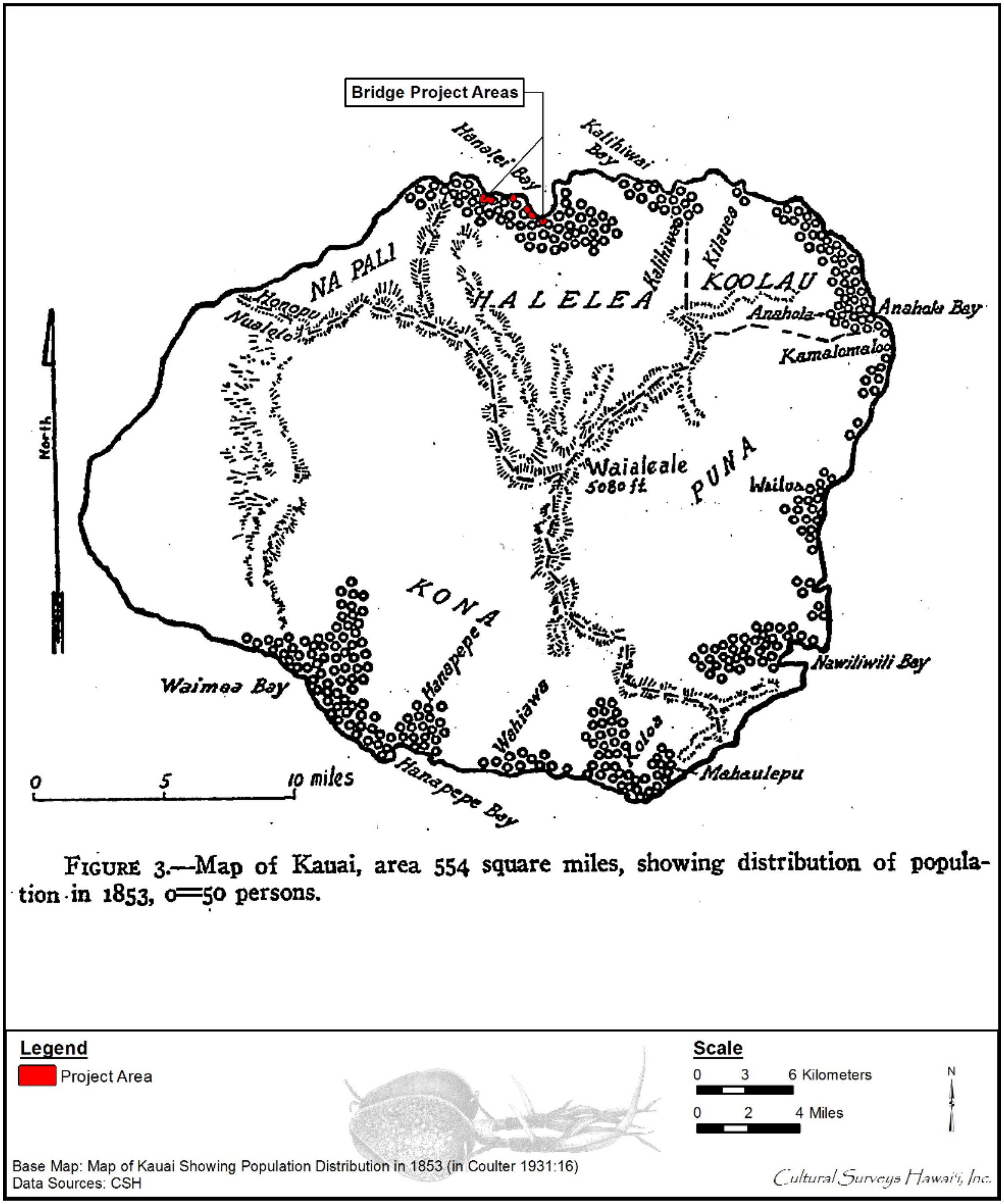


Figure 14. Map showing population estimate for Kaua'i in 1853 (Coulter 1931:16)

Of the lands in the Haleleʻa District, the following list identifies the *ahupuaʻa*, number of claims made, and number of awards issued in each *ahupuaʻa:*

Table 1. Summary of LCAs in the Haleleʻa District

Ahupuaʻa	Number of Claims	Number of Awards	*Aliʻi* Claimant
Haʻena	34	25	A. Paki
Hanalei	75	57	Kamehameha III/ Government
Kalihikai	15	14	A. Kealiiahonui
Lumahaʻi	2	1	L. Konia
Waikoko	2	1	M. Kekauonohi
Wainiha	43	33	M. Kekauonohi
Waiʻoli	66	51	Kamehameha III/ Government
Waipā	14	12	R. Keʻelikōlani and J.Y. Kanehoa

Researching the claims and testimonies given in the mid-1800s can sometimes assist in forming a settlement pattern for the region at that time and possibly earlier. Thus, it is through records for LCAs generated during the Māhele that specific documentation of traditional life in Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa comes to light. Fisheries, as well as land uses, are described in the *Māhele ʻĀina*. M. Kekuanaoa; to Keoni Ana:

> I, M. Kekuanaoa, make known the prohibited fish of the lands of V. Kamamalu, and Ruta Keelikolani, on the island of Kauai . . . R. Keelikolani Apana 5: Waipa Hee. [Hawaiʻi State Archives Interior Department – Lands Document]

4.1.1 The Māhele and the Kuleana Act of Waiʻoli

From the LCA testimony, it seems that by 1850 the people in the district have a tradition of shared resources and functioned as part of the larger district entity rather than maintaining a separate *ahupuaʻa* status. Even though neighboring *ahupuaʻa* would have had their own resources, LCAs show some persons had agricultural land in Waiʻoli but lived elsewhere, and some people living in Waiʻoli had agricultural land elsewhere. During early historic times Waiʻoli served as a nucleus of not only the new western culture and religion, but also as a resource garden for imported cultigens in the vicinity of the Waiʻoli Mission.

The Land Commission Awards describe at least 154 taro *loʻi* along the Waiʻoli Stream, the *ʻauwai* (irrigated ditch) systems, and Waikonono Stream, another small stream leading eventually down to the floodplain on the Nāpali side of Waiʻoli Stream. There are 26 claims for house lots in Waiʻoli with 12 persons claiming they live in Hanalei (LCAs 4109, 9139, 9261, 9274, 9275, 9276, 9278, 9280, 10593, 10594, 10915, and 11059) but have their *loʻi* in Waiʻoli. Another claimant has a house lot in Waiʻoli but the rest of his land is in Hāʻena (LCA 7949). Various other claimants mention they live in Waiʻoli but do not claim a house lot. There are claims for 27 *kula* (pasture) in Waiʻoli. There are no specified crops listed for any of the *kula*, but based on traditional *kula* lands, there would be sweet potatoes, yams, bananas, and sugarcane. One claimant mentions a *muliwai* (or brackish water pond behind the sand dunes used for fishing; LCA 3781), and two mention a fishpond (LCAs 4109, 10309). The Land Commission Awards also include one for the Waiʻoli

Mission, where claim is for a framed schoolhouse, pasture land and cultivated grounds, a 4-acre taro patch, a Native Church on 1/2 acre, and pasture land on the narrow strip on the western side of the Waiʻoli River.

Waiʻoli, with 3,350 acres, has 154 claims for *loʻi*, which works out to .046 *loʻi* per acre for the entire *ahupuaʻa* or probably 1.5 per acre on the 100 acres of floodplain. *Loʻi* represent 74% of possessions claimed, *kula* 13%, house lots 12.6%, and other less than 1%. A scant 14% of the awardees claimed to have held the land prior to 1824. A quarter of the claimants received their land during the time of avida Papohaku, *konohiki* of Waiʻoli from 1834-1837. Davida Papohaku or David Stonewall was one of the five members who came with Rev. Whitney to help organize the Waiʻoli Mission and it was his duty to correct and help Mr. Alexander translate his sermons into Hawaiian. He came with 75 of his own retainers and they formed the little village of thatched huts known as Kalema or Bethlehem (Damon 1931:325). Perhaps these claimants' families came with Papohaku to the Hanalei area and were part of his train. Another fifth of the claimants received their land from Daniela Oleloa, a *konohiki* in the 1840s. Oleloa did not have a very high genealogy but he held four lands prior to the Māhele (Kamēʻeleihiwa 1992:280). There are 88 names mentioned in the LCAs as neighboring land cultivators or house lot holders and some of these persons received grants to the land, such as Emelia but have no LCA listed for them. Others like Lewi and Kalili are shown in the LCA index as having received land, but no maps show them as having title to the land (at least by 1912). We might assume they died, perhaps intestate, or perhaps they have passed the land to someone else. In any case someone else is shown occupying the land they claimed. Table 2 summarizes the LCAs along the highway in and around the environmental study area of Waiʻoli for the current proposed project.

Table 2. LCAs along Kūhiō Highway in Waiʻoli, from East to West

LCA # TMK or maps	**Awardee**	***Ahupuaʻa* and *ʻIli***	**Land Use**	**Landscape Features**	**Amount**
387 Lydgate 1912 map	ABCFM (American Board of Commissioners for Foreign Missions)	Waiʻoli	Waiʻoli Mission residence, church schoolhouse, pasture land, and cultivated land	On the narrow strip of land on the western side of Waiʻoli River	9.79 acres
10305	Nahau, D.	Waiʻoli	House lot	Government road, jail house	2 acres, 3 roods 2 rods
3781 5-5 Lydgate 1912	Opio	Waiʻoli Manuakepa	House lot	Road	2 acres, 15 rods

LCA # TMK or maps	**Awardee**	***Ahupuaʻa* and *ʻIli***	**Land Use**	**Landscape Features**	**Amount**
9833B 5-5 Lydgate 1912	Pepee	Waiʻoli, Kapanoa, Kuloko, Nanipoa, Nanihoa	House lot	Government road, *muliwai*	2 acres, 17 rods
4075 5-5 Lydgate 1912 map	Koi and Kapela	Waoili Kapuoa	House lot	Government road, *muliwai*	1 rood 1 rod
10663:2 5-6-004	Puaiki	Waiʻoli	Five *loʻi* in Waiʻoli	Five *loʻi*	Unknown

4.1.2 The Māhele and the Kuleana Act of Waipā and Waikoko

Waipā Ahupuaʻa was awarded to Ruta Keʻelikōlani, great-granddaughter of Kamehameha I, during the Māhele: LCA 7716:1, TMK: 5-6-04, which became part of the Bishop Estate. It was one of 12 lands she retained, the majority of which were located on Hawaiʻi Island and Maui (Dye 2004:8). Eleven individuals were awarded lands in Waipā Ahupuaʻa. Table 3 summarizes the LCAs along the highway in and around the study area of Waipā for the current project. There were two names mentioned in Waikoko Ahupuaʻa but only one was awarded. LCA 11216 was given to M. Kekauonohi, great-granddaughter of Kekaulike, King of Maui, and granddaughter of Kamehameha the Great. No land use or landscape features were given. Figure 15 illustrates LCAs awarded in Waiʻoli, Waipā, and Waikoko Ahupuaʻa.

Table 3. LCAs Along Kūhiō Highway in Waipā and Waikoko, from East to West

LCA # TMK or maps	**Awardee**	***Ahupuaʻa* and *ʻIli***	**Land Use**	**Landscape Features**	**Amount**
3781:3 5-6-004	Opio	Waipā	Fishpond and *loʻi*	Public road and *pali*	Two *ʻāpana* (parcel); 2 acres 15 rods
10171 5-6-004	Mana (not Waiʻoli Mission and not 1071)	Waipā Haʻaheo	House lot (TMK gives 0.25 acres)	Public road and Makanui	One *ʻāpana*; 1 rood
10076:2 5-6-004	Makanui	Waipā Kiwaa, Haʻaheo	Four *loʻi*, *kula*, and house lot (TMK gives 0.25 acres)	Government road, *muliwai*, *hau*	One *ʻāpana*; 3 roods 14 rods

LCA # TMK or maps	Awardee	*Ahupua‘a* and *‘Ili*	Land Use	Landscape Features	Amount
9118:2 5-6-004	Koukou	Waipā	House lot (TMK gives 0.25 acres)	*Makai* by beach, government road	Two *‘āpana*; 1 rood 33 rods
9832:3	Kupukupu	Waipā Haako	House lot	*Mauka* foot path; *makai* beach	No amount given
7918:2 5-6-004	Kanohokou	Waipā Kapuhae, Kuhihiilu, Kawaihine	House lot in Kapuhae	*Mauka* public road; *makai* sea beach	One *‘āpana*; 1 rood 8 rods
235N:2 5-6-004	Nuuanu	Halaloa, Puaanui	*Kula* and two *lo‘i*		One *‘āpana*; 6 acres 1 rood 31 rods
10663:2 5-6-004	Puaiki	Waipā Wai‘oli	House lot in Waipā		No amount given
7716:1 5-6-003	R. Keelikolani	Waipā Ahupua‘a			No amount given
11216:4 5-6-003	M. Kekauonohi	Waikoko Ahupua‘a			476 acres

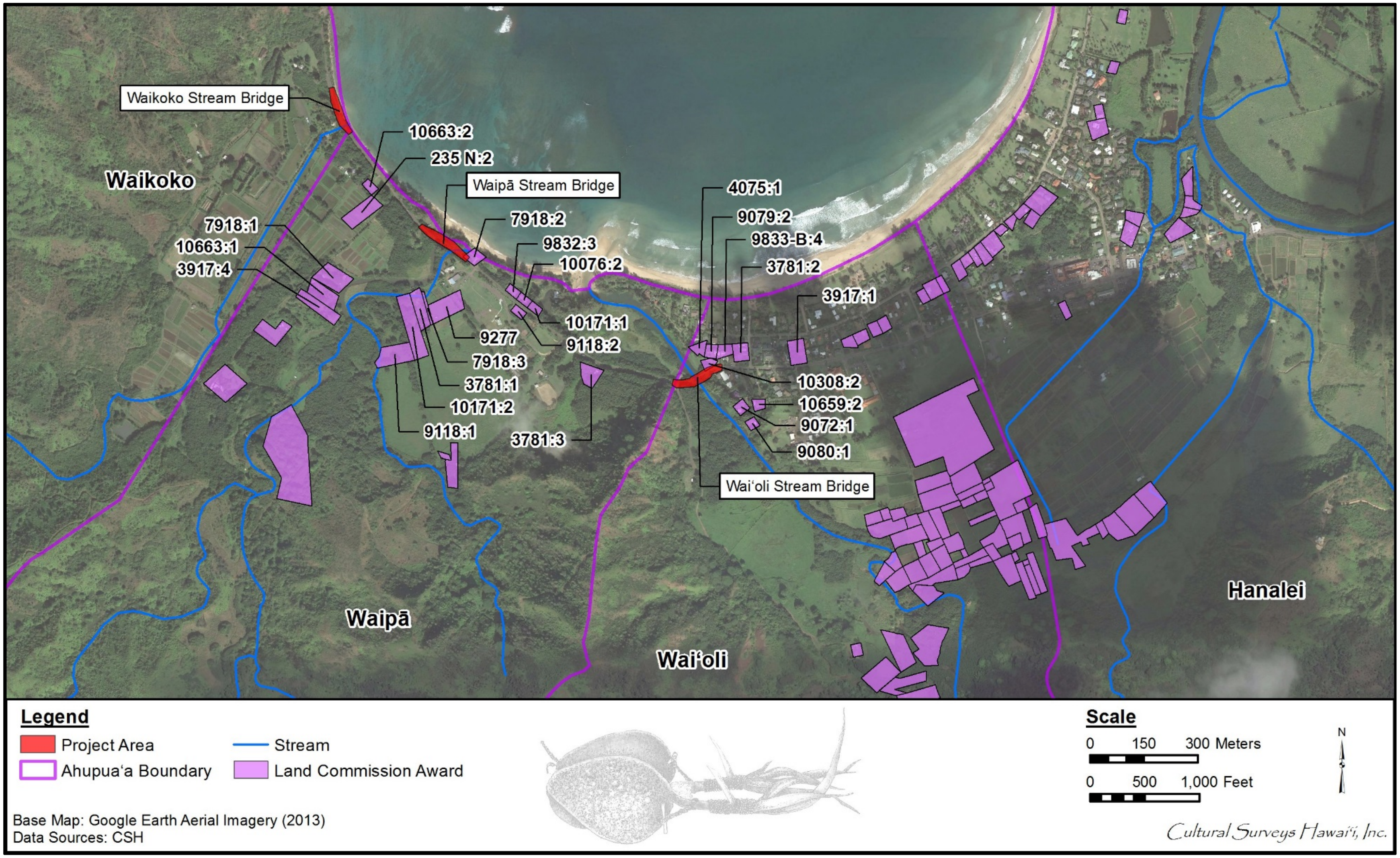


Figure 15. 2013 Google Earth Aerial Imagery with LCA overlay spanning Wai‘oli, Waipā, and Waikoko Ahupua‘a

4.1.3 The Māhele and the Kuleana Act of Wainiha

Wainiha is part of a larger LCA (11216.5) of M. Kekauʻōnohi, great-granddaughter of Kekaulike, King of Maui and granddaughter of Kamehameha the Great. A study of all the claims and their supporting testimony for Wainiha shows a well-developed land system in place. The overall settlement pattern, dating to the mid-1800s, exhibited habitation near the coast and agricultural undertakings in the well-watered interior areas. During his island-wide survey of Kauaʻi in 1928-1929, Bennett (1931:136) observed the remains of many terraced house sites and irrigated fields at Maunahina Ridge (Site 153), about 7.2 km (4.5 miles) from the sea. Maunahina is said to be the location of the ancient trail (Wichman 1985:114) that leads out of Wainiha, up to Kilohana at the north edge of the Alakaʻi Swamp, through Kōkeʻe and down to Waimea on the southwest side of the island, used to take advantage of the resources of the Alakaʻi and as an overland alternative route to Waimea. Earle's (1978:58–67, 126) analysis of the Land Commission Awards of 1850 shows that by that time, far inland sites were already abandoned and active use of the valley extended only about 2.4 km inland from the sea. At Wainiha, Earle's field survey identified six separate irrigation systems. Table 4 summarizes the LCAs along the highway in and around the proposed project area of Wainiha, also illustrated in Figure 16.

Table 4. LCAs along Kūhiō Highway in Wainiha, from East to West

LCA # TMK	**Awardee**	***Ahupuaʻa* and *ʻIli***	**Land Use**	**Landscape Features**	**Amount**
9169:2 5-8-011	Kealai	Wainiha Kaili, Naue	House lot, *loʻi*, and *kula*	2) Napali by water course; Koʻolau by rook Laukalo	No amount given
11216:5 5-8-011 and 012	M. Kekauonohi	Wainiha Ahupuaʻa			No amount given
9171:1 5-8-007	Keaka	Wainiha Kapaloa, Puhalanui, Kapaele, Ulukea	1) house lot and farming pasture (TMK is 3.575 acres) 2) *kula* 3) three *loʻi* 4) one *loʻi* 5) one *loʻi*	Bounded *makai* and Koʻolau by Wainiha River	Five *ʻāpana*
9184:2 5-8-006	Kamoolehua	Wainiha Kapohaku	1) house lot 2) two *loʻi* (TMK is 0.217 acres)	2) Napali by ditch, Koʻolau by Wainiha River	Two *ʻāpana*, 1 acre 34 rods
9267:2 5-8-006	Pumaia	Wainiha Kaeleele, Paulihu	1) house lot in Paulihu 2) three *loʻi* and *kula* in Kaeleole	No. 2 bounded by *loʻi*, watercourse, and *konohiki kula*	No amount given

LCA # TMK	**Awardee**	***Ahupuaʻa* and *ʻIli***	**Land Use**	**Landscape Features**	**Amount**
9271:1 and :2 5-8-006	Kapuumaka	Wainiha Kaeluku, Umi	1) house lot in Kaaluhee 2) four *loʻi* in Umi		Two *ʻāpana* in Umi 2.25 acres
9270:1 5-8-006	Kiwaa	Wainiha Kaeleele, Kaluhea	House lot in Kaelieli, two *loʻi*	*Mauka* church yard and road; Napali, church *makai* Wainiha river; Koʻolau Kaahoku brook	One *ʻāpana*, 1 rood 28 rods

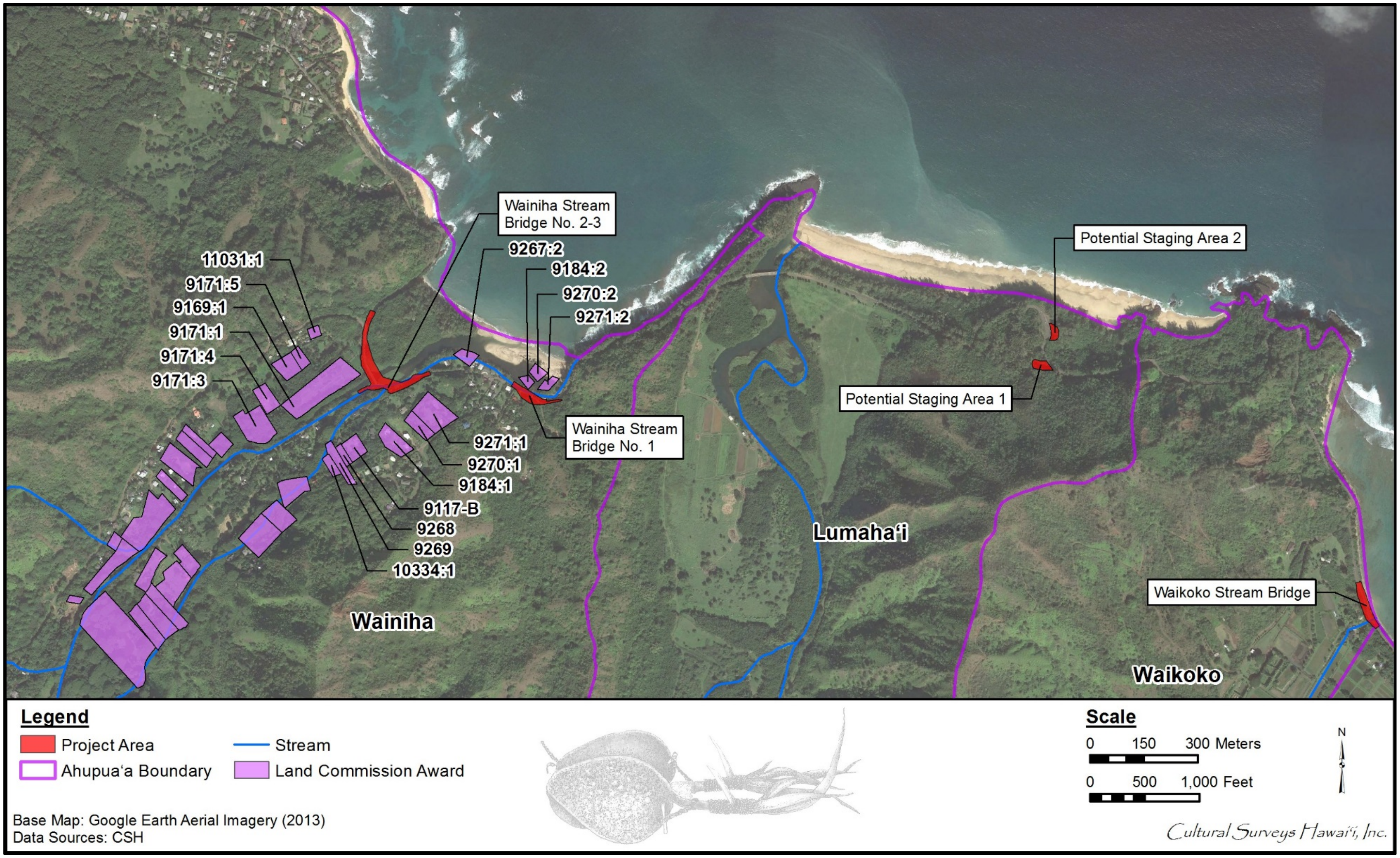


Figure 16. 2013 Google Earth Aerial Imagery with LCAs found in Wainiha Ahupua'a

4.1.4 The Māhele and the Kuleana Act of Lumaha‘i

Basic *kuleana* documentation specifies that the entire *ahupua‘a* was awarded to L. Konia Wahine. No individual *kuleana* are indicated by the Māhele data to date. In addition to the irrigated fields of *kalo*, it can be assumed that all the common Hawaiian agricultural crops were raised in Wainiha. Handy and Handy (1972) state the following:

> There were, of course, house sites all through the valley on ground not suitable for irrigation. On such land sweet potatoes were planted. Bananas flourished: in 1931 *mai‘a Poloapola* (Borabora banana, *musa pehi*) was found in gulches. This Tahitian banana, which bears its fruit on an upright stalk, is said by local Hawaiians to be indigenous to Wainiha. *‘Awa* of several varieties was growing there also, and undoubtedly the economic staples *wauke* and *olona* were planted. Specimens of yams were collected in 1931. [Handy and Handy 1972:420]

The *Foreign Testimony* (1850) presented before the Land Commission indicates Hawaiians were also raising more recently introduced crops such as oranges and coffee. The cultivation of rice came to Wainiha like to many other *kalo*-growing areas in Hawai‘i, during the late 1800s. Immigrant Chinese rice growers took over former *lo‘i* devoted to *kalo* and founded a major cash crop industry catering to Hawai‘i’s growing Asian population (Coulter and Chun 1937:21).

Table 5. LCAs along Kūhiō Highway in Lumaha‘i, from East to West

LCA # TMK or maps	Awardee	*Ahupua‘a* and *‘Ili*	Land Use	Landscape Features	Amount
5224:7 5-7-001	L. Konia Wahine	Lumaha‘i Ahupua‘a			No amount given

4.2 The Boundary Commission Reports for Kaua‘i (1873)

Following the Māhele, there arose a need to define the boundaries and rights of *ahupua‘a* awarded or sold to large private owners, mostly *ali‘i* (Waihona ‘Aina 2000). As a result, a Commission of Boundaries was formed, and testimonies from elder native residents was taken. A thorough review of all records of the Boundary Commission was made as a part of this study. Narratives describing boundaries of the lands of Lumaha‘i, Wai‘oli, Waipā (Waipaa) (all 1873) appear in Appendix B. These narratives include testimonies describing land features, *wahi pana* (storied places), and the original survey notes for the named lands. In the previous period, or as a part of the proceedings, maps were also produced in conformance with the testimonies and Certificate of Boundaries.

Duncan McBryde was the Commissioner of Boundaries for the Island of Kaua‘i in 1873. Edwin O. Hall requested the boundaries of Wai‘oli but the report did not state whether he was the owner. The boundaries for the *ahupua‘a* of Waipā were requested on behalf of Her Excellency, R. Keelikolani, who was the owner of the land; Lumaha‘i was owned at this time by Charles R. Bishop.

4.3 Late 1800s to Modern Land Use

4.3.1 Late 1800s to Modern Land Use in Waiʻoli

Karol Haraguchi (1987) brackets the rice-growing period from the mid-1860s—at the end of the whaling industry—until the 1920s, when California rice began to take over the Hawaiian rice market. The Hanalei Valley of Kauaʻi led all other single geographic units in the amount of acreage planted in rice (Figure 17 and Figure 18). The development and maintenance of the Kūhiō Highway facilitated the export of surplus crops grown in Haleleʻa (Figure 19). The valley was one of the first areas converted to this use and continued to produce well into the 1960s. Haraguchi notes that Chinese immigrants, who first arrived as contract laborers in 1852, worked most of the rice fields. It was not until after 1882 that Japanese workers supplanted the Chinese labor force in Hawaiʻi. Haraguchi documents the revival of the Hawaiʻi rice industry in 1906, 1933, and 1934, which was especially fruitful in the remote Hanalei Valley where at the time there were no competing demands for the land. Aerial photographs of the project areas in the 1950s show the predominance of agricultural-oriented land use in and in the vicinity of the project areas. By 1985 there is no trace left of the rice fields (Haraguchi 1987:xiii-xv). The production fell off rapidly by 1927 when the stem borer appeared (Territory of Hawaii 1939:95). Figure 20 and Figure 21 illustrate the changes from 1910 to the mid-1960s, especially in the Hanalei area where there is more development. Figure 22 through Figure 24 focus on the project areas.

4.3.2 Late 1800s to Modern Land Use in Waipā and Waikoko

As with Lumahaʻi, the historical records for Waipā were briefly examined and no modern history details had been written for this *ahupuaʻa*. However, Waipā Ahupuaʻa most likely took part in the broad changes that swept Haleleʻa after 1850. Early missionary census records for Waipā Ahupuaʻa indicate the population was declining in the decades before the Māhele. The 1835 census records show 85 people (73 adults and 12 children) living in Waipā Valley. By 1847, the population of Waipā had declined to 66 people. Between 1853 and 1896, population statistics collected by the Hawaiian Kingdom indicated a population in Hanalei and Koʻolau that fluctuated between a low of 1,558 people in 1872 and a high of 2,775 people in 1896 (Dye 2004a:14). In the first half of the twentieth century, the United States census indicated a relatively stable population with a high of 2,630 people in 1900 and a low of 2,065 people in 1940 with a rapid population decline in 1960 falling to 1,312 people (Dye 2004a:14).

4.3.2.1 Historic Taro Production in Waipā

Handy and Handy (1972:420) briefly discuss taro production in Waipā: "Below Hanalei and a little to the west of it on the bay is a compact area of terraces watered by Waipā stream." However, they reprint a reminiscence of an early resident (Lydgate 1913) concerning the terraces of Wainiha Ahupuaʻa, in the same district.

> All along the river, wherever the encroaching *palis* on either side leave the least available space, the land has been terraced and walled up to make ʻ*lois*.ʼ And so the whole valley is a slowly ascending stairway of steps, broad in the tread and low in the rise, all the way to Laau. [Lydgate 1913:125–127]

Figure 17. Photo of Haraguchi Rice Mill, n.d. (Library of Congress 2016)

Figure 18. Photo of Hanalei Valley with *loʻi*, n.d. (Library of Congress 2016)

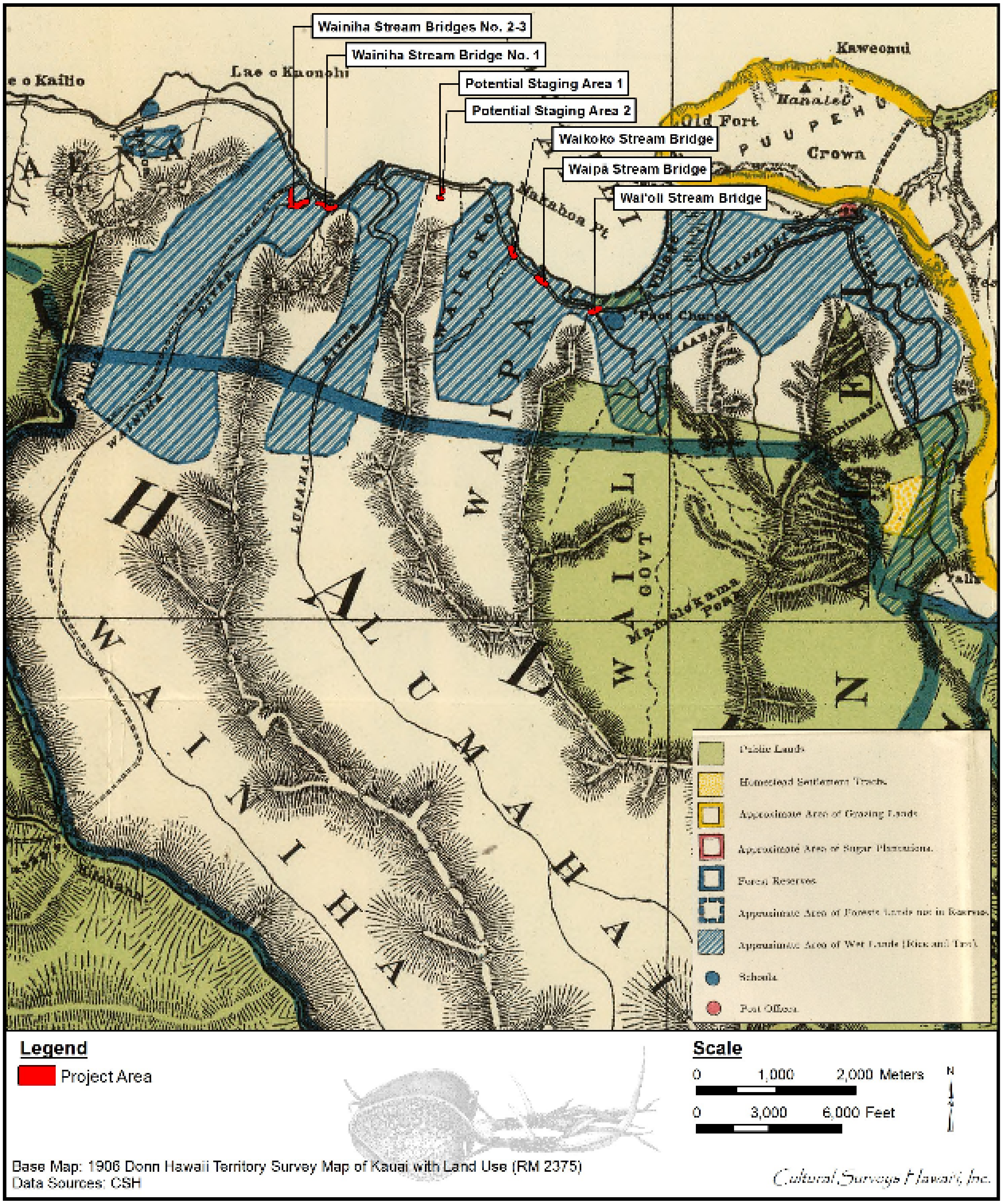


Figure 19. Portion of the 1906 Donn Hawaii Territory Survey Map of Kaua'i with land use

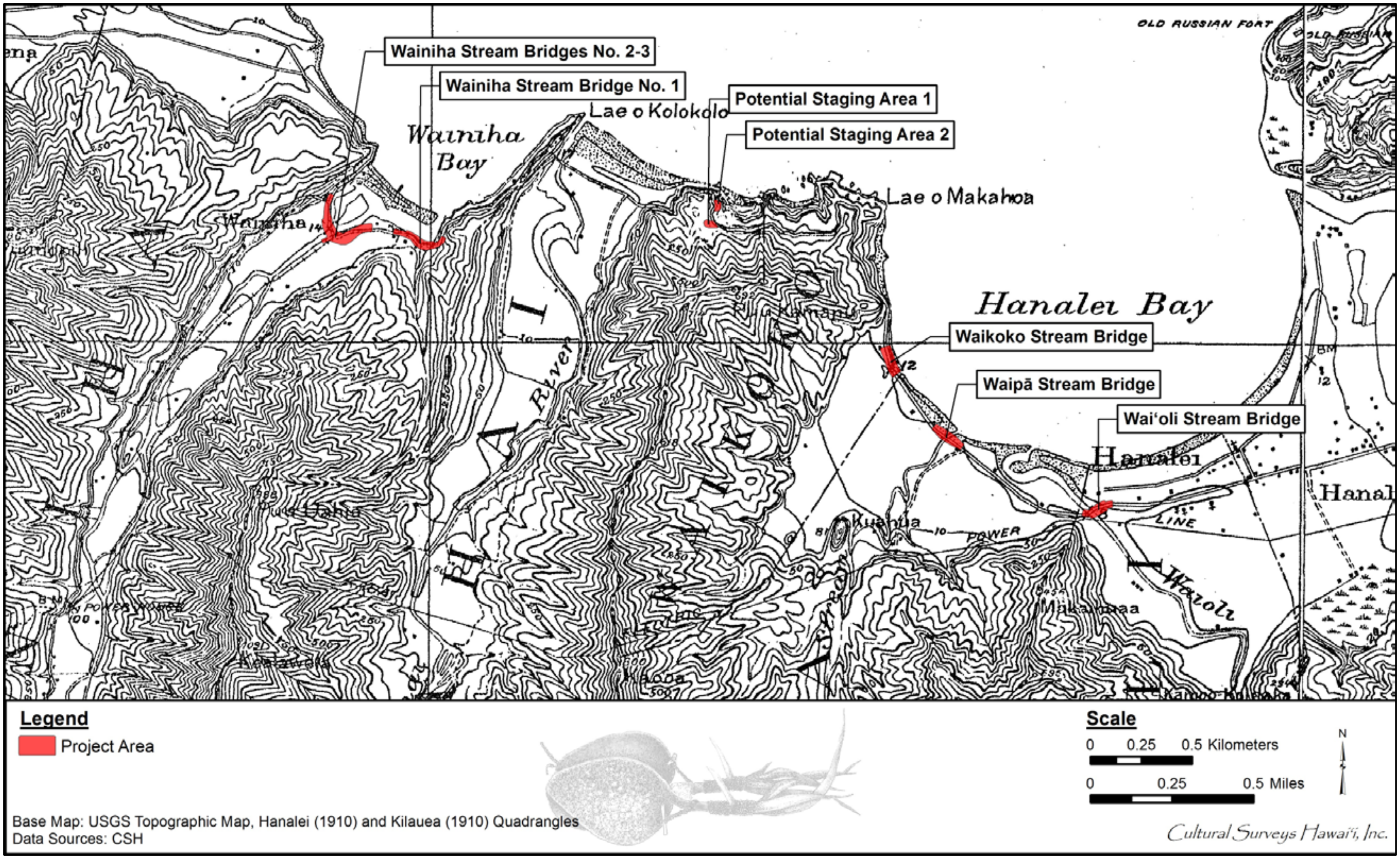


Figure 20. Portion of the 1910 Hanalei and Kilauea USGS topographic quadrangles

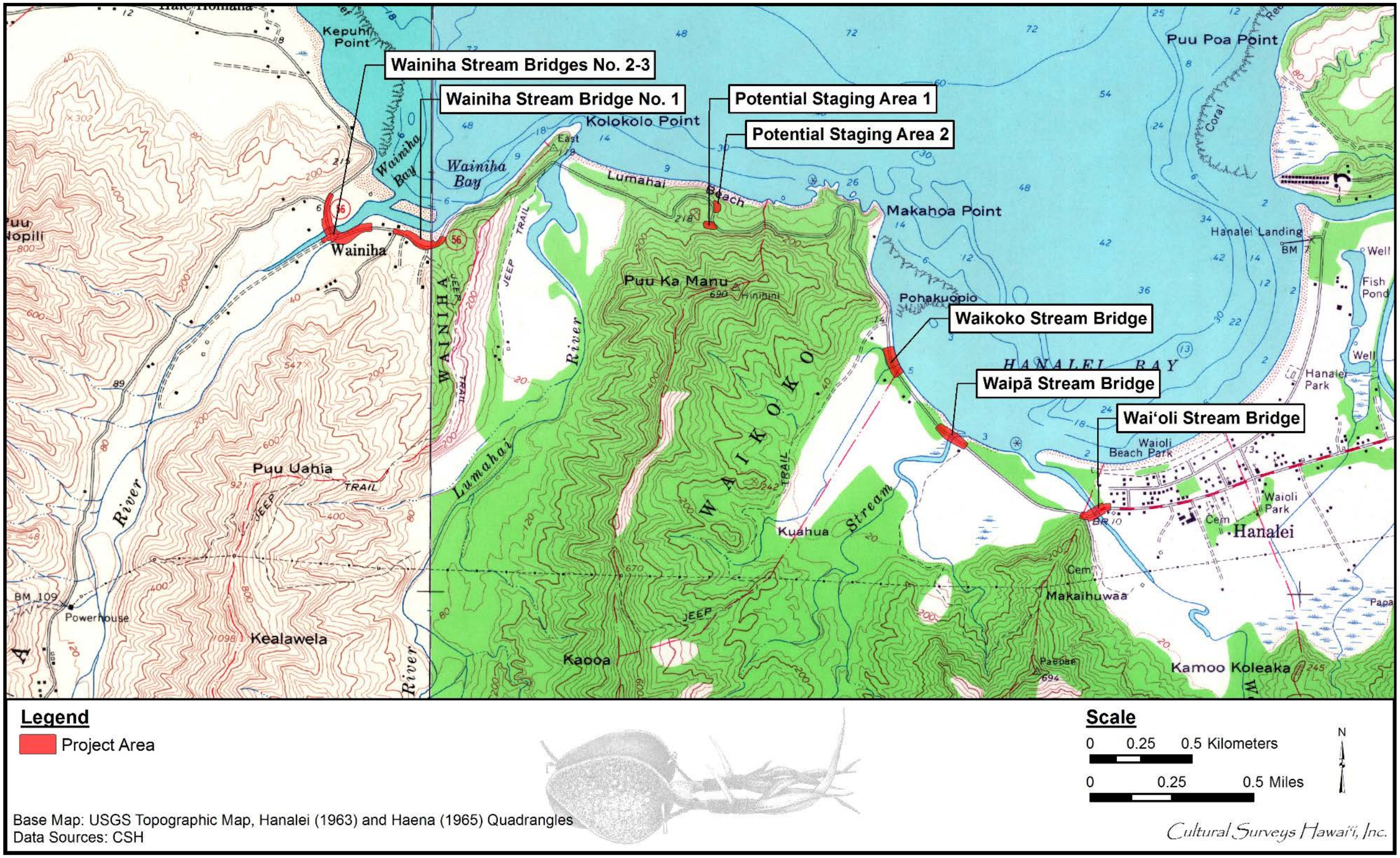


Figure 21. Portion of the 1963 Hanalei and 1965 Haena USGS topographic quadrangles

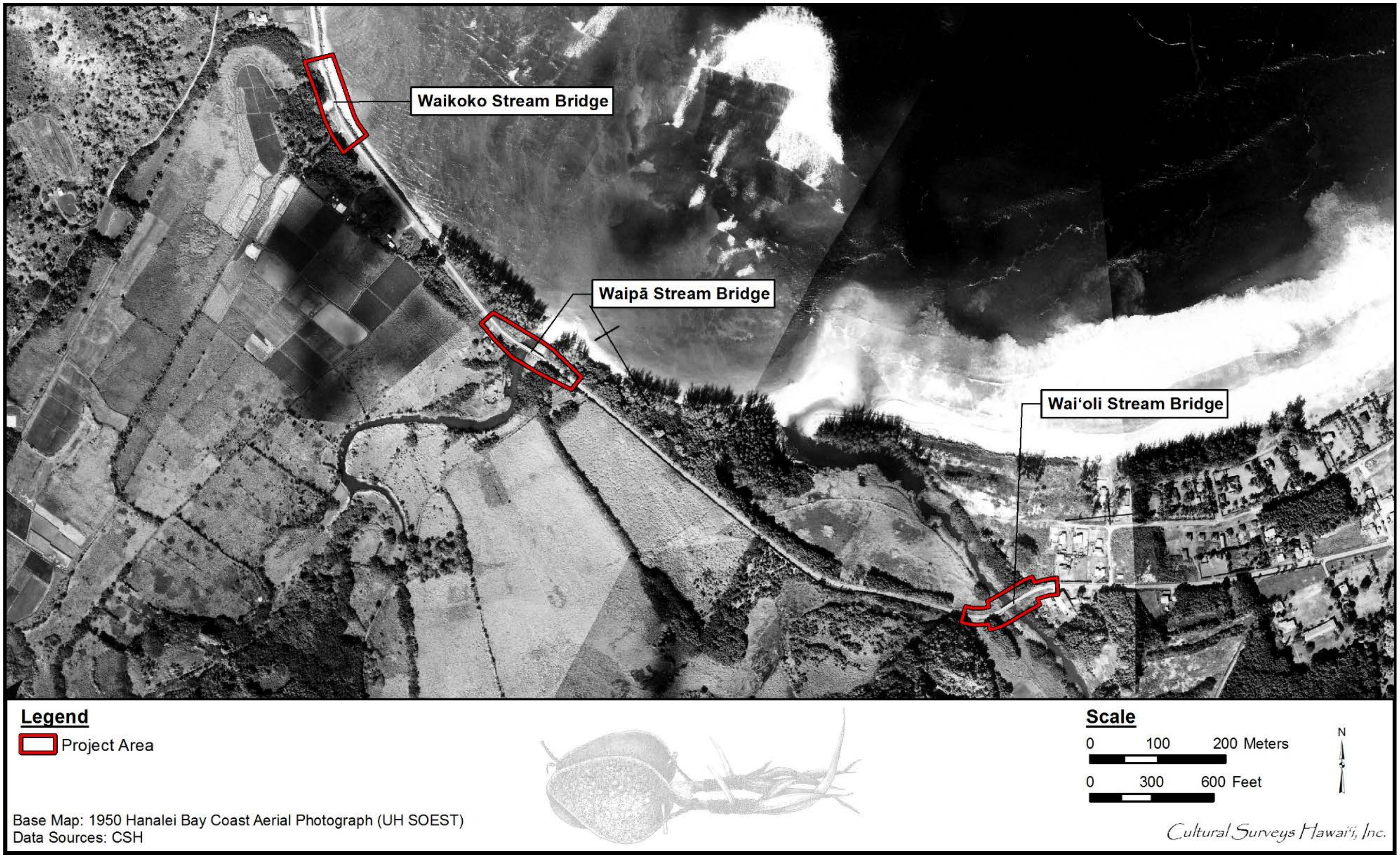


Figure 22. Portion of a 1950 Hanalei Bay Coast aerial photograph of the Wai‘ole, Waipā, and Waikoko Stream Bridge project areas (UH SOEST)

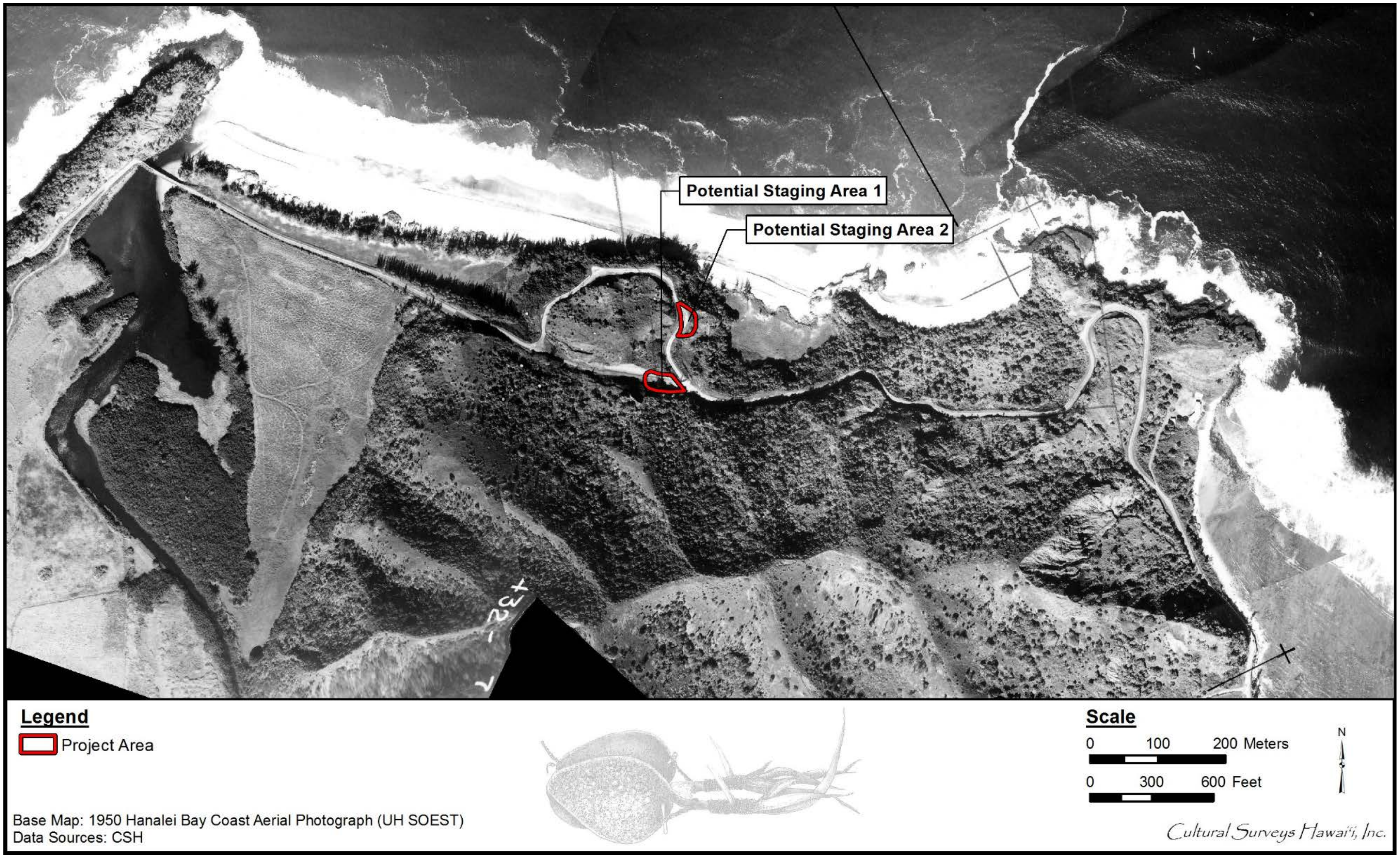


Figure 23. Portion of a 1950 Hanalei Bay Coast aerial photograph of the Potential Staging Areas 1 and 2 (UH SOEST)

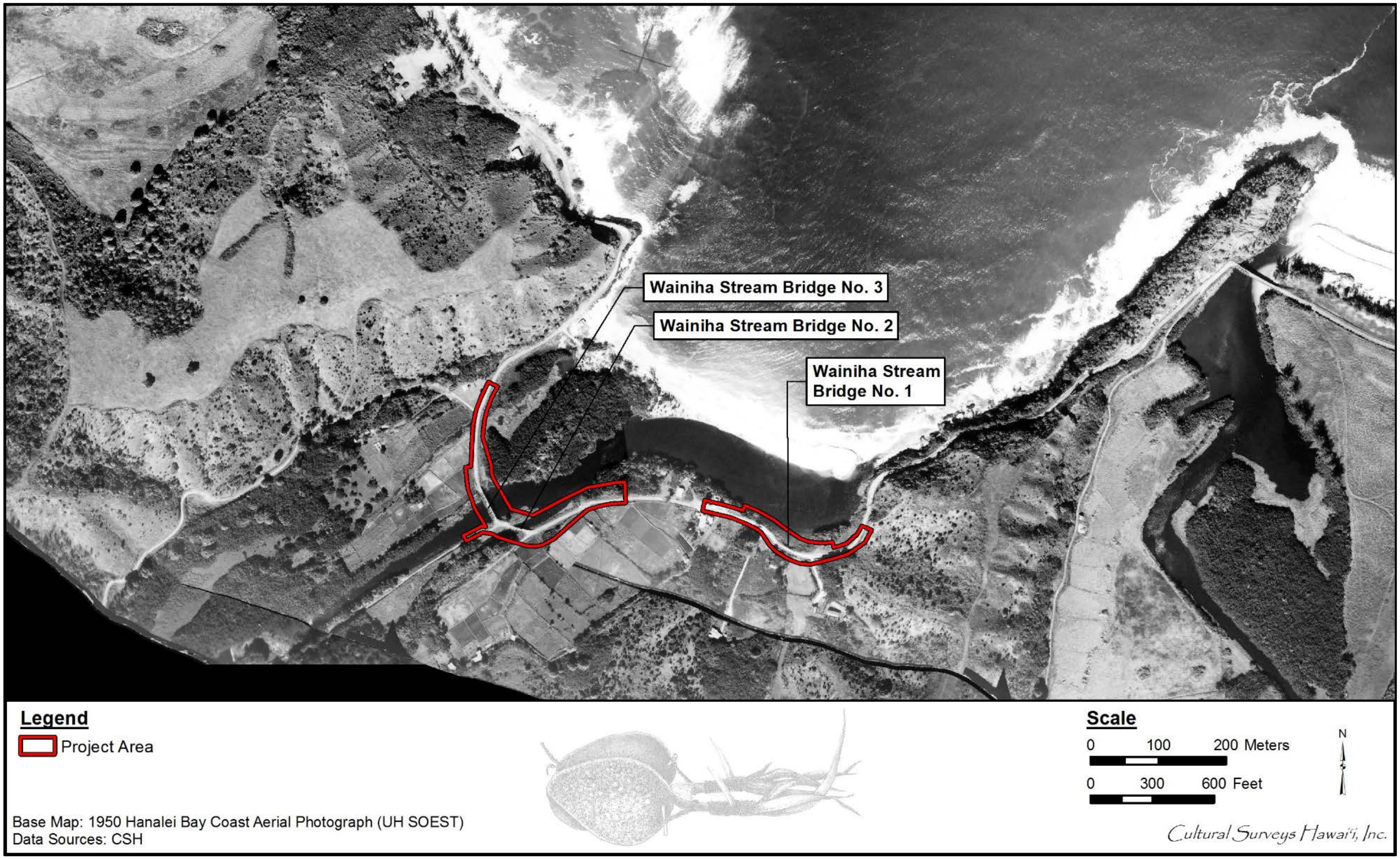


Figure 24. Portion of a 1950 Hanalei Bay Coast aerial photograph of the Wainiha Stream Bridges 1–3 project areas (UH SOEST)

Like Lumaha‘i, Waipā was a taro-growing area, and using LCAs records, Earle (1973 and 1978) has been able to pinpoint four irrigation systems along Waipā Stream in 1850 which were used for taro cultivation (Hoffman 1980:15). Waipā Valley followed similar patterns to that of Lumaha‘i, shifting from taro to rice:

> By the 1860s Chinese and later Japanese laborers imported en masse for plantation bottom lands, large areas of old taro pond fields were converted to rice. From 1880 to 1930 rice became an extremely important export industry for Halelea, and taro was virtually abandoned except in Haena, the most isolated *ahupua‘a*. Technologically, water buffalos with associated harrowing and leveling implements were introduced to prepare planting surfaces. The increased effectiveness of the individual farmer coupled with a growing market in the western United States resulted in a rapid expansion of the area in production. This was possible only with extensive use of flumes, wood and cement dams, and perhaps more intricate drainage channels. The cleaning of these expanded ditch systems was in turn greatly facilitated by the use of sickles, pitchforks, and shovels. It is highly likely, therefore, that irrigation systems in operation after 1880 were both altered and expanded for rice production. [Earle 1973:183–184 in Dye 2004a:14]

The 1938 Territory tax records indicate several dwellings and other buildings in the vicinity of the rice mill in Waipā held by Hiramoto (Dye 2004a:15). These Territory tax records list the family names of Takabayashi, Hiramoto, Okazaki, Koga, Morimoto, and Azeka. Hoffman (1980:15) reported that the lands in the survey area were Bishop Estate lands entirely used for cow pasture, although the more marshy sections were not well suited for this use. According to Kinichi Shikawa, a Waikoko farmer, the land had been overgrown for a long period of time and some years previously Bishop Estate demanded the lessee, the Robinson family, to make improvements that resulted in massive clearing operations; large areas were chained and bulldozing eliminated sections of irrigation systems east of Waipā Stream (Hoffman 1980:15). In 1986, Bishop Estate leased the land to the Hawaiian Farmers of Hanalei, Inc., a community-based, for-profit corporation that manages the *ahupua‘a* of Waipā (Dye 2004a:15).

> Waipā Ahupua‘a is currently managed by the Waipā Foundation, a community-based 501c3 nonprofit that evolved from an original community initiative in the 1980s. The Waipā Foundation serves as a Native Hawaiian learning center and community center where all who visit can renew ties to the *‘aina* (land and resources), and learn about traditional values and lifestyle through *laulima* (many hands working together). As stewards of the *ahupua‘a*, we are intently focused on our *kuleana* (responsibility) to establish and perpetuate a thriving *ahupua`a* as an example of healthy interdependent relationships between people and earth’s natural resources. We strive to be a leader in demonstrating a Hawaiian approach to watershed-scale natural resource management. [Waipā Foundation 2012]

4.3.3 Late 1800s to Modern Land Use in Lumaha‘i

Earle (1978) provides the following overview regarding Lumaha‘i:

> Very little is known about the land use of this *ahupua‘a*. Around the turn of this century, there were extensive rice plantations in the alluvial area near the sea. For

> the earlier historic period (1850), only limited information is available because no land awards were granted to commoners in Lumahaʻi *ahupuaʻa*. The reason for this absence is unclear but it was not for want of a community population (see Schmitt 1966, 1973 for nineteenth century census data). Perhaps the *ahupuaʻa* chief and/or *konohiki* (headman of an *ahupuaʻa* land division under the chief) were instrumental in discouraging awards. Extensive bulldozing for pasturage has destroyed all archaeological evidence of pond-fields in the lower section of the valley, but numerous small terrace sites are to be found in the interior. One such site was identified 2.5 km from the sea, during a rapid reconnaissance survey, and others have been described by local hunters. [Earle 1978:33]

4.3.3.1 Historic Taro and Rice Farming in Lumahaʻi

By the 1860s, taro production was being replaced by rice cultivation in all the valleys of the district except Hāʻena, frequently reworking the irrigation systems previously used for taro pond fields (Hoffman 1980:4). This shift from taro to rice production included the importtation of Asian laborers for the plantation as well as the introduction of Asian technology developed for irrigation and cultivation of rice. Rice production flourished from 1890 to 1930 in the Haleleʻa District, at which point prices dropped due to increased rice production in California and most Hawaiian rice fields were abandoned (Earle 1973:183). The growth of rice cultivation is documented by a population shift suggested by tax records and by a lease between the Bishop Estate and Chulan and Company in 1882 which rented parts of Lumahaʻi Valley's alluvial plain for rice production (Hoffman 1980:4). The 1865 tax records documented 25 Hawaiians and one Chinese paying taxes. By the time Chulan and Company had been growing rice for three years, the 1890 tax records documented only one Hawaiian and 34 Chinese. The Sing Tai Wai Company also rented lands for rice growing in the Lumahaʻi Valley (Kelly et al. 1978).

George Bowser, editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide* (1880) wrote about various statistics and places of interest around the Hawaiian Islands (Maly and Maly 2003). In the following excerpts from "An Itinerary of the Hawaiian Islands . . . " Bowser's narratives offer descriptions of the communities and various attractions of the Haleleʻa region:

> The next place, about two miles further on, is Lumahai. The valley here is about twenty miles long, and is on the average about a mile and a half wide. It is nearly all under cultivation. Messrs. Chulan & Co. have about 100 acres of it under cultivation for a rice crop. The supply of water is abundant at all seasons of the year. The scenery here is extremely grand, the mountain tops being cut into every imaginable shape of crag and peak, and their sides clothed with evergreen trees. In the gulches and ravines the wild banana grows to perfection, and the *awa* is found in profusion. This part of the island will grow any description of vegetable. When there I tasted at the table of my host, Mr. Robinson, some most delicious green peas, the seeds of which had only been sown six weeks before. The weather was delightful when I was there, and, although the rains are sometimes very heavy, the climate as a whole is exceedingly fine and enjoyable. Whilst here I climbed to the top of the dividing range between the Wainiha and Lumahai valleys. The views thus obtained are exceedingly grand. The massive mountain peaks running up to

> 3,000 feet high, are covered almost to their summits with forests, with occasional intervals of splendid grass. In the distance was the sea with scarcely a ripple on its surface, and the fine beach of brown sand. In the valleys the winding streams pursuing their course to the sea, hidden sometimes by the overhanging trees, with the rice fields in various stages of growth, some covered with water, others beautifully green and laid out in the most perfect order. Add to this a lovely Italian sky and a pleasant temperature of about 70º, a gentle breeze to make riding no exertion, and you have the scene as I saw it, as charming as any I have seen in the islands . . . [Maly and Maly 2003:36]

The exact date these companies discontinued rice cultivation in Lumahaʻi is unknown but oral reports indicate they were gone by 1925 when six Japanese families moved into Lumahaʻi Valley to grow rice (Hoffman 1980). One family "lived on the eastern side of the stream, about a mile *mauka* [inland] of the highway; the other families lived on the western (Wainiha) side, and their houses still stand today" (Kelly et al. 1978). Four families left the valley as rice prices dropped, while two others converted to taro cultivation (Hoffman 1980). The lease was taken over by Lester Robinson for cattle grazing in Lumahaʻi Valley. Robinson offered the two remaining Japanese families land in neighboring Wainiha Valley and all cultivation in the valley ceased (Hoffman 1980). Handy and Handy (1972) state the following:

> Lumahai must have had many *loʻi* areas in old Hawaiian days, but in 1935 most of it was used for ranch lands, which obliterates the evidences of Hawaiian farming. It could not have supported a population as large as Wainiha or Hanalei. [Handy and Handy 1972:420]

4.3.5 Late 1800s to Modern Land Use in Wainiha

4.3.5.1 Agriculture and fishing in Wainiha

Agriculture and fishing endeavors continued as the mainstay for Wainiha Ahupuaʻa. By the early 1900s, Wainiha had its own Chinese community which included not only the rice farmers, but also merchants and other business people (Coulter and Chun 1937). The rice industry eventually went into decline due to disease, pests, and competition from outside Hawaiʻi, and rice lands reverted to *kalo* (taro). Rice cultivation probably served the unintended purpose of keeping the ancient irrigation systems and *loʻi* operational throughout this period. In the 1930s Handy (1940:73) reported both crops being cultivated simultaneously in Wainiha with actually more land seemingly devoted to *kalo* than rice. The valley even had its own commercial *poi* factory at the time. The cultivation of *kalo* is ongoing today and is the most active agricultural undertaking in the still rural Wainiha Valley.

4.3.5.2 The Wainiha Hui

No history of Wainiha is complete without at least a mention of the Wainiha Hui. A detailed and sometimes colorful account of the *hui*'s (group or club) origins and dealings is given by Lydgate (1913) and continued by Thrum (1924). The story provides an understanding of the changing socio-economic aspects of land ownership in Wainiha following the Māhele and entering into the twentieth century. A greatly abbreviated version follows. Sometime after the Māhele, Kekauʻōnohi, a chief, held the *konohiki* lands of Wainiha, those being all of the remaining lands in the valley not awarded to the tenant farmers as *kuleana*.

Seeking a quick profit on a sandalwood deal, Kekauʻōnohi convinced Aldrich & Company of Honolulu to back the venture to the amount of $10,000. Kekauʻōnohi purchased a schooner, the *Manuokawai*, hired a captain and crew, filled the ship with sandalwood and sent it off to the Far East. Whether the ship was wrecked at sea or as Lydgate implies, was stolen by the captain who had less than a pristine reputation, she was never seen in Hawaiʻi again. Able to raise $1,000, Kekauʻōnohi still needed $9,000 to pay off Aldrich & Company. The plan was to sell the land to the Wainiha *kuleana* owners. The residents agreed to the plan although most of them were still basically subsistence farmers and did not have the cash to close the deal. Kekauʻōnohi gave them one year to raise the capital. By the time the year ended, 71 Wainiha residents had convinced Princeville Plantation of Hanalei to underwrite their venture at $100 each with the residents signing notes for the future delivery of agricultural goods, services, and labor to the plantation. This only amounted to $7,100 but Kekauʻonohi persuaded his creditor to let the residents assume the rest of the debt with interest (Lydgate 1913). Thus, in 1877 the Hui Kūʻai ʻĀina O Wainiha, the "group to purchase the land of Wainiha" was officially formed. The Wainiha Hui, as it was commonly called, now owned approximately 15,000 acres of the valley (*Garden Island* 1947). A plan was instituted to give each shareholder 10 acres of arable land—5 acres *mauka* and 5 acres *makai*. The land was never formally surveyed nor legally partitioned and disputes were settled by an executive committee. In the coming years the *hui* members, in debt and paying property taxes, found that being large landowners was not at all like what Kekauʻōnohi had promised, as shares in the *hui* had essentially become a liability (Lydgate 1913).

Around the turn of the century, McBryde Sugar Company was looking for a source of electrical power to run its irrigation pumps and mill operations at ʻEleʻele on the southwest side of the island. They proposed to build a hydro-electric power plant at Wainiha and to pay the *hui* $1,500 a year for the water rights (Thrum 1924:95–112). The Kauai Electric Company was formed to construct and operate the power plant, which was completed in 1908. They built a landing and warehouse on Wainiha Bay with a light rail system to carry materials up the valley, along with roads, trails, and laborers' camps, as well as the plant itself and the transmission line that traversed the island (Gartley 1908:141–146). While there were other similar groups formed on Kauaʻi, most notably at Hāʻena and Moloaʻa, the Hui Kūʻai ʻĀina O Wainiha remained a singular success story. The lands of Wainiha were finally partitioned and the *hui* dissolved in 1947 after legal action was initiated by McBryde Sugar Company. Each of the original 71 shares was then worth about $5,000. Through the years McBryde had bought up most of the shares and owned 48. The Robinson brothers, Aylmer and Sinclair, held 10 and 6⅓ shares respectively. Only the remaining few shares were still in the hands of the heirs of the original *hui* members (Circuit Court of the Fifth Judicial Circuit 1947).

4.3.5.3 The Kūhiō Highway, Tsunamis, and Historic Flooding in Wainiha

The Kūhiō Highway, completed in 1917 and listed as site 03001048 on the National Register of Historic Places in Hawaiʻi, exists throughout the project area. As mentioned previously, in 1895, traveler Eric Knudsen described the route from Hanalei to Hāʻena as a trail, the wagon road ending at Hanalei. "West of Waikoko Stream, Knudsen related that the trail climbed over the bluff and then descended straight down to the ocean before turning back and running along the beach again" (Fung 2013:12).

> According to historian Ralph Kuykendall, nineteenth century Hawaiʻi roads, ʻor what were called roads,' came into existence by a familiar historical process, ʻthe trail became a road.' Many roads, especially in the rural districts like Kauaʻi's North Shore, were little more than cleared rights-of-way. [Fung 2013:12]

By the end of the nineteenth century, each of the major Hawaiian Islands dreamed of building a "belt" road system. The idea for belt roads dated to the early Hawaiians, who built and maintained networks of traditional trails on all the islands. Belt roads that circumnavigated the islands played an important role in Hawaʻi's transportation history, connecting isolated communities to their island's economic, political, and social centers.

> In 1911, the territorial legislature established a ʻloan fund,' which provided the bonding needed for each island to build its belt roads and bridges. A Loan Fund Commission (LFC) was appointed for each island . . . By 1917, Kauaʻi considered its belt road complete, a feat that was accomplished earlier than any other island. [Fung 2013:14–15]

Kūhiō Highway, Route 560, was completed in 1917:

> Route 560 is a 10-mile rural road that was part of the first completed belt road in the Hawaiian Islands (constructed in early 1900s), and has retained a significant portion of its original characteristics and features. In recognition of Route 560's historic stature, a Rural-Historic Road Corridor Plan was drafted to provide design guidelines for the DOT-HWY that reflect a community consensus for future work on the highway. [Hawaiʻi Department of Transportation 2011:12–13]

The highway westward of Waiʻoli Bridge in Hanalei is identified as a scenic roadway and historic district corridor:

> The historic district begins at Mile Marker 0 on Route 560 and continues to its termination at Mile Marker 10 at Haʻena State Park . . . The Kauaʻi Belt Road between Princeville and Haʻena traverses ten miles along the island's north shore and is coterminous with its historic right-of-way. This portion of Kauaʻi's ʻbelt road' was part of Kauaʻi's original belt-road system, which extended from Haʻena on the north shore to Mana on Kauaʻi's west shore. Although belt-road systems in the Hawaiian Islands were intended to circumvent [*sic*] each island, Kauaʻi's road, like the Hawaiʻi Belt Road, never completely encircled the island due to the rugged topography of Na Pali Coast. The north shore section of the Kauaʻi Belt Road begins at State Route 560's Mile Marker 0 at Princeville and passes through the communities of Hanalei, Wainiha and Haʻena, ending at Mile Marker 10 at Haʻena State Park. The . . . historic district includes the road, the Hanalei Valley Scenic Overlook, and thirteen historic bridges and culverts. The period of significance for the north shore section of the Kauaʻi Belt Road is from 1900 when the Territory of Hawaiʻi Superintendent of Public Works began roadway improvements until 1957 when the Wainiha Bridges were rebuilt after a tidal wave. The Kauaʻi Belt Road between Princeville and Ha'ena retains historic significance and character in its location, alignment, design, setting, and association. The Kauaʻi Belt Road between Princeville and Wainiha was built during the 1910s, and from Wainiha to Haʻena circa 1928. Most of the roadway alignment is unaltered and predates the road's

> construction. The road passes through rural areas along Kaua‘i’s North Shore, connecting communities much as it did in the early twentieth century when it was built. In many areas, the road was built over a trail used by Hawaiians and nineteenth-century travelers. There is no shoulder along most of the roadway, except near Princeville. The road has been widened since its construction, but is still narrow in many locations. The roadbed varies between 18’ and 20’ wide, being narrower as it hugs the sea cliffs and wider as it passes through valleys and residential communities. Near Princeville and Hanalei, the road is 22’ wide. For most of the road’s length, there are no guardrails, which contributes to the road’s historic feeling. Lava-rock guardwalls, some dating to the 1920s, remain along the road in many locations, although many have been undermined by soil erosion. In a few locations, timber guardrails remain along the road. Only a few steel w-beam guardrails have been installed along the road in recent years. [Fung 2013:6]

Maintaining the aesthetics of this scenic and historic highway, the stream bridges along the Kūhiō Highway, Route 560, of Kauai‘i’s north shore are all one-lane bridges listed on the National Register of Historic Places as a Historic Bridge District on the Kaua‘i Belt Road (North Shore Section) (Fung 2013). The one-lane bridges require a local courtesy of taking turns, five to seven cars crossing at a time (Figure 25).

> Most of the bridges and culverts on the Kaua‘i Belt Road are one-lane wide and date to the early 1900s. The bridges represent two popular types of construction in early twentieth century Hawai‘i: steel truss and reinforced-concrete flat slab. The reinforced concrete bridges feature solid concrete parapets. In addition, there are also several pipe culverts with masonry rock headwalls that were probably constructed in the first half of the twentieth century. [Fung 2013:10]

Improvements to Kūhiō Highway and specifically to Kauai‘i’s north shore bridges became a high priority in the early twentieth century:

> Kaua‘i’s bridge-building program was extensive in 1912. During a special meeting in May, the LFC decided to build ‘a number of bridges’ near Hanalei, including Waikoko, Waipa, and Wai‘oli. The LFC instructed Moragne to prepare plans and specifications for concrete structures, and he designed three flat-slab bridges with solid concrete parapets. Within months of Moragne’s assignment, contracts were authorized for George Mahikoa to build the Wai‘oli and Waikoko bridges; and George Ewart to build Waipa Bridge. Work on the new bridges began almost immediately and was none too soon. In August 1912, three of the timber bridges that were to be replaced collapsed under the strain of wagons delivering crushed rock for the new concrete bridges. [Fung 2013:16]

Wainiha is vulnerable to inundation by tsunamis originating in the North Pacific Ocean. The tsunami of 1946 greatly impacted the northern shore of Kaua‘i. Shepard et al. (1950:415) detail the following disturbing account of the damage at the coast in the vicinity of the current project area:

> Half a mile east of Haena Bay the water swept inland 1,600 feet, knocking over trees, and a little further east it smashed through a dense grove of pandanus, laying

Figure 25. Photo of Wainiha Stream Bridge, n.d. (CSH)

> the trees over in parallel rows . . . Fishes were carried inland, as at many other places; and 11 days after the wave, small fish were found still alive in a pool 1,000 feet inland . . . At the head of Wainiha Bay the water rose 24 to 27 feet above normal sea level. . . several houses were wrecked and some loss of life occurred. [Shepard et al. 1950:415]

This destruction included stripping the sediment from the beach areas, which was washed varying distances inland and deposited. Coral blocks, up to 12 ft in diameter, were picked up and carried as much as 500 ft inland (Shepard et. al. 1950:414–415). Another account reports, “The 1946 tsunami hit with two powerful waves, with a maximum run-up of forty-five feet in elevation. All the bridges at Wainiha were washed out, and the tiny village of Wainiha itself was flattened” (Pacific Worlds 2001).

The 1957 tsunami caused a 38-ft rise in sea level at Wainiha and low-lying areas as far as 4,000 ft inland were inundated (DLNR 1975). Flooding due to heavy rainfall is also a frequent occurrence in Wainiha and results from stream-channel overflow. The valley has recorded rainfall as high as 24 inches in 24 hours. Since 1956 there have been at least eight damaging floods in Wainiha, one of which caused loss of life (DLNR 1975). As previously mentioned, the flooding of Wainiha is referred to in folklore (Pukui 1951:67). Perhaps it is this natural characteristic of the valley which explains the origin of the name “unfriendly water.”

Thus, navigating the streams of Kaua‘i’s north shore, the bridges within the project areas have historically had to contend with periodic flash floods and tsunami storms. Indicating the severe natural elements that the bridges are exposed to, the stream crossings within the project areas periodically require seasonal reworking or replacement:

> In January 1921 the Wainiha River cut a new channel during a storm, which necessitated another bridge, as flooding had carved a ‘long slim island out of the agricultural land of the valley.’ The Garden Island reported that the new bridge would ‘make three bridges in the valley, in within [*sic*] a distance of about 500 yards.’ 38 This third structure at Wainiha became known as Wainiha Bridge #2. Plans for a new single-span bridge of 75’ were drawn in 1922. The design was a timber-truss structure that complemented the adjacent timber-truss bridge (Wainiha #3).39 Even though the plans were drawn in February 1922, a construction date was not determined. The Territorial Highway Department records state that the bridge was constructed in 1931.No information was located to indicate when the original Wainiha Bridge #2 was built, although it may have been built as early as the first decade of the twentieth century. [Fung 2013:40–41]

Wainiha Bridges 1 and 3 were originally constructed in 1904 with wooden trusses and by 1921 an additional bridge was built to cross a new stream channel that formed during flooding. This middle Wainiha Bridge, referred to as Wainiha Bridge 2, was completed in 1931, however successive storms in 1946, 1957, and 1966 destroyed or damaged all three original wooden Wainiha Bridges which were replaced.

> Natural disasters struck the Wainiha bridges on two occasions in 1957. On March 9, three tidal waves struck Wainiha Valley, destroying the west span and small approach span of Wainiha Bridge #3 as well as Wainiha Bridges #1 and #2. The only span that remained after the tidal wave was the east (Hanalei side) span of

> Wainiha #3. In December, flooding from Hurricane Nina damaged Wainiha Bridge #3 again, making it impassable to traffic until it was repaired. [Fung 2013:22]

Storms in 2004 and 2007 further damaged the replacement bridges, which were then demolished and replaced with the modular steel truss bridges currently in existence.

Raw materials used in the construction of the stream crossings along the Kūhiō Highway, Route 560, of Kaua‘i’s north shore have included timber, steel, concrete, and basalt. The bridges were likely originally constructed from locally milled timber and were ultimately replaced with steel and concrete bridges. As discussed further in Section 4, the 1946 repair of the Waikoko Stream Bridge involved utilizing the fallen concrete structure in place with basalt boulders and concrete used to stabilize and level the feature.

> The earliest bridges on Kaua‘i were constructed of wood and steel. Wood was a prevailing construction material throughout the Hawaiian Islands during the nineteenth century; it was widely available, relatively inexpensive, and fairly durable. By the end of the nineteenth century, steel represented the latest in industrial technology and was a preferred construction material for its strength. Although steel bridges had to be imported from the United States or Great Britain, the strength of steel provided a feasible solution for spanning Kaua‘i’s wide rivers. Steel was also used throughout the islands to erect the substantial bridges required to carry railroads over Hawaii’s rivers and rugged gulches . . . By 1904 timber bridges spanned the rivers at Wainiha, Waikoko, and Waipā, and plans were made for a steel bridge over the Lumaha‘i River. [Fung 2013:13]

Section 5 Previous Archaeological Research

Some 30 or more previous archaeological studies have been conducted near the current proposed project areas in the Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa (Figure 26). Previous archaeological studies are described below for each *ahupuaʻa*.

5.1 Previous Archaeological Research in Waiʻoli

Table 6 displays all previous archaeological studies conducted within Waiʻoli Ahupuaʻa, while Table 7 identifies all historic properties found during those studies. These tables are followed by discussion of the research and cultural resources. Figure 27 is a composite of historic properties (including Bennett sites, burials, architectural historic properties, and historic or archaeological districts) found within a 0.5-mile radius of the current project area.

5.1.1 Thomas G. Thrum (1906)

The earliest archaeology of Waiʻoli is described by Thomas G. Thrum (1906) in his article *Heiau*s and *Heiau Sites Throughout the Hawaiian Islands* where he lists two *heiau* in Waiʻoli:

> Nakikoniawaiaau Waiʻoli uka - An open paved space, not large, dedicated to Laka, to which offerings at the annual festivities were brought.
>
> Mamalahoa Waiʻoli - A small *heiau* 24x60 feet in size, paved with walls 3 to 5 feet high. Of husbandry class. Kanehekili its deity; Kapihi its priest. [Thrum 1906:43]

Thrum lists Kupakoili Heiau (SIHP # 50-30-03-144), "Reported as a small *heiau*; probably simply a place of offering" as in Waipā but it appears to be in Waiʻoli (Thrum 1906:43).

5.1.2 Wendell Bennett (1931)

Wendell Bennett, in *The Archaeology of Kauaʻi* (1931:135), lists Nakikoniawalaau Heiau (SIHP # 50-30-03-145) but furnishes only Thrum's description for it and does not give a specific location for it. TMK: [4] 5-6 shows the site of Nakikoniawalaau Heiau on the east side of Waiʻoli Stream far inland of Kūhiō Highway. Bennett locates Kupakoili Heiau "on the west side of the *pali* west of Waiʻoli Stream, not far from the sea" (Bennett 1931:135). TMK: [4] 5-6 depicts the site of "Kupaloili [*sic*?] Unu" just *mauka* of Kūhiō Highway on the west side of Waiʻoli Stream, seemingly in Waiʻoli Ahupua'a. Bennett does not mention Mamalahoa Heiau and its location is unknown.

5.1.3 Timothy K. Earle (1978)

Timothy K. Earle (1978) did the first in-depth study of the Haleleʻa District, *Economic and Social Organization of a Complex Chiefdom: The Haleleʻa District, Kauaʻi*. This work is a seminal piece of research within the vicinity of the project area and is a classic archaeological study of traditional irrigations systems. Earle (1978) showed that the taro *loʻi* in Waiʻoli had been replaced by the cultivation of coffee and rice before the turn of the century. Earle's Systems 22, 23, and 24 describe the Waiʻoli valley systems. However, within Waiʻoli Ahupuaʻa all of these documented taro systems lie 200 m or more *mauka* of Kūhiō Highway.

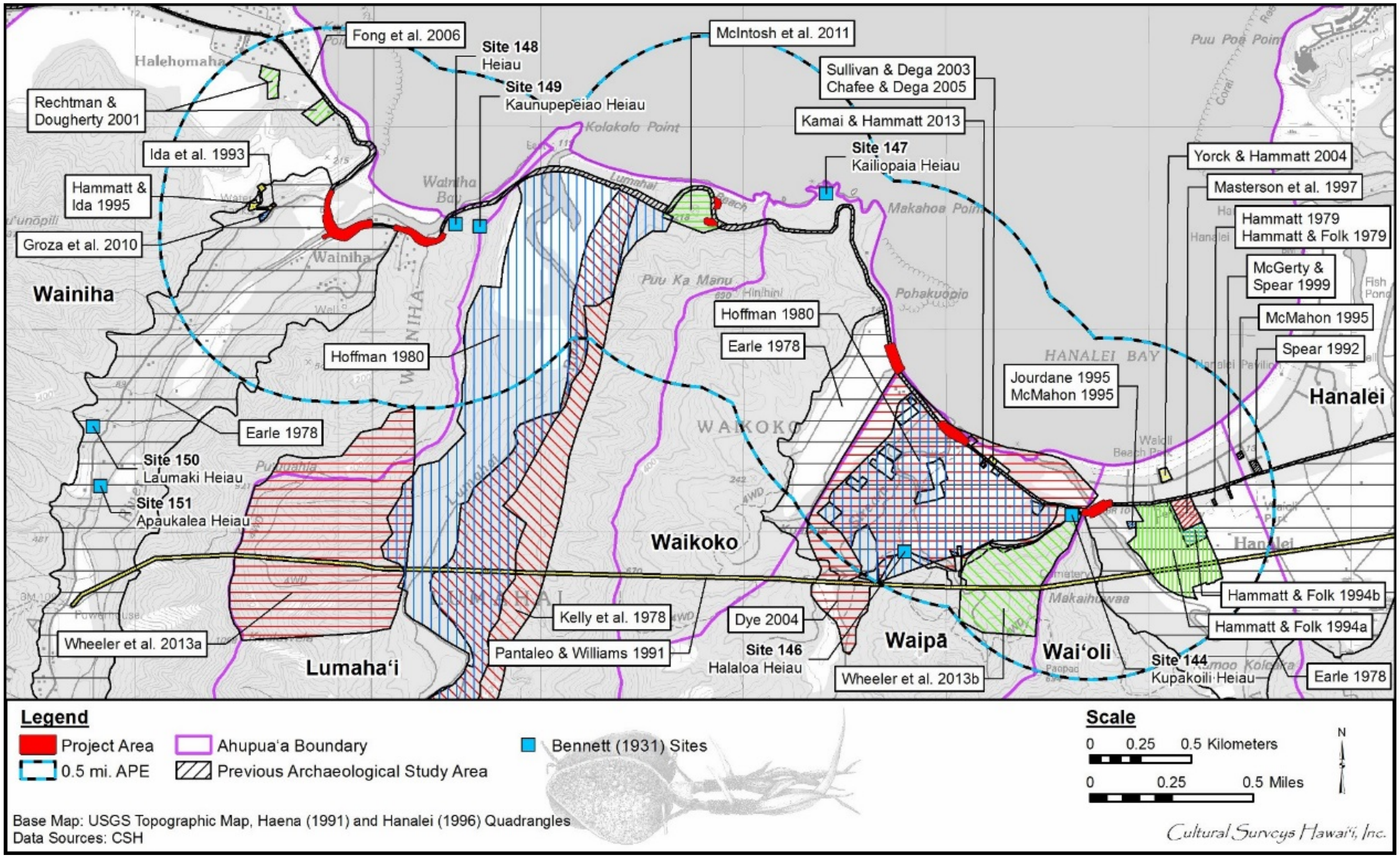


Figure 26. Portions of the 1991 Haena and 1996 Hanalei USGS topographic quadrangles depicting all project areas for the Wainiha Bridge project, illustrating all previous archaeological studies and Bennett sites found within a 0.5-mile radius from the project areas

Table 6. Previous Archaeological Studies in Waiʻoli Ahupua'a

Source	Location	Nature of Study	Results (SIHP # 50-30-03****)
Earle 1978	Haleleʻa District: Waiʻoli	Economic and social organization study	Describes Waiʻoli Valley irrigation systems 22 and 23
Hammatt 1979	Waiʻoli Mission Hall	Archaeological surface examination and subsurface testing	Documents SIHP # -00601, pre-Contact and early historic cultural layer
Hammatt and Folk 1979	Waiʻoli Mission Hall	Archaeological excavations	Discusses findings and conclusion for SIHP # -00601, pre-Contact and early historic cultural layer
Pantaleo and Williams 1991	Transmission line corridor	Archaeological reconnaissance	No cultural resources identified in Waiʻoli
Spear 1992	St. Williams Church, TMK: [4] 5-5-002:037	Archaeological inventory survey	SIHP # -06028, pre-Contact and early historic cultural layer
Kikuchi and Remoaldo 1992	Burials located at more than 50 cemeteries on Kauaʻi	Island-wide inventory of cemeteries	Maps and descriptions of burials in Kauaʻi cemeteries (not shown on Fig. 26)
Hammatt and Folk 1994a	30 acres (TMK: [4] 5-5-006:009)	Burial treatment plan	SIHP # -01877, single burial
Hammatt and Folk 1994b	30 acres (TMK: [4] 5-5-006:009)	Archaeological inventory survey	Identified SIHP #s -06031, a marsh deposit; -06032, buried cultural deposit; and -06028, a human burial
Jourdane 1995	5-5496C Kūhiō Hwy, TMK: [4] 5-5-006:012	Inadvertent burial report	SIHP # -03014, inadvertent skeletal remains
McMahon 1995a, b	Malolo Rd, Hanalei, TMK: [4] 5-5-003:035	Inadvertent burial report	SIHP # -01982, three burials described
Masterson et al. 1997	Hanalei School lot, *mauka* of Kūhiō Hwy, TMKs: [4] 5-5-006: por. 009, 018	Archaeological monitoring	SIHP # -01988, three burials and five isolated human remains
McGerty and Spear 1999	Waiʻoli Town Park, *mauka* of Kūhiō Hwy, TMK: [4] 5-6-002:005	Archaeological inventory survey	No cultural resources identified

Source	Location	Nature of Study	Results (SIHP # 50-30-03****)
Yorck and Hammatt 2004	Coastal residence, TMKs: [4] 5-5-004:009 and 010	Archaeological monitoring	Three discrete features identified; historic to modern layer, three historic bottles, and two cow teeth, no SIHP # given
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Hā‘ena	Archaeological monitoring	No cultural resources identified

Table 7. State Inventory of Historic Places Sites in Waiʻoli Ahupuaʼa

SIHP # 50-30-03-	Site Type/Name	Location	Reference
B004	Waiʻoli Huiʻia Church Cemetery Architectural recordation recommended to mitigate project's potential effects on SIHP # 50-30-03-2296 evaluated as eligible to the National and Hawaiʻi Registers	South of Kūhiō Hwy, between Waiʻoli Park and Hanalei School, TMK: [4] 5-5-006:019	Kikuchi and Remoaldo 1992:13–14
00601	Pre-Contact and early historic cultural layer	Waiʻoli Mission Hall	Hammatt 1979; Hammatt and Folk 1979
01877	Pre- and post-Contact deposits	Waiʻoli	Spear 1992
01982	Burial	Malolo Rd, Hanalei	McMahon 1995a
01988	Burials	Hanalei School	Masterson et al. 1997
03014	Burial	Kobayashi Subdivision, Waiʻoli	Jourdane 1995
06028	Burial	Kobayashi Subdivision, Waiʻoli	Hammatt and Folk 1994; Hammatt 1994
06031	Marsh deposit	Kobayashi Subdivision, Waiʻoli	Hammatt and Folk 1994
06032	Cultural deposit	Kobayashi Subdivision, Waiʻoli	Hammatt and Folk 1994
09300	Waioli Mission District	Waiʻoli	SHPD files
09374	Mahamoku (Wilcox Hanalei Beach House)	5344 Weke Rd, Hanalei, Kauaʻi, TMK: [4] 5-5-003:010	Historic Hawaiʻi Foundation
09386	Douglas Baldwin Beach House	5242 Weke Rd, Hanalei, Kauaʻi, TMK:[4] 5-5-002:107	Historic Hawaiʻi Foundation
09388	Say Dock House	Hanalei	Historic Hawaiʻi Foundation

SIHP # 50-30-03-	Site Type/Name	Location	Reference
None	Excavated pits	75 m southwest of Site 144	Wheeler 2013b
None	Irrigation system 22	East of Wai‘oli Stream	Earle 1978:67–68
None	Irrigation system 23	West of Wai‘oli Stream	Earle 1978:69–70

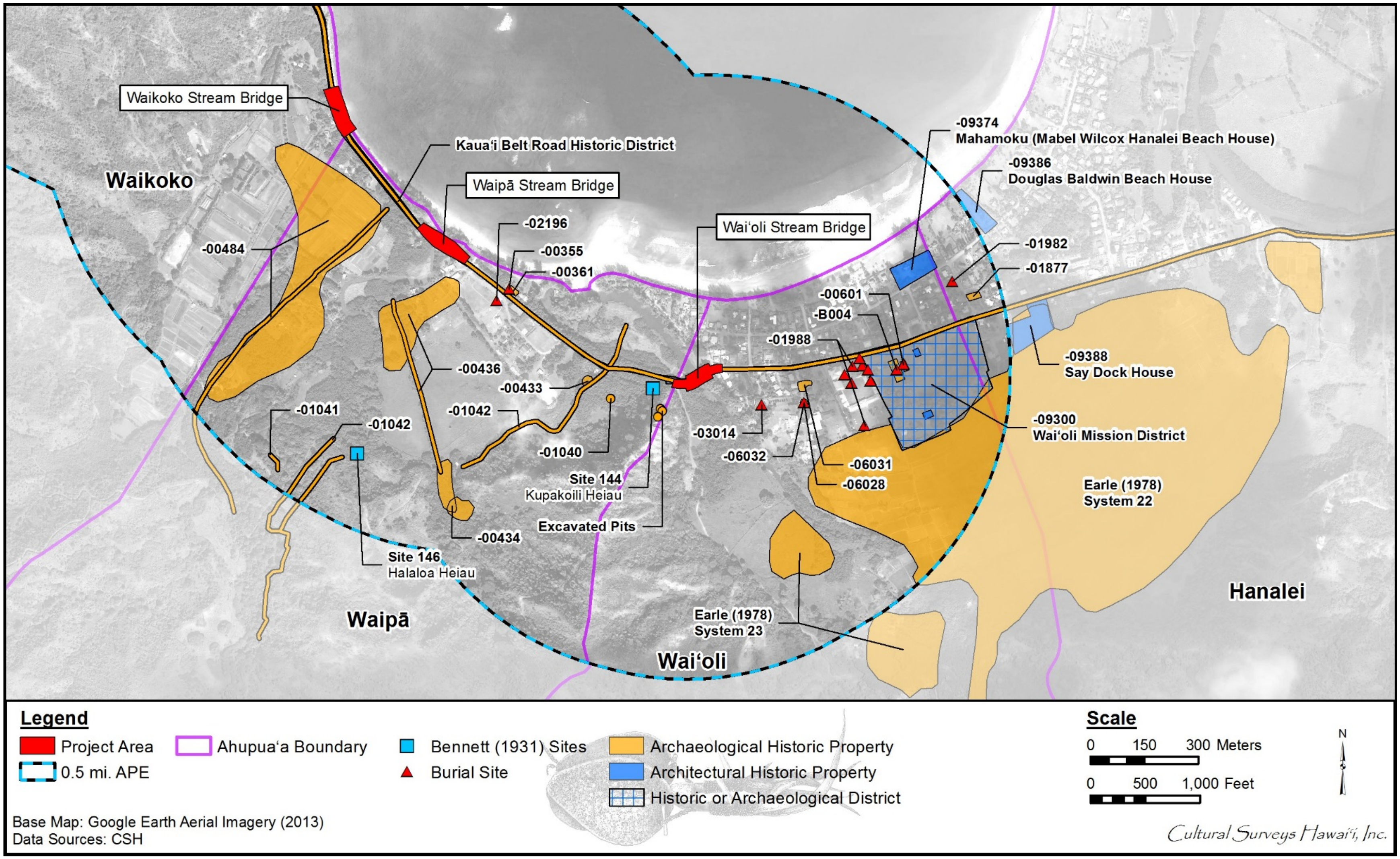


Figure 27. Aerial photograph (Google Earth 2013) showing locations of previously identified historic properties in portions of Hanalei, Wai'oli, Waipā, and Waikoko Ahupua'a

5.1.4 Hammatt (1979); Hammatt and Folk (1979) and William K. Kikuchi (1987)

In 1979, full-scale excavations of the missionary church at Waiʻoli helped document the entire history from 1832 to the twentieth century (Hammatt 1979; Hammatt and Folk 1979).

William K. Kikuchi (1987:11–12) in an article called "Kauaʻi Fishponds," describes six *loko-i-a-kalo* ponds that grew both taro and fresh water crustacean, fish, shellfish, and certain aquatic plants (Kikuchi 1987:11) in Waiʻoli:

B1a Name Ahau, of unknown acreage,

B1b Name unknown, of unknown acreage,

B1c Name unknown, of unknown acreage,

B6A Named Kaiulu, of unknown acreage,

B25a Name unknown, of 10.3 acres, and

B25b Name unknown of .12 acres. [Kikuchi 1987:8]

Kikuchi suggests these five fishponds were near the shore in Waiʻoli. He also lists five other "unknown type" fishpond sites at Waiʻoli:

B6b Name Kaaikahala, of 1.34 acres,

B10b Name Kuloko, of 1.06 acres,

B16a Name Maikai, of unknown acreage,

B16b Name Momona, of unknown acreage, and

B18a - Name Opahale of 0.25 acres. [Kikuchi 1987:8]

These unknown types of ponds are mentioned in the LCAs as being in the upland above the big bend in the river. These fishponds were in use in 1848 but already by 1852 some of them had disappeared (cf. Native Register 1847-1853 and Foreign Testimony 1848-1850).

5.1.5 Pantaleo and Williams (1991)

In 1991, an archaeological reconnaissance survey was conducted in selected portions of the Port Allen to Wainiha transmission line corridor. The purpose of the study was to determine the presence and/or absence of any inclusive cultural resources. Portions of this survey were conducted on the north side of Kauaʻi including Waiʻoli, Waipā, Waikoko, Lumahaʻi, and stops in Wainiha Valley at the Wainiha Valley Hydro-electric Plant. No new cultural resources were identified in the Waiʻoli Ahupuaʻa.

5.1.6 Spear (1992)

In 1992, Robert Spear conducted an archaeological inventory survey of St. Williams Church. Results of this archaeological inquiry included documentation of SIHP # -06028, a pre-Contact and early historic cultural layer.

5.1.7 William Kikuchi and Susan Remoaldo (1992)

In 1992, William Kikuchi and Susan Remoaldo printed their first volume of the inventory on Kauaʻi cemeteries. There is only one site inventoried in detail, the Waiʻoli Huiʻia Church Cemetery

(SIHP # -B004). They catalogue 48 gravesites with markers giving the range of known dates from 1842 through 1980. The family names were Aaron, Deverill, Doiron, Doso, Haumea, Johnson, Kapu, Kaukaha, Kawika, Kekauoha, Lota, Mahinai, Maka, Pauole, Peters, Rindt, Waiuli, Werner, and Willis (Kikuchi and Remoaldo 1992:13–17). A historical study (Waiʻoli Mission House, Hanalei, Kauaʻi, Grove Farm Homestead, and Waiʻoli Mission House, Kauaʻi) has also been done on the Waʻoli Mission by Barnes Riznik (1987). The Hawaiʻi Register of Historic Places (DLNR 1974) lists the Mission House as SIHP # -9300. Riznik documents the families who lived there and the process of restoring the Mission House. Designare Architects (1992) report a recent assessment of damage done by Hurricane ʻIniki to the Waiʻoli Huiʻia Church and Meeting Hall.

5.1.8 Hammatt and Folk (1994a and b)

Within the central area of the Waiʻoli Ahupuaʻa just *mauka* of the highway, CSH conducted a couple of archeological studies. Three cultural resources were identified during an archaeological inventory survey of a 30-acre proposed subdivision. SIHP #s -6031, a marsh deposit; -6032, a buried A horizon with few scattered flakes and sparse charcoal; and -6028, a flexed human burial were identified (Hammatt and Folk 1994a). Another AIS including subsurface testing was conducted in Hanalei School. Pond field sediments were observed in test trenches. Based on radiocarbon date of the sediments, the pond fields date to the 1960s (Hammatt and Folk 1994b).

5.1.9 Jourdane 1995, McMahon (1995a, b), and Masterson et al. (1997)

In 1995, SHPD investigated inadvertent burial finds near the project area (Jourdane 1995; McMahon 1995a and b). Burials were also identified while monitoring in Hanalei School in 1997 by a CSH archaeologist. SIHP # -01988, three burials and five isolated human remains, were identified (Masterson et al. 1997).

5.1.10 McGerty and Spear (1999)

In 1999, Scientific Consultant Services (SCS) conducted an AIS with limited subsurface testing to observe stratigraphy beneath the surface. A total of seven test units were excavated. No cultural resources were identified.

5.1.11 Yorck and Hammatt (2004)

In 2004, CSH put together an archaeological monitoring package for renovation and relocation of a house site along the Waiʻoli coastal area. The monitoring package consisted of a monitoring plan (Hammatt and Shideler 2003) and monitoring report (Yorck and Hammatt 2004). Three historic to modern discrete features were observed during the monitoring. The findings include a layer containing modern to historic refuse, three historic bottles, and two cow teeth (Yorck and Hammatt 2004:21).

5.1.12 Fong et al. (2006)

In 2006, CSH monitored an approximately 10-mile stretch from Princeville to Hāʻena for the Kūhiō Highway, Route 560 Shoulder Improvements project (Fong et al. 2006). On the basis of historic research and previous archaeology, monitoring was recommended and an archaeological monitoring plan was written (Shideler et al. 2004). During monitoring of subsurface activities, sediments appeared as disturbed by previous road construction. No cultural resources were observed (Fong et al. 2006).

5.2 Previous Archaeological Research in Waipā and Waikoko

Table 8 outlines previous archaeological studies conducted in Waipā and Waikoko Ahupuaʻa, while Table 9 depicts historic properties identified, followed by discussion of the research and cultural resources. The locations of identified cultural resources within Waipā and Waikoko Ahupuaʻa are shown in Figure 27.

5.2.1 Thrum (1906)

As previously mentioned, Thrum (1906:43) lists the *heiau* of Kupakoili, in the *ahupuaʻa* of Waipā, and says it is "reported as a small *heiau*; probably simply a place of offering." While Hoffman (1980) places the *heiau* just *mauka* of Kūhiō Highway in Waipā, Thrum also lists Halaloa Heiau in the *ahupuaʻa* of Waipā. He relates it as located "at Waipā Stream. A square *heiau* of about 80 feet in size, with low walls, Kāne its deity," noting it was destroyed years ago for a mill site (Thrum 1906:43).

5.2.2 Bennett (1931)

Bennett (1931) describes no sites in Waikoko and Halaloa Heiau at Waipā. Hoffman places the location of this historic property more than 500 m inland of the highway (Bishop Museum site KA-D8-1; SIHP # -146) more than 500 m inland of the highway.

> Site 146: Halaloa *heiau*, at the end of a little road running up on the east side of Waipā stream, at the site of an old rice mill. Thrum describes it as 'A square *heiau* of about 80 feet in size, with low walls. Kāne its deity. Destroyed years ago for mill site.' Nothing remains now but a few stones scattered about. [Bennett 1931:135]

5.2.3 Earle (1978)

Earle (1978) describes four wetland taro irrigation systems at Waipā as System Number(s) 18, 19, 20, and 21 with one of these systems extending into Waikoko (Figure 28, Table 10). None of these agricultural systems extends as far seaward. Wetland taro irrigation "System 18" is the only one of the four *loʻi kalo* (irrigated taro terrace) systems of Waipā that Earle describes in detail under the heading of "Halelea's Modern Taro Irrigation" (perhaps because it was the only one in active use at the time of the 1971-1972 fieldwork). Earl (1978) indicates that:

> In 1850, System 18 irrigated a major section of the ahupuaʻa of Waipa but now it is used only to irrigate one taro farm in the neighboring ahupuaʻa of Waikoko. The primary ditch of System 18 taps the Waipa stream in the narrow valley just before the stream enters the broad alluvial plain. The intake is placed at a natural bend in the stream so that the main ditch line continues the direction of stream flow above the dam. The head dam, itself, is a standard stone mound percolation dam using in situ boulders. River cobbles (15-30 cm) are heaped between the boulders to create a mound wall 8 m long, 1 m wide, and 0.6 m high. The primary ditch, then, channels the water around a small hill and through the alluvial plain. This ditch is a simple earth channel about 1.1 m wide by 0.5 m deep at natural ground level. Along much of the ditch's length, roots of the hau, which grows exuberantly, clog the ditch and present a major maintenance problem. Excess water is hand-led simply by a spillway to the Waikoko stream. The primary ditch is now about 1.32 km long. The

Table 8. Previous Archaeological Studies in Waipā and Waikoko Ahupua’a

Source	**Location**	**Nature of Study**	**Results (SIHP # 50-30-03)**
Thrum 1906	Island-wide	Island-wide survey	Nakikoniawaiaau, Mamalahoa, and Kupakoili *heiau* (SIHP # -144)
Bennett 1931	Waipā and Waikoko	Island-wide survey	SIHP #s -144, Kupakoili Heiau; -146, Halaloa Heiau; and -147, Kailiopaia Heiau
Earle 1978	Waipā	Anthropological study	SIHP #s -484, -436, -434, and -433, four *lo‘i* systems
Hoffman 1980	Alluvium plains of Waipā Valley	Archaeological survey, limited test excavations	Confirmed Earle’s irrigation systems
Pantaleo and Williams 1991	Transmission line corridor	Archaeological reconnaissance survey	No cultural resources identified in Waipā and Waikoko
Sullivan and Dega 2003	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Burial treatment plan	SIHP # -00355, two burials and isolated skeletal remains
Dye 2004a	KSBE lands, leased to Hawaiian farmers of Hanalei, TMKs: [4] 5-6-004:022, 023, and 025	Archaeological inventory survey	Two previously identified cultural resources: SIHP #s -00146, rice mill at the site of Halaloa Heiau and -00484, irrigation system described by Tim Earle as System 18 and three newly identified cultural resources in project area: SIHP #s-01040, a cave shelter; -01041, *‘auwai*, and -01042, an *‘auwai* system
Dye 2004b	Lo‘i System in Waipā, Kaua‘i	Inventory survey and mapping of *lo‘i* system	Four traditional taro pond-field systems SIHP #s -1047, -1048, -1049, and -1050
Chafee and Dega 2005	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Archaeological monitoring	Two cultural resources identified: SIHP #s -00355, two burials and isolated skeletal remains, and -00361, a cultural layer containing pre- and post-Contact artifacts
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Hā‘ena	Archaeological monitoring	No cultural resources identified in Waipā and Waikoko

Source	Location	Nature of Study	Results (SIHP # 50-30-03)
Kamai and Hammatt 2013	KSBE land; TMK: [4] 5-6-004:023	Burial site component of an archaeological preservation plan	SIHP # -2196, an inadvertent burial discovery
Wheeler et al. 2013b	KSBE land, TMK: [4] 5-6-003:001 por.	Archaeological reconnaissance survey and literature review	One cultural resource identified: three excavated pits on Makaihuwaʻa Ridge

Table 9. State Inventory of Historic Places Sites in Waipā and Waikoko Ahupua’a

SIHP # 50-30-03-	Site Type/Name (if any)	Location	Reference
144	Kupakoili Heiau	West of Wai‘oli Stream	Thrum 1906:43; Bennett 1931:135; Hoffman 1980
146	Halaloa Heiau	East side of Waipā	Bennett 1931:135
147	Kailiopaia Heiau	Western portion of Makahoa Point	Bennett 1931:135
00355	Burials and isolated skeletal remains	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Chafee and Dega 2005
00361	Cultural deposit containing pre- and post-Contact artifacts	0.25-acre property in Waipā, TMK: [4] 5-6-004:015	Chafee and Dega 2005
00433	Irrigation system 21	Eastern edge of Waipā Ahupua‘a	Earle 1978:234; Hoffman 1980:25; Dye 2004
00434	Irrigation system 20	Eastern boundary of Waipā Ahupua‘a, at the base of the hills	Earle 1978:234; Hoffman 1980:25; Dye 2004
00436	Irrigation system 19	Southwest of Waipā Stream	Earle 1978:223; Hoffman 1980:25; Dye 2004
00484	Irrigation system 18	Northwest of Waipā Stream	Earle 1978:33, 67; Hoffman 1980:24; Dye 2004
01040	Cave shelter	*Mauka* end of a natural depression	Dye 2004:21–24
01041	*‘Auwai* section	East side of Waipā Stream	Dye 2004:25
01042	*‘Auwai* system	East side of Waipā Ahupua‘a	Dye 2004:26–27
01047	*Traditional lo‘i* system	Upper portion of Waipā ahupua‘a	Dye 2004:2
None	Excavated pits	Makaihuwa‘a Ridge	Wheeler et al. 2013b:47–56

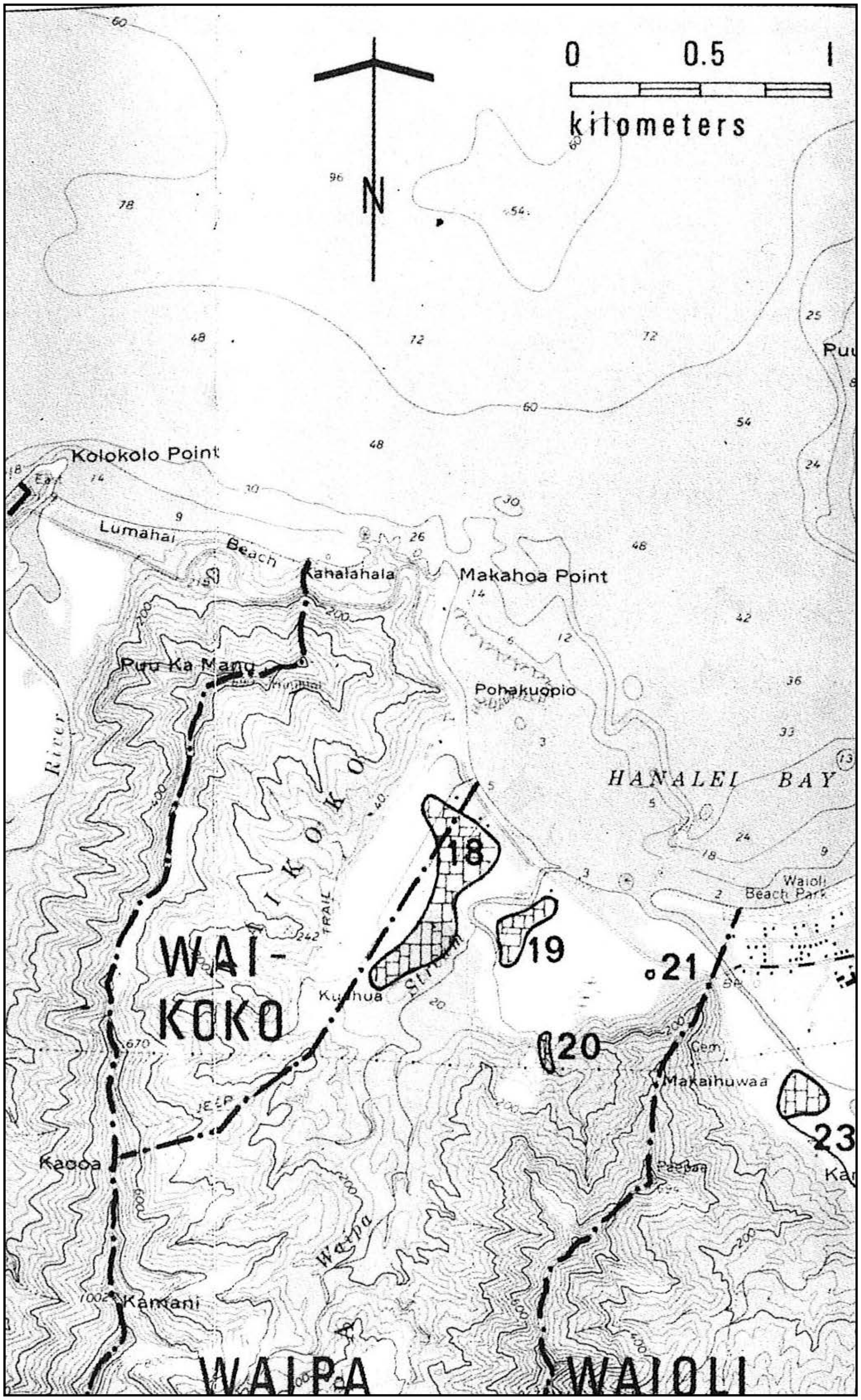


Figure 28. *Loʻi* systems of Waipā as documented by Timothy Earle (1978:196a)

Table 10. Waipā Irrigation System as Documented by Earle (1978:125)

System # (SIHP # 50-30-03)	Type	Source	Length in Meters of Irrigation Ditch		Area in Hectares of Irrigation System		Number of Farmers on Irrigation System	
			Total	Initial Segment	Net	Gross	Net	Gross
18 (SIHP # -484)	Alluvial Coastal Plain	Main stream	1,095	400	2.56	5.18	6	8
19 (SIHP # -436)	Alluvial Coastal Plain	Main stream	875	745	1.80	1.80	5	9-10
20 (SIHP # -434)	Alluvial Bottom	Small independent stream	0	0	0.33	0.33	2	2
21 (SIHP # -433)	–	Ground water	0	0	0.36	0.36	1	1

> ditch follows the line of an old ditch for the first 0.84 km and then it turns at right angles to the west where it is flumed across the Waikoko stream to water a farm with twelve pond fields. This westerly extension of the system is apparently recent, dating after the introduction of rice. The system is presently operated by a single oriental farmer. [Earl 1978:67]

The Waipā systems are clearly small for Haleleʻa District as a whole. Earl (1978:127) notes the mean net area for these Haleleʻa District systems was calculated to be 1.93 ha (range 0.1-16.38). This may be compared to the mean net area for the Waipā systems of 1.26 (range 0.33-2.56). On the basis of “receiving grants,” Earle (1978:127) concludes, “The mean number of farmers within an irrigation system [of Haleleʻa] was 4.7 (range 1 – 43).” The corresponding mean for the farmers of Waipā appears to be 3.5 (range 1-6). It appears Earl’s estimate of the total number of farmers likely to have been working on the Waipā *loʻi* systems was approximately 20 to 21.

5.2.4 Hoffman (1980)

The Hoffman study notes previous massive clearing operations in the coastal flats of Waipā. No new sites were identified but seven previously located sites are briefly summarized. The only two sites Hoffman discusses are Kupakoili Heiau previously discussed and Earle’s agricultural system 21, BPBM # KA-D8-7, SIHP # -433, located “along Kūhiō Highway.” Hoffman notes this later site included a fishpond as indicated in 1850 land records. Neither of these sites was investigated in the Hoffman study.

5.2.5 Panteleo and Williams (1991)

In 1991, an archaeological reconnaissance survey was conducted in selected portions of the Port Allen to Wainiha transmission line corridor. The purpose for the study was to determine the presence and/or absence of any inclusive cultural resources. Portions of this survey were conducted on the north side of Kauaʻi including Waiʻoli, Waipā, Waikoko, Lumahaʻi, and stops in Wainiha Valley at the Wainiha Valley Hydro-electric Plant. No new cultural resources were identified in the Waipā and Waikoko Ahupuaʻa.

5.2.6 Sullivan and Dega (2003); Dye 1994a and Chafee and Dega (2005)

In 2003, SCS wrote a burial treatment plan for two inadvertently disturbed human remains discovered during excavation of a structure foundation and a leach field of a single family residence (Sullivan and Dega 2003). Tom Dye conducted an archaeological inventory survey with subsurface testing for Waipā Foundation in 2004. Further information regarding two previously identified cultural resources and three newly identified cultural resources were documented. Previously identified cultural resources consist of SIHP # -146, a rice mill at the site of Halaloa Heiau, and SIHP # -484, an *ʻauwai* system first identified by Tim Earle who labeled it as “System 18.” Dye describes the current condition of the mill, and notes some of the waterworn cobbles used in the concrete mill construction might have been taken from the *heiau*. The newly identified cultural materials include SIHP # -01040, a cave shelter, and SIHP # -01041, “likely associated with the *heiau* ceremonial complex in pre-Contact times” (Wheeler 2013b:39–40). Additionally, Dye (2004) documents a section of *ʻauwai* along the east bank of Waipā Stream and SIHP #s -1042 and -484, an *ʻauwai* system on the east side of the Waipā Ahupuaʻa (Dye 2004). Archaeological monitoring was conducted after the discovery of inadvertent burials. The burials and isolated finds were given SIHP # -00355; SIHP # -00361 was identified as a cultural layer (Chaffee and Dega 2005).

5.2.6.1 **Dye (2004a)**

An archaeological inventory survey was conducted in Waipā *ahupuaʻa* of lands leased by Kamehameha Schools lands in anticipation of the renewed use of the lower valley for traditional Hawaiian farming and educational purposes. Three parcels were surveyed encompassing 119.417 acres. No features of high significant were noted (Dye 2004:57).

5.2.6.2 Dye (2004b)

A National Park Service grant to the Waipā Foundation permitted the group to survey and map the remains of four traditional Hawaiian taro pond-field systems. “The *loʻi* system contains about 68 patches over an area 200 m long and up to 60 m wide, with an elevational drop over the length of the system of more than 14 m.” (Dye 2004:2).

5.2.7 Fong et al. (2006)

In 2006, CSH monitored an approximate 10-mile stretch from Princeville to Hāʻena for the Kūhiō Highway, Route 560 Shoulder Improvements project (Fong et al. 2006). On the basis of historic research and previous archaeology, monitoring was recommended and an archaeological monitoring plan was written (Shideler et al. 2004). During monitoring of subsurface activities, the soil all appeared to be previously disturbed by road construction. No cultural resources were identified (Fong et al. 2006).

5.2.8 Kamai and Hammatt (2013) and Wheeler et al. (2013b)

In 2013, CSH wrote a burial site component of an archaeological preservation plan for the Waipā Foundation Community Cultural Center project. An inadvertent discovery of human remains was identified during the excavation of an electrical trench. The burial was given SIHP # -2196 (Kamai and Hammatt 2013).

Also in 2013, CSH conducted a reconnaissance survey and literature review for a portion of Waipā for Kamehameha Schools. One cultural resource was identified, a *loʻi* (SIHP # -00434), and three excavated pit features were documented on the Makaihuwaʻa Ridge. The pit features may relate to a traditional account of an aid to navigation on the ridge (Wheeler et al. 2013b).

The central of the three pit features is by far the largest. This central pit is roughly circular, measuring between 2.5 and 3.0 m in diameter and having a maximum depth of 1.7 m below the brow of the ridge on the south side. The walls of this pit are nearly vertical on the southeast, south, and southwest sides. The north side is somewhat sloping, seemingly due to collapse. The floor is roughly level and of the nature of a shallow bowl, perhaps the result of deliberate excavation into the relatively soft saprolitic, decomposing basalt of the ridge summit. This pit was observed to be located in an area with a particularly good view of the sweep of Hanalei Bay to the northwest, north, and northeast; Waipā Valley extending back to the southwest; and Waiʻoli Valley extending back to the southeast (Wheeler et al. 2013b:47–56).

Wheeler et al. (2013b) note the following preliminary points in comparing the Wichman (1985) account to the archaeological reality observed:

- The aid to navigation is deliberately placed ʻhigher . . . over the treetops and [below where] the clouds swirled just above . . . the chief . . .ʼ on Makaihuwaʻa Ridge (Wichman 1985:40–41). This fits the location of the observed historic property very well. The tradition and the archaeology both command the ideal location.
- The chief said ʻHere we must dig out a platform from the edge of the ridge . . . A small platform dug out of the side of a hillʼ (Wichman 1985:41). This is what was observed: a larger excavation with seemingly two smaller excavations with relatively level bottoms.
- ʻAnother group formed a line reaching to the river beds of Waipaʻa and Waikoko and passed smooth stones hand to hand to the work siteʼ (Wichman 1985:41). This was a proverbial way of thinking about how *menehune* worked. No water-rounded cobbles and boulders were observed. There would have been no clear need for the transport of such stones for the story to be basically true.
- The chief sat father up the ridge where he could see the work, and his voice shouting instructions could be heard. A minor mystery was the evidence of two smaller constructions spaced above and below the main pit feature. The upper one, which is certainly close enough for a chief to shout instructions, could have been a supervisory position.
- The account relates a roof over the platform, higher in front than in back in order to protect the torches from the rain and also high enough so the roof wouldn’t catch on fire. No archaeological remnant of a roof would be expected with the passage of time in such an exposed, open, wet (approximately 100 inches of rain a year) location. The 1.7-m deep hole was a surprise in that it initially was not obvious why anyone would dig such a deep hole for a signal fire. The concept that the

construction/excavation was a response to the extraordinary rain and wind does, however, make perfect sense. While remnants of a roof support system were not observed, more careful analysis might develop details of what this would have looked like.

- The nature of the fire is consistently indicated to be ‘*lamakū.*’ The concept is presented as if the lights were akin to chiefly torches understood as *kukui* nut kernels strung on a midrib, woven into cylinders and bundled with dried banana leaves. *Lamaku* does, however, also mean ‘signal fires’ which more prosaically might be of dried wood. No charcoal was observed in the archaeological properties. After the passage of two centuries it would seem likely that even a meter-thick charcoal deposit might entirely disappear from such an exposed, open, wet location. It may be that the preferred fuel would leave less trace than a bonfire. [Wheeler et al. 2013b:55–56]

Accounts of pre-Contact Hawaiian aids to navigation are few. Love Dean’s *The Lighthouses of Hawai‘i* is somewhat dismissive, asserting that

> Before Western contact, Hawaiians did not need permanent navigational aids. Those who set out in boats to fish or to travel to neighboring villages or islands knew the coastlines and all the landmarks well. An open fire to guide them safely to shore was used only at night or during storms. [Dean 1991:1]

We do, however, have an account of a trade agreement made between the planters at Kukuiolono (“Light of Lono”; Kalāheo, Kaua‘i) and the fisherman of the Kona District that required that a huge torch be kept burning at night atop Kukuiolono cinder cone. It is said that fisherman relied on this light for navigation as it could be seen along the whole south coast of Kaua‘i, from Kōloa to Ni‘ihau (Sandison 1956). Clark (1977:41) relates another popular derivation from “*lei*” and “‘*ahi*” or “wreath of fire” which may have been related to the tradition of signal beacon fires lit on the crater rim—either for special occasions and/or as a beacon for canoes. Clark also notes the probability that the prominent Leahi cape (*lae*) was used as a reference point in locating the deep sea fishing grounds or *ko‘a* (shrine, often consisting of circular piles of coral or stone, build along shore or by ponds or streams, used in ceremonies as to make fish multiply) for *‘ahi* (Hawaiian tuna fishes, especially the yellow-fin tuna; *Thunnus albacares*) fish.

5.3 Previous Archaeological Research in Lumaha‘i

Table 11 provides a list of archaeological research conducted within Lumaha‘i, including columns for source, location, nature of study, and findings. Table 12 is a list of known cultural resources within the *ahupua‘a* and includes columns for state site numbers, site type, location and reference. The locations of identified cultural resources within Lumaha‘i Ahupua‘a are shown in Figure 29.

5.3.1 Bennett (1931)

Pu‘uohewa and Pu‘uomama were not found during Bennett’s survey. Bennett (1931) lists one archaeological site at Lumaha‘i: “Site 147. Kailiopaia *heiau*, shoreward of the government road, to the east of Lumaha‘i stream on a raised coral point” (Bennett 1931:135).

5.3.2 Earle (1978)

Earle (1978) discusses Lumahaʻi in a general way but develops no detailed information regarding the agricultural systems of Lumahaʻi. He notes the following:

> Extensive bulldozing for pasturage has destroyed all archaeological evidence of pond fields in the lower section of the valley, but numerous small terrace sites are to be found in the interior. One such site was identified 2.5 km from the sea, during a rapid reconnaissance survey, and others have been described by local hunters. [Earle 1978:33]

This identified terrace site was given Bishop Museum site number Ka-D7-3 and SIHP # -450.

5.3.3 Hoffman (1980)

Hoffman (1980) performed a survey of approximately 300 acres along the floor of Lumahaʻi Valley overlapping the Cordy (1978) and Kelly and Hee (1978) study areas but extending farther to the west. The Hoffman study confirmed three previously reported sites and identified five previously unrecorded sites, Bishop Museum sites KA-D7-9 through -13; SIHP #s -440 through -444. All of these sites are 1.3 km inland or more. She notes the “massive earth-moving operations of historic times” and confirms earlier work: as Earle (1973:233) suggests, “no sites remain in the coastal plain; all located sites are above the 6-meter contour line” (Hoffman 1980:6). Hoffman (1980) does plot the location of Kaliopaia Heiau, just east of the mouth of Lumahaʻi River but notes the site was “not located by survey team.”

5.3.4 Pantaleo and Williams (1991)

In 1991, an archaeological reconnaissance survey was conducted on selected portions of the Port Allen-Wainiha Transmission Line Corridor (Pantaleo and Williams 1991). The corridor spanned through the Līhuʻe District passing through Hanamāʻulu, North Olohena, Waipouli, and Wailua Ahupuaʻa. It then continued north and west through Haleleʻa District in Kalihiwai, Kalihikai, Hanalei, Waiʻoli, Waipā, Waikoko, and Lumahaʻi Ahupuaʻa. No new archaeological sites were discovered during the reconnaissance. However, the transmission line did pass through SIHP # -1006, a pond field remnant in Hanalei Valley.

5.3.5 Fong et al. (2006)

In 2006, CSH conducted archaeological monitoring for the approximately 10-mile stretch of Kūhiō Highway spanning from Princeville to Hāʻena (Fong et al. 2006). During monitoring no archaeological or cultural finds were encountered. Soils found consisted of road fill, disturbed soils, and layers of sand.

5.3.6 McIntosh et al. 2011

In 2011, Pacific Legacy, Inc. conducted an archaeological inventory survey in the vicinity of Lumahaʻi along the highway for a proposed bypass road and emergency repair work. No cultural resources were identified (McIntosh et al. 2011).

5.3.7 Wheeler et al. (2013a)

In 2013, CSH conducted an archaeological field inspection and literature review for an approximately 99-acre portion of Lumahaʻi Ahupuaʻa for Kamehameha Schools. The purpose of the study was to provide the landowner (or their representative) with an overview of existing archaeological conditions, to facilitate planning, and to inform our client on appropriate archaeological considerations on land use for planning (Wheeler et al. 2013a:1).

Table 11. Previous Archaeological Studies in Lumaha‘i Ahupua’a

Source	Location	Nature of Study	Results (SIHP # 50-30-03)
Bennett 1931	Lumaha‘i	Island-wide survey	Site -147, Kailiopaia Heiau
Earle 1978	Halele‘a District: Lumaha‘i	Study of economic and social organization	No cultural resources identified in Lumaha‘i
Kelly et al. 1978	Lumaha‘i Valley	Historical survey	Traditional and historical literature review; identified one cultural resource, SIHP # -00445, Chinese Camp
Hoffman 1980	Alluvium plains of Lumaha‘i Valley	Archaeological survey	Confirmed three previously identified cultural resources and identified five new cultural resources: SIHP #s -00440 through -00444
Pantaleo and Williams 1991	Transmission line corridor	Archaeological reconnaissance survey	No cultural resources identified in Lumaha‘i
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Hā‘ena	Archaeological monitoring	No cultural resources identified
McIntosh et al. 2011	Proposed Bypass road (TMK (4) 5-7-03). Vicinity of Makahoa Point.	Archaeological Inventory Survey	No traditional sites or featires were located.
Wheeler et al. 2013a	99-acre portion of Lumaha‘i Ahupua‘a, TMK: [4] 5-7-002:001 por.	Field inspection and literature review	No cultural resources identified. No nearby trails will be impacted.

Table 12. State Inventory of Historic Places Sites in Lumaha‘i Ahupua’a

SIHP # 50-30-03-	Site Type/Name (if any)	Location	Reference
00445	Chinese Camp	Lumaha‘i Valley	Kelly et al. 1978:35

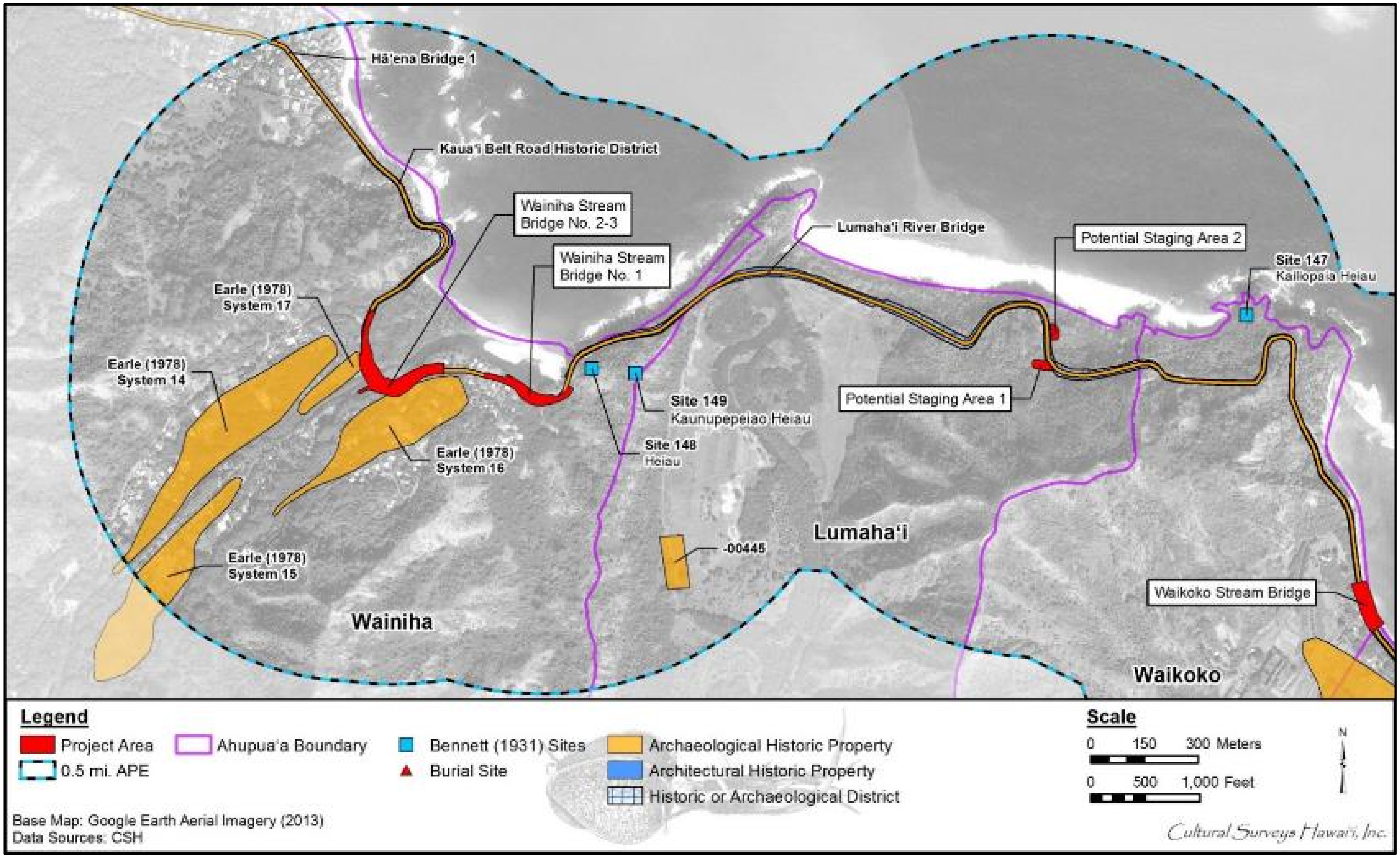


Figure 29. Aerial photograph (Google Earth 2013) showing locations of previous identified cultural resources in Lumahaʻi and Wainiha Ahupuaʻa; note Bennett's (1931) sites 152 and 153 are beyond the scope of this map, further south within Wainiha Valley

5.4 Previous Archaeological Studies in Wainiha

Table 13 provides a list of archaeological research conducted within Wainiha, including columns for source, location, nature of study, and findings. Table 14 is a list of historic properties within the *ahupuaʻa* and includes columns for state site numbers, site type, location, and reference. The locations of identified cultural resources within Wainiha Ahupuaʻa are shown in Figure 29.

5.4.1 Bennett (1931)

Bennett (1931) in his systematic, but not exhaustive, survey of archaeological sites on Kauaʻi, describes six sites in Wainiha, all of which appear to be on or near Wainiha River. Two of Bennett's sites (148, 149) are on or close to the coast, and the four remaining sites are all upstream and include two *heiau* (Site 150 - Laumaki Heiau, Site 151 - Apaukalea Heiau), taro terraces (Site 152), and house sites on Mauna Hina Ridge (Site 153). Bennett describes the sites as follows:

> Site 148. *Heiau* on Popoki knoll. Popoki knoll is located next to the road (inland side) in front of Site 149 near the Wainiha river. It is said to have been a *heiau* site, but nothing remains to mark it. [Bennett 1931:135]
>
> Site 149. Kaunupepeiao Heiau, back of the first house on the first *pali* east of the mouth of the Wainiha River. A flat place about 30 feet wide and 20 feet deep with stones along the front edge meet the description given by Thrum: 'A 12-foot open-paved *heiau* of husbandry class; probably simply a place of offering.' [Bennett 1931:135]
>
> Site 150. Laumaki *heiau*, on a knoll west of the 'Power House' road—about one mile from the government road, in Wainiha valley. Thrum describes this *heiau* as 'A small, open platform, paved heiau, 2 feet high, of husbandry class.' The platform measures 20 feet wide and 10 feet deep and faces the sea. It is paved with river stone. [Bennett 1931:135]

Table 13. Previous Archaeological Studies in Wainiha Ahupua'a

Source	Location	Nature of Study	Results
Bennett 1931	Island-wide	Archaeological survey	Lists three *heiau* in Wainiha: Laumiki, Apaukalea, and Kaunupepeiao
Earle 1978	Haleleaʻa District: Wainiha	Archaeology and socio-economics	Identifies extensive *loʻi* systems along Wainiha Stream
Pantaleo and Williams 1991	Transmission line corridor	Archaeological survey	No cultural resources identified in Lumahaʻi

Source	Location	Nature of Study	Results
Spear 1992	Lot in Wainiha Ahupua‘a, TMK: [4] 5-8-009:045	Inventory survey and data recovery	SIHP # -1878, cultural deposit with fire pits, postholes, *imu*, and a burial, data recovery located 30 pre-Contact burials
Ida et al. 1993	West side Wainiha Valley back from river mouth, TMK: [4] 5-8-002:003	Archaeological survey	No cultural resources identified
Hammatt and Ida 1995	West side of Wainiha valley back from mouth, TMK: [4] 5-8-002: por. 003	Archaeological investigation	No cultural resources identified
McGerty and Spear 1999	Lot 44, Wainiha, TMK: [4] 5-8-009:044	Archaeological inventory survey	Burial on adjoining lot part of SIHP # -1878, cultural deposit
Fong et al. 2006	Approx. 10-mile stretch of Kūhiō Hwy, Princeville to Hā‘ena	Archaeological monitoring	No cultural resources identified
Groza et al. 2010	Proposed Wainiha Well, TMK: [4] 5-8-002:003	Archaeological assessment	No cultural resources identified

Table 14. State Inventory of Historic Places Sites in Wainiha Ahupua’a

SIHP # 50-30-03-	Site Type/Name (if any)	Location	Reference
148	*Heiau*	On Popoki knoll	Bennett 1931:135
149	Kaunupepeiao Heiau	First *pali* east of mouth of Wainiha River	Bennett 1931:135
None	System 14	West side of Wainiha Stream	Earle 1978:58–63
None	System 15	On an island between two major channels of Wainiha Stream	Earle 1978:59, 63–66
None	System 16	On the east side of Wainiha Stream	Earle 1978:59
None	System 17	On flat alluvial soils west of Wainiha Stream	Earle 1978:66–67

Site 151. Apaukalea *heiau*, adjoins the “Power House” road on the east side, inland from Site 150 in Wainiha valley:

> The remains of recent occupation together with modern stone platforms, walks, graves with tombstones and other such work, make the distinction of this heiau difficult. The *heiau* consists of a small, square, paved area about 35 feet on a side. The east wall is 15 feet wide, and badly tumbled on the outside, though 3 feet high on the inside. The north wall is irregular, about 15 feet wide, and 2 feet high. A projection inwards forms a platform 10 by 15 feet. The west wall is just a trace of stone, but seems to have been 15 feet wide. The south wall is of varying width and runs from the road to the bluff, a distance of 130 feet. It is about 3 feet high. To the west of this enclosure is a flat space with two lines of stone traversing it, while on the east are two paved house sites about 10 feet square. [Bennett 1931:135]

Two of Bennett’s (1931) sites, Sites 152 and 153, described as taro terraces and house site respectively, are within the Wainiha Valley:

> This interesting taro section is high on the side of the valley utilizing a little stream and a small flat area. The hill is on one side and the stream and a bluff on the other, leaving a fairly steep section in between. At one place above the terraces stones are built across the stream as an intake, which could, with the addition of a few more stones, shunt the water into a ditch which runs between large rocks and dirt walls. All along the edge of the stream is a wall built to keep the water from running back. The terraces are from 6 inches to 3 feet high . . . Site 153. House sites, on Mauna Hina ridge in Wainiha Valley. Remains of many old house sites and much irrigated land. The house sites are mostly of the terraced type and 10 to 15 feet wide. [Bennett 1931:135, 136]

5.4.2 Earle (1978)

Earle’s documentation of irrigated taro systems in Wainiha is shown on a USGS map of the valley (Earle 1978:59). Earle’s System 14 extends along Wainiha River to just southeast of Powerhouse Road. Earle observed that the lower portion of Wainiha Valley was extensively used for taro cultivation through the 1850s (Earle 1978:32).

5.4.3 Pantaleo and Williams (1991)

See description in Section 5.2.

5.4.4 Ida et al. (1993)

In 1993, CSH conducted an archaeological inventory survey for a 50-ft by 50-ft parcel for a GTE Hawaiian Tel telecommunications hut (Ida et al. 1993) adjacent to an existing water pump. The old Wainiha Powerhouse Road and water pump access road cut through the eastern portion of the parcel, providing a maximum stratigraphic profile of 90 cmbs (cm below surface). No cultural material was found during the pedestrian survey or during a review of the exposed stratigraphy within the road cuts. No further work was recommended and the project area was observed to be too steeply sloped for agricultural cultivation or habitation.

5.4.5 Hammatt and Ida (1995)

In 1995, CSH conducted an archaeological investigation (Hammatt and Ida 1995) in the same general area as the Ida et al. (1993) project described above. The field survey included an area designated as Lot 1 that consisted of a 6,000-sq-ft area with a water tank, and a 15,769-sq-ft utility easement that extended from a pump station on Powerhouse Road to the Lot 1 water tank. No cultural material was observed during the field survey or during a review of the exposed stratigraphic profile within the road cuts. The same stratigraphic profile observed during the Ida et al. (1993) project was also present within this project area.

5.4.6 McGerty and Spear (1998)

In 1998, SCS completed an archaeological inventory survey for Lot 44, Wainiha, TMK: [4] 5-8-009:044 and found a burial on the adjoining lot, which is part of SIHP # -1878, a cultural deposit. Archaeological monitoring was advised.

5.4.7 Rechtman and Dougherty (2001)

In 2001, Rechtman Cronsulting conducted an archaeological inventory survey for two noncontiguous parcels (TMKs: [4] 5-8-012:005, 011) within Wainiha Ahupuaʻa (Rechtman and Dougherty 2001), one of which is approximately 500 m north and the other 500 m northeast of the current project area. Subsurface testing included a total of three trenches within Parcel 5 and four trenches within Parcel 11. No further work was recommended based on the lack of findings during the pedestrian survey and subsurface testing.

5.4.8 Christropher Monahan (2003)

In 2003, monitoring was conducted during excavation of the foundation for the Smith Property (TMK: [4] 5-8-009:025). Eleven individual burials, a cultural layer containing ash, fire-cracked rock, charcoal, stone and coral tools, and partial remains of a pig. These plus earlier collected materials have been designated SIHP # -1837. While there is no evidence of permanent settlement, the place was a traditional burial ground for *makaʻāinana* (Monahan 2003).

5.4.9 Fong et al. (2006)

See description in Section 5.2.

5.4.10 Groza et al. (2010)

In 2010, CSH conducted an archaeological inventory survey with shovel testing for a proposed Wainiha well (Groza et al. 2010). No cultural resources were identified.

Section 6 Community Consultation

6.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with Native Hawaiian organizations (NHO), agencies, and community members including descendants of the area in order to identify individuals with cultural expertise and/or knowledge of the *ahupuaʻa* of Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha. CSH initiated its outreach effort in October 2015 through letters, email, telephone calls, and in-person contact. Consultation efforts in finalizing transcriptions and summaries are still ongoing.

6.2 Community Contact Letter

In the majority of cases, letters (Figure 30 and Figure 31) along with a map and an aerial photograph of the project were mailed with the following text:

> At the request of The Federal Highway Administration, Central Federal Lands Highway Division (FHWA) and the State of Hawaiʻi Department of Transportation (HDOT), Cultural Surveys Hawaiʻi Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Wainiha Bridges Project, Waiʻoli, Waikoko, Waipā, Lumahaʻi, and Wainiha Ahupuaʻa, Haleleʻa District, Kauaʻi Island. Tax Map Keys (TMK) and corresponding acreage are listed below:
>
> - Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; 0.517 acres
> - Waikoko Bridge: [4] 5-6-003:002, 999 por.; 0.715 acres
> - Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por.; 0.669 acres
> - Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por.; 2.272 acres
> - Waioli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por.; 0.913 acres
> - Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.; 0.916 acres
>
> The FHWA and the HDOT propose the replacement of three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) on the north side of the island of Kauaʻi. The bridges are located between mile post 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge #2 suffered permanent damage and Bridges #1 (the southern-most bridge) and #3 (the northern-most bridge) were determined to be structurally deficient). The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by HDOT. FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. Also

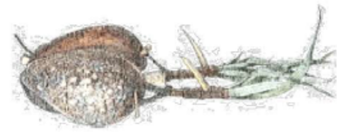
included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges), located at Waiʻoli, Waipā, and Waikoko Streams. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges. The existing temporary ACROW bridges at the Wainiha project site would be shifted *makai* (towards the ocean) to accommodate traffic during construction of the new bridges. All temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumahaʻi Ahupuaʻa are also included in the Area of Potential Effects. Staging also may occur at each bridge location.

The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assists us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project.

We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites- for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kamaʻāina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupuaʻa* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

Cultural Surveys Hawai'i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President



P.O. Box 1114 Kailua, Hawai'i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950
Job code: WAINIHA 10 amitchell@culturalsurveys.com www.culturalsurveys.com

October 2015

Aloha mai e kāua,

At the request of The Federal Highway Administration, Central Federal Lands Highway Division (FHWA) and the State of Hawai'i Department of Transportation (HDOT), Cultural Surveys Hawai'i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the Wainiha Bridges Project, Wai'oli, Waikoko, Waipā, Lumaha'i, and Wainiha Ahupua'a, Halele'a District, Kaua'i Island. Tax Map Keys (TMK) and corresponding acreage are listed below:

- Potential Staging Areas 1 and 2: [4] 5-7-003:003, 999 por.; 0.517 acres
- Waikoko Bridge: [4] 5-6-003:002, 999 por.; 0.715 acres
- Wainiha Bridge 1: [4] 5-8-002:002 por.; [4] 5-8-006:030, 031, 032, 033, 046, 060, and 999 por.; 0.669 acres
- Wainiha Bridge 2-3: [4] 5-8-006:009, 011, 017, 018, 019, 030, 999 por.; [4] 5-8-007:023, 024, 031, 032, 999 por.; 2.272 acres
- Waioli Bridge: [4] 5-5-005:005, 007, 021, 028, 999 por.; [4] 5-5-006:014, 888 por.; [4] 5-6-002:002, 004, 999 por.; 0.913 acres
- Waipā Bridge: [4] 5-6-004:014, 022, 023, 999 por.; 0.916 acres

The FHWA and the HDOT propose the replacement of three temporary pre-fabricated (ACROW) bridges on Kūhiō Highway (Route 560) on the north side of the island of Kaua'i. The bridges are located between mile post 6.4 and 6.7 near the mouth of Wainiha Stream before it feeds into Wainiha Bay. The original bridges at these three locations were replaced with temporary ACROW bridges after Bridge #2 suffered permanent damage and Bridges #1 (the southern-most bridge) and #3 (the northern-most bridge) were determined to be structurally deficient). The ACROW bridges were installed as a temporary measure to keep the roadway open to residents and public traffic until environmental clearance and funding for the permanent structures could be secured. The three bridges are owned and maintained by HDOT. FHWA and HDOT propose the replacement of the temporary ACROW bridges with new one-lane bridges that closely match the existing alignment. Also included as part of the proposed project is the placement of temporary one-lane bridges adjacent to or crossing over three historic one-lane bridges along Kūhiō Highway that access the project site (Wainiha Bridges), located at Wai'oli, Waipā, and Waikoko Streams. These historic bridges have low load capacities and temporary bridges would allow construction loads to access the Wainiha project site without affecting the historic integrity of these bridges. The existing temporary ACROW bridges at the Wainiha project site would be shifted *makai* (towards the ocean) to accommodate traffic during construction of the new bridges. All temporary bridges would be removed upon completion of the project. Two potential staging areas in Lumaha'i Ahupua'a are also included in the Area of Potential Effects. Staging also may occur at each bridge location.

Figure 30. Community consultation letter, page one

WAINIHA 10 **CIA for the Wainiha Bridges Project**

Page 2

The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area. The research and interviews assists us when assessing potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project.

We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites- for example, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

In advance, we appreciate your assistance in our research effort. **If you are interested in participating in this study, please contact Auli‘i Mitchell (amitchell@culturalsurveys.com) by email or phone at (808) 262-9972 no later than November 13, 2015.**

Me ka ha‘aha‘a,

Auli‘i Mitchell
CSH Cultural Advisor

Figure 31. Community consultation letter, page two

6.3 Community Contact Table

Table 15 contains the names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies contacted for this project. Results are presented below in alphabetical order.

Table 15. Results of Community Consultation

Name	Affiliation	Comments
Aipolani, C. Kunane	Chair, Kaua‘i-Ni‘ihau Island Burial Council	Letter and maps sent via email 16 October 2015
Akana, Kaipo	Former archaeologist, Kaua‘i resident	Letter and maps sent via U.S. Postal Service (USPS) 9 October 2015 Mr. Akana emailed CSH on 16 October 2015 with the following: *Mahalo for letter and maps. Yes I am interested. However, the locations are a bit distant to travel as an octogenarian. I have read and reviewed the maps and do not believe that there are a significant archaeological impact to these areas. Thank again for the postings.*
Alapai, Keli‘i	Kilauea community, fisherman	Letter and maps sent via USPS 19 October 2015 CSH followed up with a phone call to Mr. Alapai on 27 October 2015, left message
Albao, Liberta	Kākau ‘Ōlelo, Queen Deborah Kapule Hawaiian Civic Club	Letter and maps sent via USPS 9 October 2015
Andrade, Carlos	Professor of Hawaiian Studies, University of Hawai‘i at Mānoa Resident of Hā‘ena Ahupua‘a	Letter and maps sent via email 16 October 2015
Berg, Carl	Biologist Chair, Surfrider Foundation (Kaua‘i Chapter)	Letter and maps sent via USPS 9 October 2015
Butler, Bob	Fisherman, business owner	Letter and maps sent via USPS 9 October 2015 CSH followed up with a phone call to Mr. Butler on 27 October 2015, left message

Name	Affiliation	Comments
Cabebe, Andrew	Activist	Letter and maps sent via USPS 9 October 2015 CSH followed up with a phone call to Mr. Cabebe on 27 October 2015, left message
Carswell, Curly and Gayle	Princeville community resident	Letter and maps sent via USPS 9 October 2015
Chandler, Jeff and Linda	Historic Sites Specialist, Hui Hoʻomalu I Ka ʻĀina Cultural consultant *Kamaʻāina*	Letter and maps sent via USPS 9 October 2015
Ching, Mike	Hanalei business owner *Kamaʻāina*	Letter and maps sent via USPS 9 October 2015 Mr. Ching responded via phone on 27 October 2015 with the following: *They should make it all two lanes except for the tiny bridges. That is all.*
Crabbe, Kamanaʻopono	*Ka Pouhana* (Chief Executive Officer), Office of Hawaiian Affairs	Letter and maps sent via USPS 19 October 2015
Dohrman, Mal and Pam	*Kamaʻāina*	Letter and maps sent via USPS 16 October 2015 CSH to meet with Mrs. Dohrman on 16 November 2015
Downer, Alan	Administrator, State Historic Preservation Division – Department of Land and Natural Resources	Letter and maps sent via email 16 October 2015
Enright, Rory	Princeville Community Association	Letter and maps sent via USPS 9 October 2015
Fayé, Alan and Suzi	Princeville Community Association	Letter and maps sent via USPS 9 October 2015 Interviewed 16 November 2015 CSH emailed 1 December 2015 draft transcription of interview Mr. Fayé responded via email 1 December 2015 stating he will begin reviewing document

Name	Affiliation	Comments
		Mr. Fayé completed his edits and sent via email 2 December 2015 CSH emailed Mr. Fayé on 3 December with some edits and clarifications; Mr. Fayé responded via email the same day with edits Mr. Fayé's interview can be found in Section 6.4.1
Fitzgerald, Michael	Hanalei Business Community Owner, Hanalei Poi Company, LLC	Letter and maps sent via USPS 9 October 2015
Fronda, Kalani	Land Assets Manager, Kamehameha Schools' Land Assets Division	Letter and maps sent via email 16 October 2015
Furfaro, Jay	Councilman Gomes family historian	Letter and maps sent via USPS 19 October 2015
Goo, Wendell	*Kupuna* and fisherman	CSH called Mr. Goo on 27 October 2015, left message CSH called and spoke to Mrs. Goo on 29 October 2015 Letter and maps sent via USPS on 30 October 2015
Guy, Joel	Hanalei Community Board President Hanalei to Hāʻena Community Assocation	Letter and maps sent via USPS 9 October 2015
Helder, David	Resident of Wainiha	Interviewed 16 November 2015 CSH emailed 1 December 2015 draft transcription of interview Mr. Helder responded via email on 2 December 2015 that he would review later as he was currently traveling CSH responded to Mr. Helder via email on 3 December 2015

Name	Affiliation	Comments
		Mr. Helder responded via email 29 December 2015 with edits Mr. Helder's interview can be found in Section 6.4.1
Helder, Julian	Resident of Wainiha	Interviewed 16 November 2015 CSH emailed 1 December 2015 draft transcription of interview Mr. Helder's interview can be found in Section 6.4.1
Ham Young, Kalehua	*Kupuna* of Hanalei Waipā Foundation	Letter and maps sent via USPS 9 October 2015
Hanalei Poi Company		Letter and maps sent via USPS 9 October 2015
Harada, Yoshi	Course Superintendent, Princeville Golf Club	Letter and maps sent via USPS 9 October 2015
Haraguchi, Rodney	Taro farmer (Hanalei)	Letter and maps sent via USPS 9 October 2015 CSH followed up with a phone call to Mr. Haraguchi on 27 October 2015, left message
Hashimoto, Annie	Friends of Aloha Endowment	Letter and maps sent via USPS 9 October 2015
Hashimoto, Tommy	Historian	Letter and maps sent via USPS 9 October 2015
Hermosua, Ann	Resident of Kīlauea	Letter and maps sent via USPS 9 October 2015
Hilo, Regina	Burial Sites Specialist, State Historic Preservation Division – Department of Land and Natural Resources	Letter and maps sent via email 16 October 2015
Imparato, Carl	Hanalei Community	Letter and maps sent via USPS 9 October 2015
Ishikawa, Kennichi	Historian	Letter and figures sent via USPS 9 October 2015
Jeremiah, Jason	Senior Manager, Land Assets Division – Kamehameha Schools	Letter and maps sent via email 16 October 2015

Name	Affiliation	Comments
Jones, Donny	President, Hanalei Canoe Club	Letter and maps sent via USPS 9 October 2015
Kaʻaumoana, Makaʻala	Executive Director, Hanalei Watershed Hui	Letter and maps sent via USPS 19 October 2015
Kaluahine, Stanley	Former employee at Princeville	Letter and maps sent via USPS 9 October 2015
Kanealiʻi, Julie	Kākau ʻŌlelo, ʻAhahui Kīwila Hawaiʻi O Moʻikeha	Letter and maps sent via USPS 9 October 2015 Second letter and maps sent via email 16 October 2015
Kauka, Sabra	*Kumu*	Letter and maps sent via USPS 9 October 2015
Kimura, Jan	Hunter, Princeville employee	Letter and maps sent via USPS 9 October 2015, letter returned
Kobayashi, Chris	*Kamaʻāina*	Letter and maps sent via email 16 October 2015
Like, Kaipo	Caretaker, Waipā	Letter and maps sent via email 16 October 2015 CSH followed up with a phone call to Mr. Like on 27 October 2015, left message
Mahuiki, Samson	President, Waipā Foundation	Letter and maps sent via USPS 9 October 2015; CSH followed up with a phone call to Mr. Mahuiki later that evening and he stated the following: *Lived Hāʻena we never did go anykind place until we got older then we went [and] KS [Kamehameha Schools] had that place up for lease, when young Robinson had that lease until they developed that place cause I used to work fire department. Then KS had public auction, had a group was supposed to get them. Was all five acre parcels, when they left they had information on the fire station porch. All his life he wanted the land for raise animals. Hawaiians tried to organize a group to get the lease, it was hard for us to get anything at that time. Just show up as Hawaiians. We never did frequent those areas until we get the lease. Never go Wainiha only fish in Hāʻena. Heavy nets [were used] to fish down by Hāʻena Cave.*

Name	Affiliation	Comments
		Just summer months for akule, we had commercial license for fish; akule come in big schools; limu kohu that was the easiest safe place to pick up. Hā‘ena Beach Park, look to the left point, always get limu kohu [where the] breakers hit and low tide is the best time to pick up. If you want to eat fish, you go anytime of year get loaded with fish. Now we go have the kids cook for us. Reef ‘enenue all that kind they cracka jack now, they gotta do all the physical stuff. The net is the one when you offer them they give, you eat with desire and mahalo. You make your poi bowl clean, you going eat with friends, for give time for each other with that kind of pleasant that kind of stories. You make time for them who visit you.
McCrory, Lynn	Resident of Hanalei-Princeville	Letter and maps sent via USPS 9 October 2015; letter returned
Mijares, Scott	Save Kaua‘i	Letter and maps sent via email 16 October 2015
Miller, Pi‘ikea	*Kama‘āina*, *kuleana* land	Letter and maps sent via email 16 October 2015
Pacheco, Gary	Lions Club, Rotary	Letter and maps sent via USPS 9 October 2015
Robeson, Barbara	Long-time resident of Wainiha	Interviewed 17 November 2015 CSH followed up with Mrs. Robeson via email on 20 November 2015 Mrs. Robeson emailed CSH on 20 November 2015 stating she has documents to send CSH emailed Mrs. Robeson a draft interview summary via email 27 January 2016; Mrs. Robeson replied the same day that she would review later Mrs. Robeson’s interview can be found in Section 6.4.2

Name	Affiliation	Comments
Rogers, Nani	Ho‘okipa Network	Letter and maps sent via email 16 October 2015; letter returned
Say, Barbara	Member, Kaua‘i-Ni‘iahu Island Burial Council	Letter and maps sent via USPS 19 October 2015 CSH followed up with a phone call to Mrs. Say on 27 October 2015, left message
Schuller, Julie	Princeville Community	Letter and maps sent via USPS 9 October 2015
Sheehan, Annie and Keola	Hanalei business community	Letter and maps sent via USPS 9 October 2015
Sheehan, Patsy	Hanalei community Kaua‘i Historical Society	Letter and maps sent via USPS 9 October 2015
Sloggett, Dick	*Kama‘āina* and fisherman	Letter and maps sent via USPS 9 October 2015
Smith, Dick	Nā Molokama Canoe Club	Letter and maps sent via USPS 9 October 2015
Sproat, Stacy	Waipā Foundation	Letter and maps sent via USPS 9 October 2015
Surface, Jan	Watershed Coordinator, Hanalei Heritage River	Letter and maps sent via USPS 19 October 2015
Ueunten, Gary	Clean Water Branch, Department of Health – Environmental Services, State of Hawai‘i	Letter and maps sent via USPS 9 October 2015
Wichman, Jonathan	*Kama‘āina* of Halele‘a Moku	Interviewed 17 November 2015 CSH followed up with Mr. Wichman via email on 21 November 2015 CSH emailed Mr. Wichman a draft interview summary via email 27 January 2016 Mr. Wichamn replied via email on 28 January 2016 stating he would review later Mr. Wichman emailed edits to CSH on 1 February 2016 Mr. Wichman’s interview can be found in Section 6.4.2

Name	**Affiliation**	**Comments**
Winter, Kawika	Director, Lima Huli Garden	Letter and maps sent via USPS 9 October 2015
Yent, Martha	Archeologist, Hawaiʻi State Parks	Letter and maps sent via email 16 October 2015
Yokotake, Naomi	President, Hanalei Hawaiian Civic Club *Kumu hula*, Hula Hālau ʻo Hanalei	Letter and maps sent via USPS 9 October 2015
Yokotake, Sherri	Hanalei Hawaiian Civic Club	Letter and maps sent via USPS 9 October 2015

6.4 Kamaʻāina Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *manaʻo* with CSH whether in interviews or brief consultation, including contacts who opted not to contribute to the current cultural impact assessment, but nevertheless spent time explaining their position on the proposed project. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and in no way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s.

6.4.1 Alan Faye, Julian Helder, and David Helder

On November 16, 2015, Auliʻi Mitchell of CSH conducted a group "talk story" session with Mr. Alan Fayé, Mr. David Helder, and Mr. Julian Helder to discuss the CIA for the Wainiha Bridge Route 560 Kūhiō Highway Project, Waiʻoli, Waipā, Waikoko, Lumahaʻi, and Wainiha Ahupuaʻa, in the district of Hanalei, on the beautiful island of Kauaʻi. We were most fortunate to be hosted in the home of Mrs. Susie Fayé. The following is a summary of the interview.

Before our session began, CSH provided five separate USGS maps of the project areas on the bridges in each *ahupuaʻa*. These maps were displayed before us as to refer to them during our "talk story" session. The session began by introducing each other for recording purposes and this began with the introduction of Mr. Alan Fayé.

Mr. Alan Fayé was born in 1932 at the Waimea Sugar Plantation Dispensary to Alan Eric Fayé, Sr. and Mrs. Janet Fayé. Alan Eric Fayé was born in 1905, he and his wife, Janet raised their children in the lands of Waimea. Mr. Faye spoke sprightly about his childhood:

> I grew up in Waimea; then I went away to prep school on the east coast. All of us barefooted *haole* [white person] boys and sometimes some local Hawaiʻi boys too went back to that Prep School in Connecticut. I was at that school for three years. Choate School; a prep school for Yale. My father was one of five Fayé brothers who also went to Choate. One of the five actually did go to Yale; the rest went out to Stanford and University of California, Berkeley. So when I graduated, we were all juniors with same names as our fathers. We went from Hawaii and we learned how to wear neckties and say, "Sir," to the Masters; learned how to be proper, and how to find out what we wanted to do in life. It was spiritual school; it was Christian. Then from Choate, I was going to go to Stanford but then at the last minute I decided I wanted to go to the University of Washington in Seattle, and that is where I met Susie.

Alan's grandfather, Hans Peter Fayé (H.P. Fayé) started the Kekaha Sugar Company, one of the first big plantations on the west side. His grandfather was joined by G.N. Wilcox and others. Later his grandfather purchased Waimea Sugar from some missionaries which became the families "Waimea Sugar Mill Co., Ltd." together with the Waimea Dairy.

Mr. Faye shared an interesting fact that his grandfather, H. P. Fayé came from Norway and spoke very little English, so the first thing he learned was the Hawaiian language. On special occasions Alan's grandfather was invited to the island of Niʻihau by the Robinson Family for social gatherings. He continues by sharing how his grandparents met:

> For a "special occasion," he was invited by the Robinson Family, to Niʻihau Island for a social weekend. At the same time the Robinson Family also invited my grandmother's family, which was the Lindsay Family from Moloaʻa; they were also invited to Niʻihau for the same weekend for the same social party. The Robinsons don't do that socializing on Niʻihau anymore, but they sure did then. The Robinson Family was all like godfathers and godmothers to us in the Waimea Foreign Church. So, my grandfather from Waimea and my grandmother, Margret Elizabeth Lindsay from Moloaʻa met there on Niʻihau, and became pretty well connected. After that, grandpa would get on his horse, (he lived in Kekaha-Mānā), and would ride all the way to Moloaʻa to court my grandmother. So finally they got married in 1894. From then on, their life went wild with sugar and dairy. They had a dairy, the Lindsay's in Moloaʻa, we had a dairy in Waimea, so they moved the Moloaʻa Dairy to Waimea. The Waimea Dairy and Sugar Plantation combination was of great value, in that we could use sugar cane tops for cattle feed, along with the molasses. Raw sugar and molasses were benefits at home from the cane operation. The dairy provided the milk and byproducts.

Growing up in Waimea next door to a Filipino Camp Alan's childhood was filled with all kinds of local friends, some of which worked at the family dairy. His grandfather passed away in 1928 so his father took on the role of managing WSMCo, Ltd, including the dairy, which he managed until his death in 1968. Mr. Fayé later went to work with Boeing in 1955, later he went to work for NASA. Alan added:

> I went to work with Boeing after I graduated from UW in 1955. I later went to work for NASA. Before NASA, it was called "NACA," National Advisory Committee for Aeronautics, and the NACA Committee Chairman was Jimmy Doolittle. As NACA, we were called "Ames Aeronautical Laboratory," located in Mountain View, California. So that is where I really started.
>
> So, from starting at Boeing for one year, then on to NACA in 1956, and then in 1958, we, NACA, suddenly became NASA; named NASA Ames Research Center. We were the first research center for NASA. Mostly you heard later, of Houston and Florida. We were the ones to start with the first astronauts. We trained the first seven astronauts that did Mercury, Gemini and finally the Apollo space flights, so I knew all the guys. We trained them and built flight simulators for them and I got to know Neil Armstrong very well before he became an astronaut, when he was still flying the NACA X-15s hypersonic rocket aircraft, at Edwards. Every time I look up at the moon I think of Neil. We built a research jet-lift test bed with automated controls, to simulate the lunar module controls, to train for Neil's "manual control" on landing on the moon, if needed. He came back to thank us for the manual control landing training. The auto-land would have crashed the "LEM" into a big rock formation. He flew on. Missed the rocks and landed safely!
>
> After 25 years there, I retired and came back home to help out our plantation development, which got moved along by Hurricane Iwa. Iwa thrashed our whole sugar plantation camp so we moved the camp houses around and started the

> Waimea Plantation Cottages, which is a very successful "Plantation Cottage Resort" to this day.

Mr. Fayé and his wife Susie has lived in Princeville for 34 years. Their connection to the *ahupuaʻa* of study goes back to when Alan's father built a house on the beach in Hanalei, a vacation house in 1914 in which he spend his childhood year. At that time he remembers that there were only five to ten *haole* families in Hanalei everyone else was of Hawaiian and Chinese ancestry. This was a time when the Hawaiian *hukilau* (seine) were real and the Hawaiian culture became ingrained in all who lived there.

Our "talk story" session continued with the introduction of Mr. David Helder. Mr. Helder was born in 1947 and has lived in Wainiha for eighteen years. David is a retired artist and a caring member of the Hanalei Community. Attending the "talk story" session was his son, Julian Helder, a recent Master's graduate at the University of Hawaiʻi at Mānoa's Department of Urban and Regional Planning. His research thesis, *Historic Preservation as a Planning Tool for the Protection of a Culturally Diverse Island*, focuses on the district of Hanalei and sheds light on the bridges within the district. His specialty is community planning and historic preservation. Julian expressed his thoughts on the past history of Hanalei in the following words:

> It used to be incredibly rural basically all of the north shore past Hanalei was multiculturalism based--Filipino, Chinese, Samoan, and Pacific Islanders. They all kind of lived this subsistence based life out there and they were connected with taro farming and agriculture that went around and that was the case almost still when we moved there in 1998 even though they still did subsistence fishing and hunting all that kind of stuff, but since we moved in it has been slowly shifting over time, now half of the houses out there are vacation rentals, it has definitely changed.

It was conveyed by David Helder that Wainiha used to be considered a kind of hot bed of Hawaiianism, there and Anahola were the two places Hawaiians moved to from everywhere else. Mr. Helder also mentioned there is actually a space where there used to be a town of Hāʻena which was taken out with the title wave. It was located where the church was. There is still of cluster of Hawaiians living there that would be good to interview. These families include the Chandler Family and the Mahuiki Family. When the Helder family moved to Wainiha they noticed the many fishermen out on the reefs, throwing net, and people used nets to fish the river. There were areas where certain people fished and other people were not allowed to fish. Unspoken rules that one would adapt in order to assimilate while going out there so not to disturb the fishing activities. The Helder Family enjoyed and respected this one of the reasons they chose to live in Wainiha. David added:

> One of the things that they have just done is make a subsistence area for fishing, right off the state beach in Hāʻena. It has been because of this subsistence fishing that has gone out there. This thing was just like three weeks ago, where if you come in there and you are Hawaiian from someplace else and you want to fish you have to fish the way they fish. They now really have approval of control over it which says a lot of the area because they are wanting to do all this stuff. They are still that active that they want to protect that and preserve it. Wainiha, if you read about it, the valley used to support 2,000 Hawaiians. There was settlements all the way up the valley, I assume Lumahaʻi had something similar. There was a town that

> Lumahaʻi that got wiped out. So it has been an area out there that has been very successful and supported of Hawaiian living, Hawaiian lifestyle up until probably until post-Contact. They just took out so many people.

According to David Helder, when his family moved to Hanalei, they held many memories of what cultural events they witnessed in their time. One major event was the practice of *hukilau.* The Hawaiians were still using subsistence fishing methods, usually one a month. David remembers that Wainiha Beach used to be filled with pick-up trucks and the Hawaiians were out fishing all the time. Mr. Helder recalled the practice of fishing was very evident where Hawaiian families lived and fished all night long. Surfing was another practice amongst the Hawaiians at that time were they could often be seen on the right hand side of Lumahaʻi Bay where they dive for lobster. According to Mr. Helder these activities have substantially died off, where the children have grown up and Wainiha has gotten so expensive that they are either living at home or they have moved away to find work.

Mr. Fayé chimed in the discussion sharing his thoughts that Wainiha was the last of the old day style of Hawaiian fishing practices. Coming to Hanalei as a child, there were just a few non-Hawaiian families. Alan and his family used to sit down in front of the families beach house, they witnessed boats ready to go out filled with nets from Hanalei to Waipā. Back in the 1930s he observed a man that would sit up high in a tree watching for the fish to swim in. The man would then signal to all and everyone would take their boats out to sea. Mr. Fayé got to experience the laying of the nets. All the nets were laid way out in front of the beach way out as far as the eyes can see, then another boat came from the river side and one from the Waikoko side, then out at the end the nets were sewed together by the Hawaiians. The nets used at that time would be 16 to 18 feet deep. The Hawaiians would stay under the water for two or three minutes, holding their breath while they sewed the nets and then the *hukilau* started. The entire community new about the *hukilau.* Alan described how the *hukilau* worked:

> So the way it worked is this, they had these wooden winches, like the barrel was maybe 2 feet in diameter it was wooden. It had a huge plus kind of a bottom, so here is this thing on the top there was a huge wood piece that came through here, is this round thing on the ground so what it's got it is pretty well fixed on the ground what it is a winch, because the first 100 feet, 50 feet of the net was just rope, so the guys would turn the crank until the nets got close enough so people in the water could start *huki* [pull], both sides these big wooden winches, wooden winches crank ʻem, crank ʻem. Then when it comes to a certain then everyone is down there on both sides of the nets, *huki, huki, huki, huki, huki*, by that time bunch of guys would come down with baskets. The fish would be all like this, bamboo woven baskets about 3 feet in diameter, they would start putting the small fish in the basket, they go first, then they take them back and put them inside of the pick-up trucks, model A truck is what it was. It was huge thing in the back with a screen and they would through the fish inside there, they keep throwing the fish in the back and then they finally come to the big fish and a different bigger trucks would come and they fill those up and finally you get to the big ones, sometime like the *ono* [large mackerel type fish; *Acanthocybium solandri*] would go take off and go right through the *puka* [hole] in the nets and you couldn't grab an *ono*, but you kept maybe a few *mahimahi* [dolphin; *Coryphaena hippurus*], you always got plenty of *papio*

> [juvenile crevalle] and some *ulua* [certain species of crevalle, jack, or pompano], so and everybody would take the fish in their t-shirts or kind of shirts and fill them up whatever you can put in side that is what you take that is the fish you take. All the other fish take to the market certain this chakalaka would go over to Kapaʻa maybe take the fish to the whole east side. I think they went as far as Kapaʻa and Anahola and they would go real fast before the fish got bad. Then people at that end would know about because had hand crank phone in those days. So then, they had this Hanalei Pier used to have nothing on top it was open they had a railroad track that went all the way back, they had this shed a big long shed inside it was hundreds and hundreds and piles of *hukilau* nets they stored them in there, so when was *hukilau* time the nets weren't down by the boats. They dragged ʻem down to the boat you know depends on how deep the *hukilau*. Whoever went up to see the fish, the fish potter, he had a Hawaiian name. He would tell how many fish, how far out and they judge how deep the net had to be because it had to go all the way to the bottom. In the waning days of the *hukilau*, the man who sat up in the tree, had one iron wood tree, iron wood tree must of been about 40 feet high, and he climb up to the top and sit up there for hours and wait for the fish, it was none other than John Hanohano Pa.

Mr. Fayé spoke very highly of Mr. John Hanohano Pa. According to Alan, John Hanohano Pa was a very famous person who lived in Wainiha, he was born in Kalalau and used to swim back and forth from Kalalau to Hāʻena. At the age of three years old, Mr. Pa taught Mr. Fayé how to swim, he was like a Hawaiian father to him. In his youth, Alan's father received a *waʻa aliʻi* from Kona. It was special for the *aliʻi* once had racing canoes, this canoe was very slender and it was kept in Waimea until each summer it was brought to Hanalei along with a 16 foot sailboat. It was then that John Hanohano, referred to as "Hanohano" by the family, would right up the sailboat and take everyone out around the point pass Puʻupoa Point. Mr. Hanohano would teach how to spear fish and get lobster. Today he is survived by his granddaughter, Honey Girl.

The observing of fish was an ancient practice known as *kilo iʻa*, where a man would climb high in the tree and tell to the people below about the fish in the water. During this discussion Mr. David Helder shared that the man who used to watch for the fish over at Kalihiwai was Uncle George. He was the *konohiki* at that time. The following story is told by Mr. David Helder:

> There was a story……..the guy who used to watch for the fish over at Kalihiwai was Uncle George, he got old and really couldn't see all that well. This one Christmas he was really was looking to spot some fish and go get ʻem himself. He was the *konohiki* and he had come down there and he had a new and he was up there, the way he spotted the fish the oil that would come up on the surface when the fish ball was being attacked, the oil would come up on the surface of the water and so he was out there and walked out and looked and here was this big oil boil in Kalihiwai Bay. He got in his pick-up truck got in his canoe and drug his net all the way and was bringing it in, and the guy, there was a guy down there watching him…the man was from the water company and he had gotten drunk and drove his truck off in the water and it was leaking oil and that was leaking the oil. He told Uncle, "Listen I can't swim, so if you take this cable out we can pull my truck in and if you don't tell ʻem I put my truck in, I won't tell them you netted my truck."

> That was a while back, those kind of events happened all the time here. One time we were down at Hanalei Bay not too far from the peer they were having a *hukilau* and everyone on that beach got in the water to help.

Mr. Helder stated that the *hukilau* he witnessed in Hanalei Bay was about 20 years ago and at that time everybody on the beach got in the water. Two pick-up trucks with 55 gallon drums in the back filled with fish.

Our "talk story" session now focused on the topic of cultural sites, archaeological site and historic sites in the project area. Mr. David Helder was quick to note that there are burials everywhere on the beach. It was told to them many times where the state archaeologist have dug in the past and *iwi* (bones), just around the corner from his home and down at the Brescia's property where many burials were found.

Mr. Helder states there were over 30 burials were discovered last year. The burials on the beach were a common practice of the past where the waves would wash the back into the sea. In Wainiha, the bridges are right on the ocean. The sea wall was built and this wall is presently being broken down. His son Julian expressed that whenever a new housing project occurs it is almost certain burials will be found, in which the Brescia case was highlighted for in the past.

The conversation led to the Waikoko Bridge that was knocked out in a past tidal wave, where basically the end was washed out and the bridge fell and dropped down. At that time the Hawaiians simply built the bridge out of stone directly on top of the old one, therefore this group voiced their shock of the replacement of the bridge for the Waikoko Bridge is really indicative of the history of the place and the industriousness of the people who quickly repaired it. Mr. Helder wished they do not improve it at all. Mr. Alan Fayé was concerned with the erosion on the sea wall. He states that one of the most important things about the bridge is that it is really is a one lane bridge with a weight limitation more so than any other bridges in Hanalei. This is what keeps the big concrete trucks from coming out into the Hāʻena and Wainiha areas.

As we spoke the topic of the twin bridges of Wainiha surfaced in which the group referred to as Acro Bridges. These bridges were said to be the weakest of the bridges due to rust. All five bridges are on the historic register. The group felt no reason to restore the bridges of Waioli, Waipā and Waikoko. David Helder witnessed:

> It used to be that the bridges were narrow they had a low side, the kids in the neighborhoods would all go out and jump off them which you can't do now and they were kind of the heart and soul of Wainiha Village. They were photographed many times and they were just absolutely gorgeous. The DOT [Department of Transportation] had just no idea. They don't know why they don't seem to have a historic preservation officer working with DOT at all. They will do what they want to until they are stopped. In this case I really do believe in the activism because if you want to protect something it's going have to an internal vigilance when come to the DOT. That is why people like Karen Diamond and Barbara Robeson are so important in preserving what we have out there now because if they went doing someone else have to otherwise it would be gone.

Julian Helder readily explained the meaning of "bottom planning" in that basically what happens is, if the planning department is geared for development they want "top down planning," therefore a powerful planning commission in wanted, this way things stay the same or slower development, more historic in mind of preserving a place the way the residence like it, so it must be done from the bottom up, thus the need for social activism. Mr. Helder refers to the Transient Vacation Rental (TVR) issue, where half of the building are vacation rentals bringing the sense of community to slip away.

Getting back to the bridges Mr. Fayé raised questions relating to the Wainiha Bridge No. 1 on what is wrong with the present bridge. And what has to be done? Mr. David Helder mentioned that it was torn down along with all the Wainiha Bridges, he shared that in its place are now Acro Bridges.

Mr. Helder stated that in the past the Department of Transportation promised that they were going to replace the bridges, but they were torn down and the two were perfectly good viable historic bridges.

The group’s discussion led to any possible cultural sites within the project area in which Mr. Fayé felt that the two Wainiha Bridges were part of the cultural community and they should be restored to what they were culturally and historically correct. David Helder pointed to the map near the Waipā Bridge is a fishpond which belongs to Bishop Estates and the Waipā Foundation, under the direction of Stacy Sproat. Mr. Helder shared that six years ago, the foundation restored the fishpond and now runs a camp for the children. He stated that the fishpond is absolutely lovely.

Julian Helder that Mr. Carlos Andrade wrote a book on Hā‘ena and he is the leading authority on the history of Hā‘ena, and he is teaches at UH (University of Hawai‘i) Hawaiian Studies, he would be a good one to talk with relating to Hā‘ena history.

Mr. Faye tells of a *moi* (threadfish; *Polydactylus sexfilis*) cave located underneath Lumaha‘i. The cave is a curved tubed cave and the Hawaiian people go in and spear fish. The people come down from the Lumaha‘i side or they come down another side where there is path that goes down.

Mr. David Helder shared his experience on witnessing traditional cultural practices in Wainiha Bay. The following is his description of *hukilau*:

> In Wainiha Bay where these two bridges are, this beach here is Wainiha Beach Park [pointing to map] this is the one I am talking about with all the people doing the *hukilau*. Kids surf this side of the bay all the time that is a continuous process and it is the Hawaiians kids not the *haole* kids that are here, they fish her all the time, they night fish off of this point they fish all the time, just straight fishing [pointing to map] off this beach and they do some fishing here but there is a reef out here that kind of blocks it; this is interesting is that the reef doesn’t come in front of it is about 40 feet deep right here and the reef curls out like that so we whales right in here.

Mr. Fayé spoke about a place known as Black Pot Beach, today known as Hanalei Beach Park. The name is associated with a descendant of the area, Mr. Ham Young who used a black pot to cook fish. Alan tells that all the fisherman would bring in their fish and they would throw the fish into a pot. This pot was tended by Mr. Ham Young, Tai Hook Ham Young. Mr. Ham Young would cook dinner at the beach in a big black pot of fish stew and everyone would come and eat there. The park actually took its name from the practice of cooking in a black pot.

The topic of cultural sites continued. Mr. Helder pointed to the map where he knew to be a *heiau* located near the property of Mr. Michael Olanolan. This huge *heiau* is located across a place known today as Tunnels. David shared that the kids in the community were paid to park cars there before. He mentioned that the *heiau* is on top of the ridge and no one is allowed to go up there, on Power House Road. In Mr. Helder’s lifetime he has witnessed many people that took beloved’s remains in the form of ashes of the beach in Wainiha, then paddling out to conducting ritual and ceremony.

Concerns were voiced by Mr. Helder in that the practice of fishing is still practiced today all along the coast. He believes that this project may impact that practice once the construction of the bridges are under way for it will take up to a couple years to complete a project this big. Mr. Fayé was quick to mention that this project cannot go ahead if the shearwater birds are here. Mr. Helder continued to share that the north shore, considered to be local is this stretch of Lumaha‘i Beach where the Lumaha‘i River, a place where everybody from this neighborhood brings their children to play and swim in the waters. He mentioned that sometimes on Kolokolo Point one can witness some hula girl practicing her chanting. Night fishing is also a cultural practice along these shores.

Mr. Fayé spoke of a time around 1949 while he and his cousin were driving the road and crossed Lumaha‘i Bridge and right up on the road level was a big white dog running down the road, in which he associates the dog as Pele, the fire goddess. The group referred CSH to contact the Chandler Family as the story tellers of these lands.

On the topic of trails in the area, Mr. Helder pointed to the map to a trail where in early years a man died and his body was taken up the trail to be buried, up between the two Wainiha Bridges. David mentioned that it was an old practice to take their people up and bury them on the ridges in the mountain. Mr. Helder clarified that the first Wainiha Bridge is on the stream, the second and third go over the road that runs up behind the Wainiha General Store. The trail he spoke of earlier starts behind a blue house behind the general store and goes *mauka* and the man’s house sits on the start of the trail. The trail comes down from the point of the ridge (*alapi‘i* marked on the map).

It is at this time the group voiced their various concerns about the proposed projects for the five Hanalei Bridges to be replaced. Mr. Fayé felt it is very important to keep the bridges the way they were originally, in the same way they are on the national register and the reason for that is what curbs development out there. Mr. David Helder anticipates the inclusion of width and weights. He voices the principle reason is because it cost $600 dollars for a cubic yard of concrete. They would have to bring a truck and then bring all the induvial materials, a mixer, mix it on site, with three men, and a pumper, thus it ends up being $600 a yard and that keeps development down no matter what the instant you make it possible for any size of concrete truck with pre-mix it is going to Pop! Development! David states that all houses has to be 27 feet in the air like his home. They have to pour these huge concrete columns that makes the cost for just a straight foundation for a house about $55,000 to $60,000, adding it really is about preservation. He believes it doesn’t have to be. The bridges do not need to be any more stressed than the Hanalei Bridge which is 4,000 lbs. Mr. Fayé states that this is the one that restricts, Mr. Helder agrees, it is a physical restriction, for the weight limit on the Hanalei Bridge is stress for more than 8 tons. He continues by noting that these are not stressed bridges and that no engineer has ever put a limit what can be driven over or what cannot be driven over, because the way the bridge was fixed by the people who live out here when it was broken. Mr. Helder believes:

> The problem is that all the time out here the locals drive over limit trucks. That is what broke this bridge is that they had a way over loaded truck and it busted the bridge off. So if you take an 8,000 pound bridge and you put it 12,000 lbs., sure as 18,000 is going to go over it, so we prefer that they stay like this. If you want to have this road. It is just like looking at Hana Road, if you want to keep Hana Road, Hana Road, don't put a freeway or monorail you leave it as it is, because it is the only other road that is on the historic register.

Our "talk-story" session concluded with all agreeing that improvements need to be made and at the same time it is important to keep the historic nature and physical appearances of these bridges proposed for replacement.

6.4.2 Barbara Robeson and Jonathan Wichman

CSH conducted a "talk story" session with Mrs. Barbara Robeson and Mr. Jonathan 'Johnny' Wichman on 17 November 2015 for the cultural impact assessment for the Wainiha Bridges Project, Waiʻoli, Waikoko, Waipā, Lumahaʻi, and Wainiha Ahupuaʻa, Haleleʻa District, Kauaʻi Island. This "talk story" session was graciously hosted at the home of Mrs. Robeson in Wainiha. The following is a summary of a recorded "talk story" session with Mrs. Robeson and Mr. Wichman.

Mrs. Barbara Robeson was born and raised in San Diego, California. Mrs. Robeson married her husband, Mr. Scott Robeson in 1972. That same year they purchased property in Wainiha and built their lovely home moving permanently to Wainiha in 1975. Mrs. Robeson has been involved with many projects including the present project concerning the rehabilitation of the historic Wainiha Bridges and preservation of the Hanalei Bridge to Kēʻē, Kūhiō Highway now on the National Register of Historic Preservation.

Our "talk story" session included a delightful man, *kamaʻāina* to Hawaiʻi *nei*, born in Honolulu and raised in Hāʻena, Mr. Jonathan Goodale Wichman. Mr. Wichman has a rich family history connected to the island of Kauaʻi. He was born in 1963 to Mr. Charles Wichman and Jeanne Rose Wichman. His paternal grandparents are of well-known Kauaʻi Families, Mr. Holbrook Goodale and his wife, Juliette Rice Wichman. Grandma 'Jule', as she was affectionately known to her *ʻohana*, was a living treasure of Kauaʻi and a co-founder of the Kauaʻi Museum. Today Mr. Wichman, who works for LBH Hawaiʻi is raising his family in Hāʻena.

Our discussion began by talking of the general history of the project area and any knowledge of the past and present land use related to the bridges in Wainiha. Mrs. Robeson began with the following information in relationship with the Wainiha Hui Partition located around Bridge Number 3:

> The Wainiha Hui Partition and the various impacts at that particular time and the continuing impacts for those parcels that were part of the Partition and that they now have multiple owners, and taxes. For example, some of them own only a twentieth of a parcel and you see that when you look at a TMK, so a lot of times the parcel gets sold to somebody else, or it goes into some kind of "who pays the property taxes" issue. It leaves the community, basically which is a concern and then also some of the Wainiha folks from way back. They would have a portion of several parcels and you know they wouldn't pay or be able to pay taxes on one even

> though they were paying for those people that owned it. It has been very controversial, controversial is the wrong word, but concerned that they haven't been able to maintain the parcels that belonged to them from way back. Other histories n the partition within the past 30-plus years include litigation: The Mahuiki, North Shore ‘Ohana, et. al. vs. the Planning Commission and Alex Ferreira (related to the Wainiha Subdivision), and three other lawsuits in the Wainiha Subdivision (Lots 2, 6 & 12) won by our community at the State Supreme Court). Plus I could get into the impacts from the zoning of those vacation rentals which has taken over a lot of parcels in the particular area. Not so well in the Wainiha Bridge area but mainly in the Wainiha Hui Partition which is around bridge number 3. The impacts of those Transient Vacation Rentals (TVR) will impact the circulation of the bridges, especially in a *tsunami* [tidal wave] evacuation zone in which we are located.

Because of the abundance of water, Mrs. Robeson mentioned Wainiha's past land use included *kalo* farming and a rice mill in the 1920s. It is at this time Barbara marks on the USGS Map provided by CSH the location of her home in Wainiha. Mr. Jonathan Wichman's knowledge of Wainiha recounts a fishing village and although Mr. Wichman does not give a specific location to a rice mill, the history of one was told to him. He notes that for the bridges and road ways it is important to record the roadway as the community's life line and how important the road way is and always has been. CSH learned when the bridges went out in the 1946 and 1957 *tsunamis*, everyone, especially the residents of Hā‘ena were cut off. Jonathan also feels it is important to realize today the community members are committed to single lane bridges, keeping then slow and safe, and to keeping Route 560's historic nature intact. Mr. Wichman shared the following words:

> In the 1970's, The State of Hawai‘i had plans to replace the Hanalei Bridge with a huge, sweeping, modern style concrete bridge. The community rose up and prevented that. The community fought for the Hanalei Bridge which Barbara was heavily involved in to keep it single lane. Since then the community is being committed to keeping the rest of these bridges downstream of the Hanalei bridge one single lane.

Our conversation shifted to talking about any memories or knowledge that existed in these areas relating to cultural events. Mr. Wichman recalled the *hukilau* as being a cultural practice witnessed often. The *hukilau* he recalls hearing of were conducted on the beachs at Hanalei, Hā‘ena, Manini-holo, and Hā‘ena Beach Park. He was around five years old at that time, but recalls that everybody would go down to the beach. His uncle Thomas Hashimoto, one of the lead fisherman in Hā‘ena, would lead the *hukilau*. Mr. Wichman remembers everyone helping to pull in the *hukilau* nets and the sharing of fish, but the *hukilau* has not happened for a long while. Barbara Robeson recollected in the past 20 to 30 years there were many more community gatherings, like baby's first birthday *lū‘au* (Hawaiian feast) and those kind of family practices.

Mrs. Robeson and Mr. Wichman relates the lack of traditional cultural practices within Wainiha, Hanalei and Hā‘ena could be contributed to the fracture of the local communities. Mrs. Robeson discussed the facts that the residential population has decreased. They share the following information:

> I don't know if you are aware of the census data. Census designated place for Hanalei and another for Wainiha and another one for Hā‘ena. The residential

> population has decreased. In the 2000 CDP [census-designated place] verses the 2010 CDP and my interpretation of that is people can't afford to live here anymore and a lot of those structures were taken over and became a vacation rental. For example in the CDP for Hanalei, the population of the residents in the year 2000 was 478 and in 2010 it was 450 it went down. The number of occupied of residential housing units went down also between that 10 years and you would think that population would grow for residential populations but it has gone exactly the opposite way. In this area the residential population for 2010 was 2.5 a persons per unit in 2010 in the US census data. TVRs [transient vacation rental] based on if you go to various websites and see how many people they sleep between 2 and 14 or between 2-16 people so the occupancy rates for TVRs is an average of about six or seven.

Mr. Wichman added:

> The community has been fractured. The community in Hāʻena is barely a community anymore because there are so many vacation rentals. Everyone has been driven out, locals have been driven out. There are probably 10 or 20 kids in Hāʻena where there used to be a hundred. So that is what is happening and that is what has happened not so much in Wainiha but in Hanalei. Hanalei is like a big hotel now. All the houses are in the front are vacation rentals all the ones across Weke are vacation rentals so it is hard. These numbers are conservative because there is a lot of illegal vacation rental that are saying they're residential but they are not.....but then along with that the road way and bridges is getting heavier use. Because the number of visitors goes up so the cars are growing the number is at an all-time low, this summer was the all-time high.

Both agree that the cars on the bridges and road has increased which will impact the *tsunami* evacuation zone, as the cars increase the community becomes more committed to single lane bridges. Single land bridges slow traffic down for the *malihini* (stranger, foreigner) who often times are late for the sunset or late for a *hula* (dance) show or *lūʻau.*

At this time CSH re-directs the discussion to the cultural connection of Mr. Jonathan Wichman with the island of Kauaʻi. Any researcher of Kauaʻi Island legends is familiar with the Wichman ʻOhana. Mr. Wichman is the descendant of two long time Kauaʻi Families. The Rice Family were descendants from the early missionaries to Kauaʻi arriving in the 1850s. Other family became cattle ranchers at Kipu. He is a descendant of the Goodale Family on his grandfather's side who were school teachers on Kauaʻi. His great-great grandfather, William Hyde Rice recorded many legends famous of Kauaʻi and spoke Hawaiian fluently, translating many legends of the Garden Isle.

Our "talk story" returned to subject of past and present land use in relationship with agriculture. CSH learned the community of Hāʻena with the aid of the State helped in the restoration of *kalo loʻi* at Hāʻena by forming a stewardship program, so that ancient practice is on-going today. Other agriculture is still going on, by diverting the water from Wainiha River into *kalo* farming areas.

The topic of *hula hālau* (school where ancient Hawaiian dance is taught) practicing today in the general areas of the bridges led to the knowledge of most of the *hula hālau* take their practices to Kēʻē at the *Ke Ahu a Laka*. This led to the sharing knowledge about any burials that may be impacted by the proposed work on the bridges. Mrs. Robeson related:

> The only large number of burials I know about in the Wainiha Hui Partition were on the Brescia property, Lot 6 of the Wainiha Subdivision. This was one of the lawsuits I previously mentioned. Not related to burials, across the way from here is the sand bar that was of the Partition, now it is the County Beach Park.

On the subject of history, Mrs. Robeson spoke about another site located distant from the project area which include a charcoal kiln for making charcoal which was identified when she revealed it to an archaeologist who was working up at Powerhouse Road. At the site, there were also, remnants of train tracks used for taking equipment up to the construction of the Powerhouse Plant in about 1906.

As we came to the end of our "talk story" session, Mrs. Robeson led us to some artifacts she collected from the Wainiha Landing. Our session ended with much gratitude for each other in the knowledge that was shared and the exchanging of addresses to keep in touch. CSH is so grateful to Mrs. Barbara Robeson and Mr. Jonathan Wichman for their willingness to share their knowledge about the lands they call home and their great concerns for their community.

6.5 Summary of Kamaʻāina Interviews

A common theme for all interviews was subsistence practices throughout Haleleʻa Moku. All parties that were interviewed discussed the practice of *hukilau*. Mr. Alan Fayé recalls sitting with his *ʻohana* on the beach and watching boats being filled with nets. Boats would travel from Hanalei to Waipā. Nets would be stretched far and have a depth of 16 to 18 feet. Fish caught during *hukilau* included *ono*, *mahimahi*, *papio*, and *ulua*. The community would gather their share and the remaining fish would be taken to the market in Kapaʻa and Anahola. Mr. Jonathan Wichman recalls *hukilau* being practiced at Hanalei, Hāʻena, Maniniholo, and Hāʻena Beach Park. Mr. Wichman recalls Uncle Tommy Hashimoto leading the *hukilau* at Hāʻena with the community. Mrs. Robeson adds that these community gatherings were more common 20 to 30 years ago for a baby's first birthday celebration and other family practices. Mr. David Helder remembers *kilo iʻa*, Uncle George, who sat in a tree in Kalihiwai and would observe the fish below in the water. Uncle George was the *konohiki* of the area. Although Uncle George couldn't see very well, he had a method to spot the fish by observing the oil the fish secreted when they were being attacked. Hanalei Beach Park, commonly known amongst the community as Black Pot Beach, was named after Tai Hook Ham Young who brought a large black pot to cook fish in. Fishermen would bring their catch to Mr. Ham Young, who would create a pot of fish stew and share it with the community.

Mr. Wichman and Mrs. Robeson add that these community fishing practices have been fractured over time most likely due to the change in the residential population, which has decreased. An increase of vacation rentals have appeared in the Haleleʻa district.

In addition to aquaculture resources, Haleleʻa Moku is abundant with agricultural resources. Mrs. Robeson points out that Wainiha Ahupuaʻa is abundant with water and past land use of the area included *kalo* and rice farming. Hāʻena Ahupuaʻa continues the cultural practice of restoration of *loʻi kalo* with the help of the State of Hawaiʻi to create a stewardship program. Water from the Wainiha River is also being diverted to assist with *kalo* farming areas.

Another topic that was mentioned was burials. Mr. David Helder points out that many *iwi kūpuna* (ancestral bones) can be found on the beaches of the area. He recalls when archaeologists have dug in the vicinity of his home and at the Brescia property and many bones were found. Just last year 30 burials were found. He adds that burials on the beach were a common practice for Native Hawaiians. His son, Julian Helder, adds that the Wainiha Bridges are built on the ocean. The sea wall is currently being broken down. As new housing projects begin, Mr. Julian Helder is almost certain that burials will be discovered, as was the case for the Brescia case. Mrs. Robeson also knows of the burials that were found at the Brescia property.

In relation to other cultural practices significant to the area, Mrs. Robeson also knows of *hula hālau* who practice to Kēʻē at the *Ke Ahu a Laka*. Mr. David Helder recalls surfing was another common practice on the right sie of Lumahaʻi Bay, also a place where people would dive for lobster. According to Mr. Helder, these two practices—surfing and diving for lobster—have died due to the next generation moving away and finding work elsewhere due to the high cost of living in Wainiha. Across from Mr. Michael Olanolan's home is a *heiau*. The *heiau* is located across a place called Tunnels on Power House Road. Mr. David Helder recalls people taking human remains in the form of ashes to the beaches of Wainiha and scattering them out in the ocean.

Mr. Fayé also spoke of Mr. John Hanohano Pa, a very famous person who lived in Wainiha Ahupuaʻa. Mr. Pa was born in Kalalau located on the North Shore of Kauaʻi, accessible by hike from Hāʻena Ahupuaʻa. Mr. Pa would regularly swim from Kalalau to Hāʻena. When Mr. Fayé was the age of three years old, Mr. Pa taught him how to swim. Mr. Fayé compares Mr. Pa to a Hawaiian father figure.

In regards to the proposed Waikoko Bridge replacement project, Mr. Fayé, Mr. David Helder, and Mr. Julian Helder voiced they are in shock that the bridge is being repaired. Mr. Fayé is concerned with erosion of the sea wall. Mr. David Helder wished they did not need to improve the bridge at all as it would take away from the historical integrity. The group pointed out that all five bridges are on the Historic Register and felt that there is no reason to restore the bridges. Mr. David Helder pointed out that a fishpond that belongs to Bishop Estate and the Waipā Foundation is located near the Waipā Bridge. Another concern of Mr. Helder's are fishing practices and how the project will impact cultural practitioners who participate in aquaculture subsistence. Mr. Fayé adds that if shearwater birds are in the vicinity of these bridges, the project cannot go through.

Mr. Julian Helder refers University of Hawaiʻi at Mānoa Hawaiian Studies professor, Carlos Andrade, who has written a book on Hāʻena Ahupuaʻa.

Section 7 Traditional Cultural Practices

7.1 Gathering of Plant Resources

According to LCA documentation, all *ahupuaʻa* appeared to have been heavily farmed in *loʻi kalo*, especially Waiʻoli Ahupuaʻa with a record of 154 *loʻi* along the Waiʻoli Stream. *Kula* lands were planted in sweet potatoes, yams, bananas, and sugarcane. Several claims in Waiʻoli, Waipā, and Waikoko claimed fishponds. Data taken during this time concludes that the area was very productive agriculturally.

Today, still abundant in water, Haleleʻa Moku continues to be famous for *kalo* and rice farming. During the early 1900s, a Chinese community in Wainiha began rice farming, which also included merchants and other business people (Coulter and Chun 1937). The rice industry declined over time due to disease, invasive species, and competition from outside of Hawaiʻi. Rice paddies were reverted back to *loʻi kalo*. Hāʻena Ahupuaʻa continues the practice of *loʻi kalo* farming today. With the help of the State of Hawaiʻi, a cultural stewardship program was developed to continue the restoration of taro farming. Water from the Wainiha River is also being diverted to assist with *kalo* farming areas.

7.2 Fishing Practices

A common topic for interviewees was aquaculture throughout the district of Haleleʻa. All parties interviewed discussed the practice of *hukilau*. Boats would travel from Hanalei to Waipā and would be stretched at their maximum capacity with a depth of 16 to 18 feet. The community would assist in the practice. Fish caught during *hukilau* included *ono*, *mahimahi*, *papio*, and *ulua*. The community would gather their share of fish. Any remaining fish would be taken to the market in Kapaʻa and Anahola Ahupuaʻa and sold. Mr. Jonathan Wichman recalls *hukilau* being practiced at Hanalei, Hāʻena, Maniniholo, and Hāʻena Beach Park. Mr. Wichman recalls Uncle Tommy Hashimoto leading the *hukilau* at Hāʻena with the community. Mrs. Robeson adds that these community gatherings were more common 20 to 30 years ago for a baby's first birthday celebration and other family practices. Mr. David Helder remembers *kilo iʻa*, Uncle George, who sat in a tree in Kalihiwai and would observe the fish below in the water. Uncle George was the *konohiki* of the area. Although Uncle George couldn't see very well, he had a method to spot the fish by observing the oil the fish secreted when they were being attacked. Hanalei Beach Park, commonly known amongst the community as Black Pot Beach, was named after Tai Hook Ham Young who brought a large black pot to cook fish in. Fishermen would bring their catch to Mr. Ham Young, who would create a pot of fish stew and share it with the community. Mr. Samson Mahuiki, states that *akule* (big-eyed or google eyed scad; *Trachurops crumenophthalmus*) came in large schools during the summer. Commerical fishing licenses were obtained to fish. *Limu kohu* (seaweed) was picked at Hāʻena Bech Park.

7.3 Burials

A number of burials have been found throughout the Haleleʻa Moku coastline. SIHPs # 50-30-03-1982 yielded three burials (McMahon 1995a, b); SIHP # -1988, consisted of three burials and five isolated human remains (Masterson et al. 1997); SIHP # -355 yielded two burials and isolated skeletal remains (Sullivan and Dega 2003); SIHP # 361, did not yield human remains, but a cultural layer which contained pre- and post-Contact artifacts (Chafee and Dega 2005). However, cultural layers have been known to also yield human remains. In 1992, SIHP # -1878 yielded 31 pre-Contact burials along with cultural deposits with fire pits, postholes, and an *imu* (underground oven) (Spear 1992). In 2003, monitoring was conducted and 11 burials were found along with a cultural layer containing ash, fire-cracked rock, charcoal, stone and coral tools, and partial remains of a pig (SIHP # 1837) (Monahan 2003).

Interviewees all mentioned the Brescia case where 30 burials were unearthed. Mr. David Helder points out that a common practice amongst Native Hawaiians during pre-Contact and post-Contact era was to bury *iwi kūpuna* on the beach. He adds that many *iwi* can be found along the beaches of Halele‘a Moku and can regularly be found. His son, Julian Helder, adds that the proposed Wainiha Bridge project is along the ocean. As sea walls continue to break down and new housing projects begin, Mr. Julian Helder is almost ceretain that burials will be unearthed, as was the case for the Brescia property.

7.4 Cultural Sites

Some of the earliest archaeological studies were conducted by Thomas G. Thrum (1906) and Wendell Bennett (1931). Thrum and Bennett both cataloged Nakikoniawaiaau Heiau and Mamalahoa Heiau in Wai‘oli Ahupua‘a. Kupakololi was reported in the *ahupua‘a* of Waipā by both Thrum and Bennett. Thrum also listed Halaloa Heiau in Waipā Ahupua‘a. Pu‘uohewa and Pu‘uomama Heiau were found in Thrum’s survey of Lumaha‘I, however, Bennett did not located them in his 1931 survey. Bennett instead lists Kailiopaia Heiau, *makai* of the government road and to the east of Lumaha‘i Stream. In Wainiha Ahupua‘a, Bennett describes six sites: *Heiau* on Popoki knoll; Kaunupepeiao Heiau; Laumaki Heiau; Apaukalea Heiau; and two taro terraces and a house site.

Mr. David Helder also pointed out Mr. Michael Olanolan’s property, which is near a *heiau*. The *heiau* is located across an area known as Tunnels. The *heiau* sits at the top of a ridge on Power House Road.

7.5 *Ka‘ao* and *Mo‘olelo*

In the tale of *Hi‘iakaikapoliopele and Malaeha‘akoa*, Hi‘iaka comes across the fisherman, Malaeha‘akoa, who sat and fished. Malaeha‘akoa was also a seer. The correlation of Malaeha‘akoa of being a fisherman validates the abundance of aquacultural resources in the area. Malaeha‘akoa was also the messenger who told Hi‘iaka about Lohiau’s (Pele’s lover from Hā‘ena) death when she arrived on the shore of Hā‘ena.

Lumaha‘i and Wainiha Ahupua‘a have many tales about the *menehune*, a legendary race of small people who were responsible for the construction of building fishponds, roads, and *heiau* in the evenings. Some say the *menehune* and the *mū* were the original inhabitants of Kaua‘i, driven to the *mauka* sections of the island by the arrival of the Hawaiians. A census of Wainiha Ahupua‘a during the time of Kaumuali‘i’s ruling, lists 65 men of Lā‘au, Kaua‘i as *menehune*. The census also listed the following places as *menehune* villages: Naue, Pā‘ie‘ie, Maunaloa, Pali‘ele‘ele, Maunahina, Pōhakuloa, Opaikea, Hōmaikalani, and Lā‘au. Makaihuwa‘a Ridge, a steep prominence that overlooks Waipā and Waikoko Stream Bridges, consists of three excavated pits on the ridgeline as well as a *lo‘i* and *heiau* at its base. This is the site of the Menehune Lighthouse.

Translated, Makaihuawa‘a means “eye nose canoe,” a possible reference to the signal fires that emitted from the pits or phosphorescent algae in the water.

Section 8 Summary and Recommendations

CSH undertook this CIA at the request of CH2M HILL and on behalf of the FHWA/CFLHD. The research broadly covered the entire *ahupua‘a* of Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha.

8.1 Results of Background Research

Background research for this study yielded the following results:

1. *Ka‘ao* and *mo‘olelo* throughout Halele‘a Moku correlate and validate cultural practices of the area. In the tale of *Hi‘iakaikapolipole and Malaeha‘akoa*, Hi‘iaka comes across the fisherman, Malaeha‘akoa. The *moku* of Halele‘a is known for its aquacultural resources such as fishing. The story validates the abundance of resources in the area then and now. It was Malaeha‘akoa who also notified Hi‘iaka of her sister's (Pele, the fire goddess) lover's (Lohiau from Hā‘ena Ahupua‘a) death.
2. The *ahupua‘a* Lumaha‘i and Wainiha were known for their tales of the *menehune*, a legendary race of small people who were responsible for the construction of building fishponds, roads, and *heiau* in the evenings. Some say the *menehune* and the *mū* were the original inhabitants of Kaua‘i until they were driven to the *mauka* (upland) sections of the island by the arrival of Hawaiians.
3. A census in Wainiha Ahupua‘a during the time of Kaumuali‘i listed 65 men of Lā‘au as *menehune*. The census also listed the following villages to be inhabited by *menehune*: Naue, Pā‘ie‘ie, Maunaloa, Pali‘ele‘ele, Maunahina, Pōhakuloa, Opaikea, Hōmaikalani, and Lā‘au.
4. According to Land Comission Award (LCA) documentation, the *moku* was heavily farmed in taro *lo‘i*. Wai‘oli Ahupua‘a yielded 154 *lo‘i* along the Wai‘oli Stream. *Kula* lands were planted in sweet potatoes, yams, bananas, and sugarcane. Several claims included fishponds. Data taken concludes that the area was very productive agriculturally.
5. A number of burials have been found throughout the Halele‘a Moku coastline. SIHPs # 50-30-03-1982 yielded three burials (McMahon 1995a, b); SIHP # -1988, consisted of three burials and five isolated human remains (Masterson et al. 1997); SIHP # -355 yielded two burials and isolated skeletal remains (Sullivan and Dega 2003); SIHP # 361, did not yield human remains, but a cultural layer which contained pre- and post-Contact artifacts (Chafee and Dega 2005). However, cultural layers have been known to also yield human remains. In 1992, SIHP # -1878 yielded 31 pre-Contact burials along with cultural deposits with fire pits, postholes, and an *imu* (Spear 1992). In 2003, monitoring was conducted and 11 burials were found along with a cultural layer containing ash, fire-cracked rock, charcoal, stone and coral tools, and partial remains of a pig (SIHP # 1837) (Monahan 2003).
6. Rice farming began in the mid-1860s and ended in the 1920s when California rice began to take over the market. Hanalei Valley led the Hawaiian rice market in most acreage planted in rice.

8.2 Results of Community Consultation

CSH attempted to contact NHOs, agencies, and community members. Below is a list of individuals who shared their *mana‘o* and *‘ike* about the project area and the *ahupua‘a* of Wai‘oli, Waipā, Waikoko, Lumaha‘i, and Wainiha.

1. Mike Ching, Hanalei business owner and *kamaʻāina* (native-born)
2. Alan Fayé, Princeville Community Association
3. David Helder, resident of Wainiha
4. Julian Helder, resident of Wainiha
5. Samson Mahuiki, President of the Waipā Foundation
6. Barbara Robeson, long-time resident of Wainiha
7. Jonathan Wichman, *kamaʻāina* of Haleleʻa Moku

8.3 Impacts and Recommendations

Based on information gathered from the cultural and historic background, the proposed project may potentially impact Native Hawaiian burials and subsurface cultural layers. CSH identifies these potential impacts and makes the following recommendations:

1. There is a very high possibility of *iwi kūpuna*, or ancestral bones, that may be present based on previous cultural, historical, and archaeological research that was conducted as well as via community consultations. The community has voiced knowledge of burials being found on the beaches and dune lands. Some of the currently proposed project areas are situated on soils classified as Beaches, a preferred sediment for the interment of the dead. Land disturbing activities during construction may uncovered presently undetected burials and/or other cultural finds.
2. Personnel involved in the construction activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. Should burials (or other cultural finds) be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies be notified pursuant to applicable law, HRS §6E.

Section 9 References Cited

Akina, Joseph A.

1904 *The Story of the Menehune*. Frances Frazier, translator. Unpublished holographic manuscript in Hawaiian. Private collection.

Armstrong, R. Warwick, editor

1983 *Atlas of Hawaii*. Second edition. University of Hawaii Press, Honolulu.

Ava Konohiki

2015 Ancestral Visions of ‘Āina website. Available online at http://www.avakonohiki.org/.

Beckwith, Martha

1940 *Hawaiian Mythology.* Yale University Press, New Haven, Connecticut.

1970 *Hawaiian Mythology*. University of Hawaii Press, Honolulu.

Bennett, Wendell C.

1931 *The Archaeology of Kaua‘i.* Bishop Museum Bulletin 80. Bernice Pauahi Bishop Museum, Honolulu.

Boundary Commission

1873 *Kauai*, Volume 1. Available online at http://waihona.com

Bowser, George

1880 *The Hawaiian Kingdom Statistical and Commercial Directory and Tourist Guide, 1880-1881*. George Bowser & Company, Honolulu and San Francisco.

Chafee, David B. and Michael Dega

2005 *Archaeological Monitoring Report for a 0.25 Acre Property Located in Waipa Ahupua‘a, Hā‘ena District, Island of Kaua‘i, Hawai‘i [TMK: 5-6-04:15]*. Scientific Consultant Services, Inc., Honolulu.

Chinen, Jon J.

1958 *The Great Māhele, Hawai‘i’s Land Division of 1848*. University of Hawaii Press, Honolulu.

Circuit Court of the Fifth Judicial Circuit

1947 *Report of the Commissioners in the Circuit Court of the Fifth Judicial Circuit, Territory of Hawaii, at Chambers, in Equity, McBryde Sugar Company, Limited Petitioner vs. William P. Aarona, et. al.* Circuit Court of the Fifth Judicial Circuit, Līhu‘e, Kaua‘i.

Clark, John R.K.

1977 *The Beaches of O‘ahu*. University of Hawaii Press, Honolulu.

Coulter, John Wesley

1931 *Population and Utilization of Land and Sea in Hawaii, 1853.* Bishop Museum Bulletin 88. Bernice Pauahi Bishop Museum, Honolulu.

Coulter, John Wesley and Chee Kwon Chun

1937 *Chinese Rice Farmers in Hawaii*. Bulletin 16:5. University of Hawai‘i, Honolulu.

Damon, Ethel M.

1931 *Koamalu.* 2 vols. Privately printed by the Honolulu Star-Bulletin Press, Honolulu.

Dean, Love

1991 *The Lighthouses of Hawaiʻi.* University of Hawaii Press, Honolulu.

Designare Architects

1992 *Hurricane Iniki Damage Assessment of Waioli Huiʻia Church & Meeting Hall*. Designare Architects, Honolulu.

DLNR (Department of Land and Natural Resources)

1975 *Wainiha Flood Hazard Area* (map). Department of Land and Natural Resources, Honolulu.

Donn, John M.

1906 Based on 1903 map of "Kauai Hawaiian Islands" by Walter E. Wall with data from private surveys by John M. Donn. Land use as of 1906 added to map. Registered Map 2375. Hawaiʻi Land Survey Division, Department of Accounting and General Services, Honolulu.

Dye, Thomas S.

2004a *Archaeological Inventory Survey of Lands in Waipā Ahupuaʻa, Kauaʻi.* T.S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

2004b *Description and Mapping of a Loʻi System in Waipa, Kauaʻi.* T.S. Dye & Colleagues, Archaeologists, Inc., Honolulu.

Earle, Timothy K.

1973 Control Hierarchies in the Traditional Irrigation Economy of Halelea District, Kauai. Ph.D. dissertation, Department of Anthropology, University of Michigan.

1978 *Economic and Social Organization of a Complex Chiefdom: The Haleleʻa District, Kauaʻi*. Museum of Anthropology, Anthropology Papers No. 63, Ann Arbor, Michigan.

Emerson, Nathaniel B.

1915 *Pele and Hiʻiaka.* Reprint. ʻAi Pōhaku Press, Honolulu.

1965 *The Unwritten Literature of Hawaii: The Sacred Songs of the Hula*. Collected by Nathaniel B. Emerson. Charles E. Tuttle Company, Rutland, Vermont and Tokyo.

1978 *Pele and Hiiaka-A Myth from Hawaii.* Charles E. Tuttle, Rutland, Vermont.

Fong, Jeffrey W.K., Gerald K. Ida, and Hallett H. Hammatt

2006 *Archaeological Monitoring Report for the Approximately 10-Mile Stretch of Kuhio Highway, Route 560 Shoulder Improvements Project, Princeville to Haena, District of Halelea, Island of Kauai.* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Foote, Donald E., Elmer L. Hill, Sakuichi Nakamura, and Floyd Stephens

1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*. U.S. Department of Agriculture, Soil Conservation Service, in cooperation with the University of Hawai‘i Agricultural Experiment Station. U.S. Government Printing Office, Washington, D.C.

Fornander, Abraham

1917-1918 Story of Lonoikamakahiki and Legend of Kuapaka‘a. In *Collection of Hawaiian Antiquities and Folklore*, edited by T.G. Thrum. Memoirs of the Bernice Pauahi Bishop Museum (Vols. IV and V). Bishop Museum Press, Honolulu.

1919 *Fornander Collection of Hawaiian Antiquities and Folklore*. T.G. Thrum, editor. Memoirs of the Bernice Pauahi Bishop Museum (Vol. VI, Part I). Bishop Museum Press, Honolulu.

Fung Associates, Inc.

2013 *Hawai‘i Statewide Bridge Inventory and Evaluation.* Chapter 3: KAUAI and Appendices of significant persons and historic register nomination forms. Fung Associates, Inc. and MKE Associates LLC, ‘Aiea, Hawai‘i.

Garden Island

1947 Hui Kū‘ai ‘Āina O Wainiha. *Garden Island*, 25 November.

Gartley, A.

1908 The Wainiha Electric Power Plant. In *Hawaiian Annual*. Thos. G. Thrum, Honolulu.

Giambelluca, T., M. Nullet, and T. Schroeder

1986 *Rainfall Atlas of Hawaii Report R76*. State of Hawai‘i, Department of Land and Natural Resources, Division of Water and Land Development, Honolulu.

Google Earth

2012, 2013 Aerial photographs of Hawai‘i. Google Inc., Mountain View, California. Available online at www.google.com/earth.html.

Groza, Randy, David W. Shideler, and Hallett H. Hammatt

2010 *Archaeological Assessment for the Proposed Wainiha Well Project, Wainiha Ahupua‘a, Hanalei District, Kaua‘i Island TMK: [4] 5-8-002:003.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Hammatt, Hallet H.

1979 *Archaeological Surface Examination and Subsurface Testing in the Waioli Mission Hall Hanalei, Halele‘a, Kaua‘i Island, Arch 14-145 I.* Archaeological Research Center Hawai‘i, Inc., Lāwa‘i, Hawai‘i.

Hammatt, Hallett H. and William H. Folk

1979 *Archaeological Excavations in the Waioli Mission Hall, Halele‘a, Kaua‘i Island ARCH 14-145 II.* Archaeological Research Center Hawai‘i, Inc., Lāwa‘i, Hawai‘i.

1994a *Archaeological Inventory Survey and Subsurface Testing of 2.87 Acres in Waioli, (Hanalei School), Halelea District, Kaua‘i (TMK 5-5-06:por. 9).* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

1994b *Archaeological Inventory Survey 30 Acres in Waiʻoli, Halelea District, Kauaʻi (TMK 5-5-6-09).* Historical and Land Use Sections by Victoria S. Creed. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Hammatt, Hallett H. and Gerald K. Ida

1995 *Archaeological Investigation of Land Proposed for Acquisition by County of Kauaʻi at Wainiha, Kauaʻi (TMK 5-8-02:Por.3).* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Handy, E.S. Craighill and Elizabeth G. Handy

1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Haraguchi, Karol

1987 *Rice in Hawaii: A Guide to Historical Resources.* Compiled and Annotated by Karol Haraguchi. Linda K. Menton, editor. Hawaiʻi Humanities Program and Hawaiian Historical Society, Honolulu.

Hawaiʻi Department of Transportation

2011 *Draft Environmental Assessment: Kūhiō Highway Bypass Road at Lumahai, Kauai.* Onlineat http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Kauai/2010s/2011-11-23-DEA-Kuhio-Hwy-Bypass-Road-pdf. (accessed 2 September 2015).

Hawaiʻi State Archives

n.d. Photograph of Wainiha River and Valley. Hawaiʻi State Archives, Honolulu.

Hawaiʻi TMK Service

Tax Map Key [4] 5-6-002, 5-7-003, and 5-8-006. Hawaiʻi TMK Service, Honolulu.

Hoffman, Ellen

1980 *Archaeological Survey and Limited Test Excavations in Waipā and Lumahaʻi Valleys, Island of Kauaʻi.* Department of Anthropology, Bernice Pauahi Bishop Museum, Honolulu.

Hoʻoulumāhiehie

2008 *The Epic Tale Of Hiʻiakaikapoliopele*. Puakea Nogelmeier, translator. Awaiaulu Press, Honolulu.

Huapala

1997-2015 Hawaiian Music and Hula Archives. Compiled by Kaiulani Kanoa-Martin. Available online at http://huapala.org/ (accessed 21 December 2015).

Ida, Gerald K., Hallett H. Hammatt, and Edward D. Duncan

1993 *Archaeological Survey of Proposed Telecommunication Hut for GTE Hawaiian Tel at Wainiha, Kauaʻi (TMK 5-8-02:3).* Cultural Surveys Hawaiʻi, Kailua, Hawaiʻi.

Jourdane, Elaine

1995 *Inadvertent Discovery of Skeletal Remains at Kobayashi Subdivision, Waiʻoli, Hanalei, Kauai, Site 50-30-03-3014*. State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

Juvik, Sonia P. and James O. Juvik

1998 *Atlas of Hawaiʻi.* Third edition. Department of Geography, University of Hawaiʻi at Hilo. University of Hawaiʻi Press, Honolulu.

Kamai, Missy and Hallett H. Hammatt

2013 *Burial Site Component of an Archaeological Preservation Plan for the Waipā Foundation Community Cultural Center Project, SIHP # 50-30-03-2196, Waipā Ahupuaʻa, Haleleʻa District, Island of Kauaʻi, TMK: (4) 5-6-004:023*. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Kamakau, Samuel Manaiakalani

1961 *Ruling Chiefs of Hawaii*. Kamehameha Schools Press, Honolulu.

1992 *Ruling Chiefs of Hawaiʻi.* Revised edition. Kamehameha Schools Press, Honolulu.

Kameʻeleihiwa, Lilikalā

1992 *Native Land And Foreign Desires Ko Hawaiʻi ʻAina a me Na Koi Puʻumake a ka Poʻe Haole Pehea la e Pono ai?* Bishop Museum Press, Honolulu.

Kelly, Marion, Clayton Hee, and Ross Cordy

1978 *Cultural Reconnaissance of Hydroelectric Power Plant Sites: Waiheʻe Valley, Maui, Lumahaʻi Valley, Kauaʻi.* Historical Survey by Marion Kelly and Clayton Hee; Archaeological Survey by Ross Cordy. Bernice Pauahi Bishop Museum, Honolulu.

Kikuchi, William K. and Susan Remoaldo

1992 *Cemeteries of Kauaʻi,* Volume 1 (2 vols). Kauaʻi Community College, Līhuʻe, Hawaiʻi.

Knudsen, Eric A.

1946 *Teller of Hawaiian Tales*. Reprint. Mutual Publishing, Honolulu.

Library of Congress

n.d. Photograph of Haraguchi Rice Mill. Library of Congress, Washington, D.C.

n.d. Photograph of Hanalei Valley with loʻi. Library of Congress, Washington, D.C.

Lydgate, John M.

1913 The Affairs of the Wainiha Hui. In *Hawaiian Annual.* Thos. G. Thrum, Honolulu.

Maly, Kepa and Onaona Maly

2003 *Hana Ka Lima, ʻAi Ka Waha A Collection of Historical Accounts and Oral History Interviews with Kamaʻāina Residents and Fisher-People of Lands in the Haleleʻa-Nā Pali Region on the Island of Kauaʻi.* Kumu Pono Associates LLC, Hilo, Hawaiʻi.

Masterson, Ian, Hallett H. Hammatt, William H. Folk, and Victoria S. Creed.

1997 *Archaeological Monitoring Report for the Hanalei School, Waioli, Haleleʻa, Kauai (TMK 5-5-06: por. 9, l8).* Historic and Land Use Sections by Victoria S. Creed. Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

McGerty, Leann and Robert Spear

1998 *Archaeological Inventory Survey at a Residential Property, Lot 44, Wainiha, Halele‘a, Kaua‘i, Hawai‘i (TMK: 5-8-09:44).* Scientific Consultant Services, Inc., Honolulu.

1999 *Archaeological Inventory Survey of Wai‘oli Town Park, Wai‘oli, Haele‘a, Kaua‘i, Hawai‘i (TMK: 5-6-02:5).* Scientific Consultant Services, Inc., Honolulu.

McIntosh, James, Kimberly Mooney, and Plau L. Cleghorn

2011 *Archaeological Inventory Survey in the Vicinity of Lumaha‘i: Old Loop Road and Bypass Corridor, Lumaha‘i Ahupua‘a, Hanalei District, Island of Kaua‘i [TMK (4) 5-7-003]*. Pacific Legacy, Kailua, Hawai‘i.

McMahon, Nancy

1995a *Inadvertent Burials Discovery, Malolo Road, Wai‘oli, Hanalei, Kaua‘i TMK:5-5-03:35, State Site 50-30-03-1982*, State Historic Preservation Division, Department of Land and Natural Resources, Honolulu.

1995b *Mitigation Report: Burial Treatment for an Inadvertant Burial Site 50-30-03-3014 Located in the Kobayashi Property, Waioli, Halelea, Kaua‘i.* Exploration Associates, Ltd., Koloa, Hawai‘i.

Native Register

1847-1853 Native Register of Kuleana Claims to Quiet Land Titles in the Hawai‘i Lands (1847-53). Hawai‘i State Archives, Honolulu.

OHA (Office of Hawaiian Affairs)

2014 *Papakilo Database.* Office of Hawaiian Affairs cultural and historical database. Electronic document, http://papakilodatabase.com/main/index.php.

Pacific Worlds & Associates

2004 *Hā‘ena, Kaua‘i, Hawaiian Islands*, Available online at http://www .pacificworlds.com/haena/index.cfm. (accessed 18 December 2015).

Pantaleo, Jeffrey and Scott S. Williams

1991 *Archaeological Reconnaissance Survey of Selected Portions of the Port Allen-Wainiha Transmission Line Corridor, Kaua‘i Island, Hawai‘i.* Anthropology Department, Bernice Pauahi Bishop Museum, Honolulu.

Pukui, Mary Kawena

1951 *The Water of Kane.* Kamehameha Schools Press, Honolulu.

1983 *‘Ōlelo No‘eau: Hawaiian Proverbs and Poetical Sayings*, Bishop Museum Special Publication No.71. Bishop Museum Press, Honolulu.

1995 *Na Mele Welo: Songs of Our Heritage.* University of Hawai‘i Press, Honolulu.

Pukui and Curtis

1951 *Tales of the Menehune*. The Kamehameha Schools Press, Honolulu.

Pukui, Mary K. and Samuel H. Elbert

1986 *Hawaiian Dictionary.* Second edition. University of Hawaii Press, Honolulu.

Pukui, Mary Kawena, Samuel H. Elbert, and Ester T. Mookini

1974 *Place Names of Hawaii.* University of Hawaii Press, Honolulu.

Rechtman, Robert B. and Dennis S. Dougherty

2001 *Archaeological Inventory Survey of Two Parcels at Wainiha (TMK: 4-5-8-12:5, 11) Wainiha Ahupuaʻa Haleleʻa District Island of Kauai.* Rechtman Consulting, Keaʻau, Hawaiʻi.

Rice, William Hyde

1923 *Hawaiian Legends*. Bishop Museum Bulletin 3. Bernice Pauahi Bishop Museum, Honolulu.

Riznik, Barnes

1987 *Waiʻoli Mission House, Hanalei, Kauai.* Grove Farm Homestead and Waiʻoli Mission House, Līhuʻe, Kauaʻi.

Sandison, John

1956 *Walter Duncan McBryde and Kukuiolono Park.* Publisher unknown.

Shepard, F.P., G.A. MacDonald, and D.C. Cox

1950 *The Tsunami of April 1, 1946*. University of California Press, Berkeley and Los Angeles, California.

Spear, Robert L.

1992 *Archaeological Inventory Survey of St. Williams Church, Hanalei, Island of Kauaʻi TMK: 5-5-02:37 State Site Number 50-30-02-1877.* Applied Planning Services, Honolulu.

Sullivan, Mary C. and Michael Dega

2003 *Burial Treatment Plan for a 0.25-Acre Property Located in Waipa Ahupuaʻa, Hāʻena District, Island of Kauaʻi, Hawaiʻi [TMK: 5-6-04:15]*, Scientific Consultant Services, Inc. Honolulu.

Territory of Hawaii

1939 *An Historic Inventory of the Physical, Social, and Economic and Industrial Resources of the Territory of Hawaii (1939).* Advertiser Publishing Co., Ltd., Honolulu.

Thrum, Thomas G.

1906 Heiaus and Heiau Sites Throughout the Hawaiian Islands. *Hawaiian Annual for 1907*. Thos. G. Thrum, Honolulu.

1907 Tales from the Temples. *Hawaiian Annual for 1908*. Thos. G. Thrum, Honolulu.

1907 *Hawaiian Folk Tales*: *A Collection of Native Legends*. A.C. McClurg & Company, Chicago, Illinois.

1923 *More Hawaiian Folk Tales.* A.C. McClurg & Company, Chicago, Illinois.

1924 Securing the Wainiha Water-Right Lease. In *All About Hawaii, The Recognized Book of Authentic Information on Hawaii*; combined with Thrum's Hawaiian Annual and Standard Guide. Honolulu Star-Bulletin, Honolulu.

UH SOEST

1950 *UH SOEST Hanalei Bay Coast Aerial Photograph*. University of Hawaiʻi at Mānoa School of Ocean and Earth Science and Technology–Coastal Geology Group. Online at http://soest.hawaii.edu/

Ulukau

2014 *Māhele Database.* Hawaiian Electronic Library, http://ulukau.org/cgi-bin/vicki?l=en..

U.S. Department of Agriculture

2001 *Soil Survey Geographic (SSURGO) database*. U.S. Department of Agriculture, Natural Resources Conservation Service. Fort Worth, Texas. http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/ (accessed September 2015).

USGS (U.S. Geological Survey)

1910 Hanalei and Kilauea USGS 7.5-minute topographic quadrangles. USGS Information Services, Denver, Colorado.

1963 Hanalei USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1965 Haena USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1991 Haena USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

1996 Hanalei USGS 7.5-minute topographic quadrangle. USGS Information Services, Denver, Colorado.

Waihona ‘Aina

2000 *The Māhele Database*. Electronic document, http://waihona.com (accessed 27 September 2014).

Waipā Foundation

2012 Waipā Foundation website. Online at http://www.waipafoundation.org/ (accessed September 2015).

Wheeler, Momi, David W. Shideler, and Hallett H. Hammatt

2013a *Archaeological Literature Review and Field Inspection of a Portion of Lumaha‘i, Lumaha‘i Ahupua‘a, Halele‘a District, Island of Kaua‘i TMK parcel (4) 5-7-002:001 por.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

2013b *Archaeological Reconnaissance Survey and Literature Review of a Portion of Waipā, Waipā Ahupua‘a, Halele‘a District, Island of Kaua‘i TMK Parcel (4) 5-6-003:001 por.* Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Wichman, Frederick B.

1985 *Kauai Tales*, Bamboo Ridge Press, Honolulu.

1998 *Kauai: Ancient Place-Names and Their Stories,* University of Hawai‘i Press, Honolulu.

WRCC (Western Regional Climate Center)

2010 1961-1990 Monthly Climate Summary for Kawailoa. Available online at http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?hi3754

Yorck, Jesse and Hallett H. Hammatt

2004 *Archaeological Monitoring Report for Renovation and Relocation of a Residence at Coastal Hanalei Waiʻoli Ahupuaʻa, Haleleʻa District, Kauaʻi. (TMK 5-5-04:9 &10).* Cultural Surveys Hawaiʻi, Inc., Kailua, Hawaiʻi.

Appendix A Place Names of Waiʻoli, Waikoko, Waipā, Lumahaʻi and Wainiha

Place Names are compiled from Dr. Lloyd Soehren *Inoa ʻAina (Hawaiian Place Names)*, ulukau.org, legends, LCAs, Pukui et al. 1974 and Wichman 1985.

Waiʻoli Place Names

Haeleele, boundary point, *puʻu*, "little green hill" between Mookoleaka and Puʻu Ki on the Hanalei/Waioli boundary. (Soehren)

Hanalei, town, bisected by the Hanalei/Waiʻoli boundary. (Soehren)

Hanalei Bay, a large, semicircular bay fronting the *ahupuaʻa* of Hanalei, Waiʻoli, Waipā and Waikoko. USGS map, coastal frontage of Waipā and eastern Waikoko. Literally, "crescent bay" (Pukui et al. 1974:40–41). Wichman (1985:108) traces the name to "wreath making" and "*lei* valley" relating "The wreaths are the rainbows that appear in the upper valley from the constant rain showers."

Kahulaʻana, an oceanside cliff where high waves often prevent one from going around the cliff. Hiʻiaka and Wahine-ʻōmaʻo route the *moʻo* Hoʻohila so they can continue on their journey (Wichman 1998).

Kaliko, *puʻu*, Hanalei Ahupuaʻa, between Waipā and head of Waiʻoli on the Hanalei/Waiʻoli boundary, elevation 4200+ ft. (Soehren)

Kalapa, boundary point, rock, Waiʻoli Ahupua**ʻ**a, the boundary of [Waiʻoli] commences on the east side of the Waiʻoli River at a stone in the sea called Kalapa (Soehren)

Kamanui, Waiʻoli, *loʻi*, LCA 9278 to Uaua, "Apana 2, Akahi loi maloko o Waioli ʻKamanui ka inoa…" (Soehren)

Kamoʻokoleaka, a hill which was once a *moʻo* (Wichman).

Kapuoa, boundary point, place, Waiʻoli Ahupuaʻa, "…a place on the river bank…" between Kalapa and Makaihuoa on the Waiʻoli/Waipā boundary. (Soehren)

Kuhimana, boundary point, place, "flat kalo land" at foot of Mookoleaka ridge, between Kamookoleaka and Naoneana on the Hanalei/Waioli boundary. (Soehren)

Manalau, Waiʻoli Ahupuaʻa, ancient surf at Waiʻoli, Hanalei.

Mamalahoa, Waiʻoli Ahupuaʻa**,** boundary point, *puʻu*, between Kapalikea and Puʻu Manu on the Waiʻoli/Waipā/Lumahaʻi boundary; the *mauka* corner of Waipā. Elevation 3745 ft. Also known as "Neki or Namalawa" (q.v.). Perhaps a corruption of Namalawa? (Soehren)

Manuakepa, *ʻili*, LCA 3781, Waiʻoli Ahupuaʻa. (LCAs)

Naoneana, boundary point, place Hanalei Ahupuaʻa, "place on Government road" between Manolau and Kuhimana on the Hanalei/Waiʻoli boundary. (Soehren)

Palikea, Waiʻoli Ahupuaʻa, boundary point, *puʻu*, between Makaihuwaa and Kapalikea on the Waiʻoli/Waipā boundary. Elev. 940 ft. Not named in Boundary Commission testimony (Soehren)

Puʻu Ki, Hanalei Ahupuaʻa, boundary point, *puʻu*, between Kamoo Koleaka and Hihimanu on the Hanalei/Waiʻoli boundary. Written "Puu Kii" in BCT. (Soehren)

Puʻu Kokala, boundary point, *puʻu*, the Hanalei/Waiʻoli boundary passes "round head of [Waiʻoli] valley to commencement of Eastern boundary at a place on high hill called Puʻu Kokala…" Perhaps the same as or near Kaliko (Soehren)

Waiokihi, Waiʻoli Ahupuaʻa, boundary point, *puʻu*, between Makaihuwaa and Kapalikea on the Waiʻoli/Waipā boundary. Elevation 940 ft. Not named in Boundary Commission testimony. (Soehren)

Waiʻoli, *ahupuaʻa* (Soehren)

Waiʻoli Beach Park, park in Waiʻoli. (Soehren)

Waiʻoli Park, park in Waiʻoli. (Soehren)

Waiʻoli Stream, Waiʻoli Ahupuaʻa, stream (LCA 10564)

Wahiawa, *moʻo* in Claim no. 9069 by Kulou. (Soehren)

Waipā Place Names

Awaa, *ʻili* of Waipā Ahupuaʻa (LCA 10663:1).

Haako, *ʻili* of Waipā Ahupuaʻa (LCAs 9831, 9832 and 10076:2; 10171).

Haaloa, *ʻili* of Waipā Ahupuaʻa (LCA 235N).

Halulu, Wichman (1985:114) cites this as a place in Waipā named after a fabulous bird.

Kaooa, Waipā Ahupuaʻa, boundary point, *puʻu*. Between Kuahua and Kolopu on the Waipā/Lumahaʻi boundary. Elevation 760+ ft. The *mauka* corner of Waikoko Ahupuaʻa (Soehren)

Kahalahala, Wichman (1985:115) cites this as a beach near near Makahoa Point named after the "young stage of the *kāhala* (*Seriola dumerilii*) fish".

Kahihiilu, *ʻili* of Waipā Ahupuaʻa (LCA 7918:3).

Kahulaʻana, Wichman (1985:116) cites this as "a cliff-point at the seashore where one must swim around to the beach on the other side of the cliff" near Makahoa Point.

Kaluanono, *ʻili* of Waipā Ahupuaʻa (LCA 10171).

Kamani, USGS map, 1,002 ft high peak on west boundary of Waipā with Lumahaʻi.'

Kaoo, USGS map, area on east boundary ridge where Waikoko, Waipā and Lumahaʻi come together.

Kapailu, USGS map, area on west boundary of Waipā with Lumahaʻi at approximately 2,000 ft elevation.

Kapalikea, USGS map, approximately 1,000 ft high peak, east boundary of Waipā and Waiʻoli.

Kapuhae, *ʻili* of Waipā Ahupuaʻs (LCA 7918:2).

Kawahine, *ʻili* of Waipā Ahupuaʻa (LCA 7918:1).

Keahu, Waipā Ahupuaʻa, boundary point, place, the Waipā/Waikoko boundary between Pohakuopio and Kuahua runs along the east side of Waikoko stream from the sand beach at Keahu. Coordinates approximate. (Soehren)

Kīwaʻa, Wichman (1985:114) cites this as a place in Waipā named after a fabulous bird.

Kolopua, USGS map, 1,270 ft high peak on west boundary of Waipā with Lumahaʻi.

Kuahua, Waipā Ahupuaʻa, boundary point, hill, "...a small hill" between Keahu and Kaooa on the Waipā/Waikoko boundary. Elevation 40+ ft. The boundary no longer passes over this hill, but lies to the west.(Soehren); USGS map, flats back from coast shared by Waikoko and Waipā.

Kuhihiilu, *ʻili* of Waipā Ahupuaʻa (LCA 7918:3).

Mahina Kēhau, USGS map, approximately 1,600 ft high peak on west boundary with Lumahaʻi.

Makahoa Point, point, Hanalei Bay; ridge and *heiau* near Kaunalewa Kauaʻi; literally, "friendly point" (Pukui et al. 1974:140) Waikoko Ahupuaʻa. Point named after the "young stage of the *kāhala* (*Seriola dumerilii*) fish".

Makaihuwaʻa, USGS map, coastal ridge on east boundary of Waipā with Waiʻoli.

Māmalahoa Peak, USGS maps, 3,745 ft high peak where Lumahaʻi, Waipā, and Waiʻoli come together. Peak, Hanalei District, Kauaʻi (Pukui et al. 1974:144). Perhaps 1985:113).

Papahoiki, *ʻili* of Waipā Ahupuaʻs (LCA 10661).

Pohakuopio, Waipā Ahupuaʻa, boundary point, stone, "...a stone on sand beach called Pohakuopio" marks the boundary at the shore between Waipā and Waikoko. The name appears misplaced on USGS. Coordinates are for the boundary at shore. (Soehren)

Puʻaʻanui, *ʻili* of Waipā Ahupuaʻa (LCA 235-N:2).

Puʻu Ka Manu, USGS map, 690 ft high hill on east boundary with Waikoko. Literally, "the bird hill" (Pukui et al. 1974:198).

Waiakaaka, *moʻo* of Waipā Ahupuaʻa (LCA 3917:4).

Waiokihi, USGS map, 947 ft high peak on east boundary of Waipā with Waiʻoli.

Waioli, *ʻili* of Waipā Ahupuaʻa (LCA 10663:2).

Waipā, *ahupuaʻa*, land division and stream; literally, "touched water" (Pukui et al. 1974:227). Wichman (1998:114) relates the meaning "to request to the gods in prayer."

Waipaʻa, Given by Wichman (1985:114) as a variant of Waipā, "dammed-up water" referring to the frequent building up of a sand bar at the stream mouth.

Waikoko Place Names

Puʻu Hanauakia, Waikoko Ahupuaʻa, boundary point, place, between Kahalahala and Puʻu Hanauakia on the Waikoko/Lumahaʻi boundary. Elevation 600+ ft. (Soehren)

Lepahu, Lumahaʻi Ahupuaʻa, boundary point, place, boundary between Lumahaʻi and Waikoko (Lumahai Boundary Commission).

Pohakupili, Waikoko Ahupuaʻa, boundary point, place, between Puʻu Hanauakia and Kaooa on the Waikoko/Lumahaʻi boundary. Course 4 "Passing Pohakupili" (BC 11). Coordinates estimated.

Waikoko, Waikoko Ahupuaʻa, *loko, pali*, "The pali of Waikoko" bounds the west side and "a dry loko called Waikoko" bounds the *mauka* side of Claim No. 10564:2 by Oleloa. (Soehren)

Waikoko Stream, Waikoko Ahupuaʻa, stream. (Soehren)

Wainiha Place Names

Kaili, Wainiha Ahupuaʻa, *loʻi*, LCA 9169 to Kealai. "Apana 1. Akahi loi Kaili ka inoa maloko o Wainiha..." (Soehren)

Maunahina Stream, Wainiha ahupuaʻa, stream, Rises at about 2760 ft. elevation, enters the Wainiha River at 440+ ft.

Puwainui Falls, Wainiha Ahupuaʻa, *wailele*, on the Wainiha River at the gaging station, elevation about 990 ft. (Soehren)

Lumahaʻi Place Names

Aikanaka, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Kealawela and Puʻu Iliahi on the Lumahaʻi/Wainiha boundary. Elevation 1080+ ft. Not named in Boundary Commission records but corresponds with point called "Moi" (q.v.). (Soehren)

Hapuupuu, Lumahaʻi Ahupuaʻa

Hilele, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Moi and Pipiwai on the Lumahaʻi/Wainiha boundary. (Soehren)

Kahoolinapaka, Lumahaʻi Ahupuaʻa, boundary point, place, the boundary at the shore between Lumahaʻi and Wainiha. (Soehren)

Kahililoa, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Pipiwai and Kioula on the Lumahaʻi/Wainiha boundary.(Soehren)

Kaluahee, Lumahaʻi Ahupuaʻa, boundary point, place, along Kolokolo Ridge, between Kolokolo and Waianu on the Lumahaʻi/Wainiha boundary. Elevation 240+ ft. (Soehren)

Kaluamaikai, Lumahaʻi Ahupuaʻa, boundary point, place, between Waianu and Kealawele on the Lumahaʻi/Wainiha boundary, along Kolokolo Ridge. Elevation 240+ ft. (Soehren)

Kaluapohakukee, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Kawaialea and Kawailoa on the Lumahaʻi/Wainiha boundary. (Soehren)

Kamakeanu, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Puʻu Iliahi and Laau Ridge on the Lumahaʻi/Wainiha boundary. Elevation 3880+ ft. Not named in Boundary Commission records. (Soehren)

Kawaialea, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Kioula and Kaluapohakukee on the Lumahaʻi/Wainiha boundary. (Soehren)

Kawailoa, Lumahaʻi Ahupuaʻa, between Kaluapohakukee and Hapuupuu on the Lumahaʻi/Wainiha boundary.(Soehren)

Kealawele, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Kaluamaikai and Moi on the Lumahaʻi/Wainiha boundary. Elev. 1098 ft. Misspelt "Kealawela" on USGS 1965. (Soehren)

Kioula, Lumahaʻi Ahupuaʻa, boundary point, gulch, between Kahililoa and Kawaialea on the Lumahaʻi/Wainiha boundary. (Soehren)

Kolokolo Point, Lumahaʻi Ahupuaʻa, boundary point, point, ridge, the narrow ridge separating Lumahaʻi and Wainiha is called Kolokolo in Boundary Commission testimony and in BC 11 (1:54). Also called "Lae o Kolokolo" (Mitchell 1930:154, East trig. station). (Soehren)

Kulanaililia, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Puʻu Nopili and Pali Eleele on the Wainiha/Hāʻena boundary. Elevation 2003 ft. Not named in Boundary Commission records. (Soehren)

Laau Ridge, Lumahaʻi Ahupuaʻa, boundary point, ridge, between Kamakeanu and Puʻu Kamaha on the Lumahaʻi/Wainiha boundary. Not named in Boundary Commission records. (Soehren)

Mahinakehau Ridge, Lumahaʻi Ahupuaʻa, boundary point, ridge, between Puʻu Laau and the head of Lumahaʻi on the Lumahaʻi/Wainiha boundary. Elev. about 3700 ft. Not named in Boundary Commission records. (Soehren)

Moi, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Kealawele and Hilele on the Lumahaʻi/Wainiha boundary. Elevation 1080+ ft. This point is called "Aikanaka" on USGS 1965. (Soehren)

Pipiwai, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Hilele and Kahililoa on the Lumahaʻi/Wainiha boundary. (Soehren)

Puu Iliahi, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Aikanaka and Kamakeanu on the Lumahaʻi/Wainiha boundary. Elevation 3390 ft. Not named in Boundary Commission records. (Soehren)

Puu Laau, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Puʻu Kamaha and Mahinakehau Ridge on the Lumahaʻi/Wainiha boundary. Elevation 3504 ft. Not named in Boundary Commission records. (Soehren)

Pulehua, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, the corner of Hanalei/Lumahaʻi/Wainiha. Elevation about 4560 ft. (Soehren)

Puʻu Nopili, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between the shore and Kulanaililia on the Wainiha/Hāʻena boundary. Elev. 1087 ft. Not named in Boundary Commission records. (Soehren)

Puʻu Kamaha, Lumahaʻi Ahupuaʻa, boundary point, *puʻu*, between Laau Ridge and Puʻu Laau on the Lumahaʻi/Wainiha boundary. Elev. 4016 ft. Not named in Boundary Commission records. (Soehren)

Puʻu Uahia, Lumahaʻi Ahupuaʻa, boundary point, *puʻu,* between Kolokolo Point and Kealawela on the Lumahaʻi/Wainiha boundary. Elev. 921 ft. Not named in Boundary Commission records. Perhaps this should be written "wāhia" (Soehren)

Waianu, Lumahaʻi Ahupuaʻa, boundary point, place, between Kaluahee and Kaluamaikai on the Lumahaʻi/Wainiha boundary. Elevation 200+ ft. on Kolokolo Ridge. (Soehren)

Wainiha Place Names

Alakai, Wainiha Ahupuaʻa, boundary point, *puʻu*, the corner of Wainiha and Hanakapiai on the Hanalei/Waimea District boundary. Elevation 4120+ ft. (Soehren)

Aliinui, Wainiha Ahupuaʻa, boundary point, *puʻu*, "...the furthest point of Haena and the jctn of this land with Wainiha." (BCT) Between Kalapahalulu and Haka on the Wainiha/Hanakapiai boundary. Elevation 3330 ft. This point is called "Hono o Na Pali" on USGS 1965. (Soehren)

Apaukalea, Wainiha Ahupuaʻa, *heiau*, Bennett's Site 151. "...adjoining the 'Power House' road on the east side, inland from Site 150 [Laumaki heiau] in Wainiha valley. The remains of recent occupation together with modern stone platforms, walks, graves with tombstones, and other such work, make the distinction of this heiau difficult." (Soehren)

Haka, Wainiha Ahupuaʻa, boundary point, *puʻu*, between Aliinui and Waiau on the Wainiha/Hanakapiai boundary. (Soehren)

Hiaupe Stream, Wainiha Ahupuaʻa, stream, rises at about 2500 ft. elevation, enters Wainiha River at 300 ft. (Soehren)

Hinalele Falls, Wainiha Ahupuaʻa, *wailele*, on the Wainiha River, elevation about 2600 ft. (Soehren)

Hono o Na Pali. Wainiha Ahupuaʻa, boundary point, *puʻu*, the *mauka* corner of Hāʻena, called "Aliinui" (q.v.) in BC 21. Between Pali Eleele and Kilohana on the Wainiha/Hāʻena/Hanakapiai boundary. Elevation 3330 ft. (Soehren)

Io, Wainiha Ahupuaʻa, *moʻo*, stream, Claim No. 9802 by Napea: "In the ili Kilua...a houselot in Io, Wainiha." Bounded on *mauka* side by Io brook. (Soehren)

Kaloopa, Wainiha Ahupuaʻa, *ʻili ʻāina*, LCA 11053 to Naoi. "2 apana ma ka ili o Kaloopa i Wainiha..." Perhaps Ka-lōpā? (Soehren)

Kapoki, Waimea Ahupuaʻa, boundary point, *puʻu*, vent, "...the NE corner of [Waimea] and the SW corner of Wainiha..." and the north corner of Makaweli. A vent in the Koloa Volcanic Series. Elevation 4680+ ft. in Alakai Swamp. (Soehren)

Kaunupepeiao, Wainiha Ahupuaʻa, *heiau*, Bennett's Site 149. "...back of the first house on the first pali east of the mouth of the Wainiha River. A flat place about 30 feet wide and 20 feet deep with stones along the front edge meet the description given by Thrum: 'A 12-foot open-paved heiau of husbandry class; probably simply a place of offering.'" (Soehren)

Laumaki, Wainiha Ahupuaʻa, *heiau*, Bennett's Site 150. "...on a knoll west of the 'Power House' road, about one mile from the government road, in Wainiha valley. Thrum describes this heiau as 'A small, open platform, paved heiau, 2 feet high, of husbandry class.'" (Soehren)

Makawea Stream, Wainiha Ahupuaʻa, stream, rises at about 2760 ft. elevation, enters Wainiha River at 300+ ft. (Soehren)

Nalowale, Wainiha Ahupuaʻa, *heiau*, Bennett's Site 148. "...on Popoki knoll....located next to the road (inland side) in front of Site 149 near the Wainiha river. It is said to have been a heiau site, but nothing remains to mark it." The name is lost. (Soehren)

Pali Eleele, Wainiha Ahupuaʻa, boundary point, *pali*, between Kulanaililia and Hono o Na Pali on the Wainiha/Hāʻena boundary. Elevation 3225 ft. Not named in Boundary Commission records. (Soehren)

Waiau, Wainiha Ahupuaʻa, boundary point, *puʻu*, between Haka and Alakai on the Wainiha/Hanakapiai boundary. (Soehren)

Wainiha, Wainiha Ahupuaʻa, town/village (Soehren)

Wainiha Bay, Wainiha Ahupuaʻa, bay. (Soehren)

Wainiha Pali, Wainiha Ahupuaʻa, *pali*, Wainiha Pali Comments: Forms the west side of the Wainiha Valley and the east side of Alakai Swamp. (Soehren)

Wainiha River, Wainiha Ahupuaʻa, river/stream. (Soehren)

Appendix B Boundary Commission Reports

Waiʻoli

Waioli Ahupuaʻa, District of Haleleʻa, Island of Kauaʻi, Boundary Commission, Volume 1, pps 56-61

Boundary of the Ahupuaa of Waiole
Department of Interior
Honolulu September 13th 1873

Honorable D. McBryde, Commissioner of Boundaries
Sir
In setting the boundaries of Land on your Island please have defined the following which have been suggested by his Honor Judge Widemann in:
Waiole
2 of Houkou
Hanakapiai
Kalalau
Pohakuao Q
Honopu
Waiapuhi
Kamalamalo
Kaakoanui Q
Halaula Q
Mountain lands adjoining Moloaa whatever named. Some of the above with an Q Mr. W. was doubtful whether still unsold or unleased.
Yours Very truly,
Edwin O Hall [flourish at end of name]

Thereupon appointed the 7th day of October 1873 at Court house house [sic] Waioli for the hearing of the evidence in relation to the Boundary of the Ahupuaa of Waioli, and caused notice to be served on the owners of the adjoining lands to appear at the hour and place above named.

Peepee, sworn, The boundary of this land commences on the East side of the Waiole River at a stone in sea, Kalapa
thence to a place on river bank called Kapuoa
thence crosses river to stone at corner of hill Makaihuoa
thence up ridge to top and called same name Makaihuoa
thence up peak called Peapea [page 57]
Thence up ridge to Kapalekea
Thence up to junction with Lumahae at Neki
Thence along ridge to little hill called Kapailu
Thence along to another hill Haulauloa [first u perhaps crossed out]
and thence on to Molokama

thence to peak Kanaenae
the extreme point of Western Boundary of this land, Thence round head of Valley to commencement of Eastern Boundary at a place on high hill called Puukokala
thence down the ridge to Puukii
thence down the ridge to little green hill, Hooeleele
thence down to flat kalo land, Kuhimana near Ohia trees and thence along and on top of and old Kuaauna to a place on Government [road called Nameana
thence to a place in sea called Manolau
and round to place of commencement

From the above and the evidence of several other natives whose testimony was the same the following decision was given.

Decision

The Northwest boundary of this land commences at a rock out in the sea called Kalapa from thence to a place on the east Bank of the stream called Kapuoa. Thence across stream to stone at foot of hill called Makahuoa, thence to top of hill called same name Makaihuoa, thence up and along ridge to peak called Peapea. Thence up ridge to peak Kapalekea, thence up ridge to Junction with Lumahae at Neki. Thence along ridge to peak or hill Kapailu, thence to hill or peak Halauloa, thence to Molokama. Thence to Peak Kananae, the most western point on the boundary of this land. Thence following round the head of valley to commencement of Eastern Boundary to a place on high hill called Puukokala. Thence down the ridge to Puukii, thence down ridge to little green hill called Hoaeleele. Thence down and round ridge to Mookoleaka thence following down ridge to flat kalo land Kuhimana near Ohia trees and thence down and along an old bank or Kuaauna to a place on Government[page 58] Road called Naoneana thence to a place in the sea called Manolau, and round to place of commencement.
Duncan McBryde
Survey Ordered, Boundary Commissioner, Island of Kauai

Notes of Survey of Waiole Kauai

The North East corner of this land commences on the sea shore of Hanalei harbour at a stone let into the ground and from whence the following objects bear. An Orange tree on the ridge at the head of Waikoko and called Kaooa
South 70° 47' West true (61? 45' West Magnetic).A peak called Leapea on the Western boundary of this land South 39? 55' West true (South 30? 53' Magnetic) a tall stake on point of hill below Peapea South 58° 23' true (49? 21' Magnetic) This Eastern boundary runs thence
South 26° 44' true (35? 46' Magnetic) 1000 links through a grove of Guava bushes and across Government Road and just within Johnsons Paddock, Thence
South 20° 76' 1405 links crossing through Johnsons Paddock to the end of an old Kuauna. Thence
South 23° 44' East 1560 links following along old Kuaauna and hau tree fence to taro patches. Thence
South 9° 21' East 1700 links crossing through taro patch to foot of a spur and thence up said spur

to place called Kuhimana. Thence
South 24° 29' West 531 links. Thence
South 27° 1' East 1360 links. Thence
South 30° 37' East 1604 links. Thence
South 60° 1' East 779 links. Thence
South 23° 59' East 576 links. Thence
South 6° 31' 274 links. Thence
South 40° 26' East 280 links. Thence
North 66° 18' East 256 links. Thence
South 84° 25' East 579 links. Thence
North 86° 25' East 316 links to top of a peak at junction of ridge leading toward the flat, and at this place there is a mark cut in the ground and filled with stones and in the centre a broken bottle Y [mark]. Thence the boundary follows along the watershed of Mooleaka Ridge on the following bearings and distances South 23° 15' East 2400 links. Thence
South 44° 30' East 2240 links to the edge of the woods. Thence
South 69? 30' East 1240 links up the ridge through woods to junction of main range leading down from the mountain. Thence
South 6° 30 West 2220 links up watershed of main ridge to Hoaleleele Peak.Thence~~1100 links~~
[page 59]
South 36° 30' West 1500 links to sharp peak Hihimanu.Thence down 1100 links to sharp peak called Pukii, Thence
South 26° 30' West 3150 links to sharp peak called Puuhokala, Thence following round in a South Westerly direction the water shed of range to a peak called Kanaenae (see plan) which is the south east end of this land.

Returning to place of commencement the north boundary follows along the sea shore
North 74° 15' 3412 links to a long stone fit into the ground which is the Northwest corner of this land thence the Westerly boundary runs thence
South 11° 7' East 401 links to a place called Kupuaa on the river bank. Thence
South 40° 59' West 600 links crossing the river and on to the foot of spur called Makaiheaa.Thence South 19° 35' West 640 links up face of spur to a stone let into the ground. Thence
South 33° 2' 1290 links up this spur the watershed being the boundary.Thence
South 2° 45' West 2080 links to peak called Peapea, Thence
South 63° 8' West 1850 links along ridge to peak. Thence
South 8° 15' West 2400 links to a sharp peak, Thence
South 16° 54' West 2120 following round the head of spur to edge of woods. Thence
South 5° 35' West 4260 links up the face of spur to Kapalekea. Thence
South 20° 15' East 1980 links; Thence
South 2° 0' East 4600 links to top of peak called Neki or Namalawa. Thence
South 27° 10' East 4120 links to a peak called Kapailu. Thence
South 36° 45' East 3250 links to peak called Halaula.Thence
South 40° East 2440 links to sharp peak
South 84° 30' East 3360 links to the top of a mountain called Namoolakama.Thence following round in an easterly direction to water shed of ridge to a peak called Kawainae, which is the

Southeast corner of this land (see plan) and containing an area of Three Thousand, Three Hundred and Fifty acres more or less (3350 acres).

N.B. At all stations where practicable there is a mark put with a stone bottle below, or else a trench Y with bottle broken and set down in the centre.
James W. Gay, Surveyor

October 17th 1873
N.B. for fishing right, see plan
Duncan McBryde, Commissioner of Boundaries

[No. 13, Waioli Ahupuaa, District of Halelea, Island of Kauai, Boundary Commission, 3350 acres, 1873]

Waipā

Waipaā Ahupua‘a, District of Halele‘a, Island of Kaua‘i, Boundary Commission, Kaua‘i, Volume 1, pps. 60-61

Boundary of the Ahupuaa of Waipaa

No. 13

Received the following petition

Honorable D. McBryde, Commissioner of Boundaries for the Island of Kauai
Wahiawa, August 21st 1873

Sir:
For and on behalf of Her Excellency, R. Keelikolani, I beg to apply to you for the rectification of the boundaries of Ahupuaa of Waipaa, District of Hanalei on said Island.

Waipaa is bounded on the south by the Government land of Waiole, and on the North by the Ahupuaa of Waikoko, now owned by Mr. Albert Wilcox.
I have the honor to be Your Most obedient servant
H.A. Widemann

Thereupon appointed the 7th day of October A.D. 1873 at the Courthouse Hanalei for the hearing of said petition and caused notice to be served on the owners of the adjoining lands or agents to appear and attend to their interests.

Court opened at 10 a.m.
Mr. James Gay appeared for the petitioner and called the following witness and others.

Peepee, sworn, The ~~Western~~ Eastern boundary commenced at the sea there at a stone called Kalapa; thence to a place on river bank called Kapuoa

Thence across river to stone at bottom of ridge, Makaihuaa;
Thence to top of ridge same named Makaihuaa;
Thence up ridge to peak Peapea;
Thence up ridge to peak Kapalikea;
Thence to junction with Lumahai at Neki;
Thence to hill or peak, Puuhoonauwekia;
Thence down to Kolopuu;
Thence continuing down ridge to Kaooa;
Thence down small ridge along Waikoko boundary to a small hill called Kuahua; [page 61]
And thence down the east side of the bank of the stream to sand beach at Keahu
and thence to a stone in sand beach called Pohakuopeo, and thence round to place of comencement [sic].

From the above evidence and that of several other natives which was precisely similar, the following decision was rendered.

Decision:
The Northeastern Boundary of this land comences [sic] in the sea at a stone called Kalapa and from thence runs to a place o the river bank called Kapauoa;thence across stream to a stone at foot of ridge called Makaihuaa; thence to top of ridge at a place called by the same name, Makaihuaa; thence up ridge to a peak callee Peapea. Thence up ridge to a place called Kapalakea; thence up ridge to junction with Lumahae at a pace called Neki and thence to hill or peak, Puuhoonauwikia and thence down to Kolopuu, continuing down ridge to Kaooa, where there is an Orange tree, the Junction of Waipaa and Waikoko; thence following down a branch ridge along the boundary of Waikoko to a place called Kuahua, from thence down the east side of the Waikoko stream to sand beach at Kuahu, thence along the beach to a large stone on the sand called Pohakuopai, and from thence to place of comencement [sic].
Duncan McBryde, Commissioner of Boundaries, Island of Kauai.

No survey received.
Decision 9th October 1873

[No. 13, Waipaa Ahupua`a, District of Halelea, Island of Kauai, Boundary Commission, no amount, 1873]

Lumahaʻi

Lumahaʻi Ahupuaʻa, District of Haleleʻa, Island of Kauaʻi, Boundary Commission, Kauaʻi, Volume 1, pps. 52-55

1873, Boundary of the Ahupuaa of Lumahai

No. 11

August 7, Received notice from Charles R. Bishop, owner of the Ahupuaa of Lumahai to have the Boundary of that land settled and defined, also received intimation that Mr. James Gay has been empowered to act for said owner if convenient for him to do so.

Thereupon appointed the 6th day of October A.D. 1873 for the hearing of said petition and caused notices to be served on the several witnesses and the owners of the adjoining lands.

Momooiki, sworn:The northeastern boundary of this land commenced on the sea shore at a place called Kaahoolinapakai; from thence up side of hill to ridge called Kolokolo; thence up ridge to Lauhala, Kaluahee; thence to Waianu; thence to Lauhala, Kaluamaikai; thence across gulch and up ridge to Kealawele; thence up ridge and to peak, Moi; thence up ridge to peak Hilele; thence up ridge to Pipewai[?]; thence up ridge to peak Kaheleloa; thence to gulch; Keoula; thence to gulch Kawaialea; Thence up ridge to Kaluapohakukee; thence up ridge to Kawailoa; thence up ridge to Hapuupuu; thence up ridge to Pulehua;

The junction of this land with Hanalei; thence down the Eastern boundary to Namolokama;
[thence down to] Kapailu;
Thence to hill Neki; Thence to Kolopu;
Thence to Keokiawailua;
Thence to orange trees, Kaooa;
The junction of Waipa & Waikoko; thence to Pohakupili; thence Puuhanamakia; thence to Lepahu; thence to Kahalahala; thence to sea and round to place of commencement.
[page 53]

Kanohoku, sworn, this boundary commences on the sea shore at a place called Kahookinapakai; from thence up the side of hill to ridge called Kolokolo; thence up ridge to Lauhala tree Kaluahee; thence up ridge to Waianu; thence to Lauhala Kaluamaikai; thence across gulch and up ridge to Kealawele; Thence up ridge to peak Moi; thence up ridge to Helele, thence to Pipewai; thence to Kaheleloa; thence to gulch Kioula; thence to Kaluapohakukee; thence to Kawailoa; thence to Hapuupuu; thence to Pulehua; the junction of this land with Hanalei; thence down the Eastern Boundary to Namolokama; thence down to Kapailu[?] thence to high hill Niki; thence to Kolopuu; thence to Keokiawailua; thence to orange trees at Kaooa; the junction with Waipa and Waikoko; thence to Pohakupili; thence to Puukananakia; thence to Lepahu; Thence to Kalahala; thence to sea and round to place of commencement.

The following Decision was then rendered

The Northwestern boundary of this land commenced on the sea shore at a place called Kahoolinapakai and from thence up the side of hill to ridge called Kolokolo and thence up and along ridge to a Lauhala tree at Kaluahee; thence along ridge to Waianu; thence to hala tree at Kaluamaikai; thence across gulch and up ridge to a place called Kealawele; thence up ridge to peak Moi; thence up ridge to peak Hilele; thence up ridge to peak Pipiwai; thence up ridge to Kahililoa; thence up to gulch Kioula and Kawaialea; thence up ridge to Kawailoa; thence to Hapuupuu; thence up to Pulehua; the junction of this land with Hanalei. Thence down the Eastern Boundary to Namoolokama; thence down to Kapailu; thence down to high hill Neki; thence down to Kolopu; thence continuing down ridge to keokiawailua; thence down to orange trees at Kaooa; the junction of Waipa and Waikoko; thence down ridge to Pohakupili; thence to

Puukanakaia; thence down to Lepahu; thence down to Kalahala; thence to [page 54] sea and round to place of commencement.
Duncan McBryde, Commissioner of Boundaries, Kauai

Survey Ordered

Notes of Survey of Lumahai, Situated on the Island of Kauai

The Northeast corner of this land commences on the sea shore at a rocky point called Kahalahala, and runs thence
North 1° 21´ West 2000 chains and ten links crossing over the top of a conical hill close to the beach and on to top of spur called Lepahu; Thence
South 74° 16´ West 760 links along the ridge; thence
South 69° 11´ West 1300 links to Puuhanauakea (X iki); Thence
South 10° 58´ West 3200 passing Pohakupili, a large prominent stone on the spur; thence
South 25° 50´ West 2460 links; thence
South 1° 19´ East 5820 links to Keokiawaelua; Thence
South 16° 9´ West 3950 links along the ridge; Thence
South 26° 6´ East 1540 links up the ridge to stony peak or knob called Kolopuu; thence
South 30° 36´ East 9460 links to a peak called Puuhoonauwekia (appearing thus) [diagram: line angling down from left with knob in center and then large U or gully below on right]; the ridge to the west of the bearing~~s~~ is the boundary; Thence
South 81° 36´ East 3860 links along the ridge to Neki or Namalawa; thence
South 27° 10´East 41 chains 20 links to a peak called Kapailu; thence
South 36° 45´ East 3240 links to a peak called Halaula; thence
South 40° East 2440 links to sharp peak; Thence
South 34° 30´ East 3360 links to the top of mountain called Namoolokama.

Returning to place of commencement at Kahalahala, the Northern boundary of this land runs N 75° 41´ West 5300 links, along sandy beach and crossing river, and on up to the top of spur called Kolokolo; thence
North 49° 52´ West over the face of pali to sea shore distance about two chains; thence from Kolokolo the boundary runs thence
South 40° 10´ West 1200 links along the ridge; thence
South 52° 5´ West 379 links along ridge to Makai side of the road, crossing the spur; thence
South 29° 20´ West 409 links; thence
South 41° 4´ West 870 links along the ridge to place called [page 55] Kaaluahee; thence
South 8° 28´ West 967 links along ridge to Waianu; thence
South 19° 36´ West 1122 links along the ridge and 50 links west of some Lauhala trees; Thence
South 11° 1´ West 1190 links along ridge; where there is a Lauhala and a large hole called Kaluamaikai; Thence
South 39° 34´ West 1360 links crossing a gully and over on to the point of spur; thence
South 71° West 620 links up spur; thence
South 31° 55´ West 418 links up spur; thence
South 75° 46´ West 491 links; Thence

South 39° 0´ West 794 links; thence
South 87° 16´ West 961 links; Thence
North 76° 36´ West 428 links to the top of spur; Thence
South 37° 6´ West 978 links up the ridge; Thence
South 84° 24´ west 169 links to the top of Kealawele; thence
South 4° 28´ West 3800 links to Moi (the boundary from Kealawele follows along water shed of ridge up and round the head of Lumahai valley and down to the beach at Kahalahala); Thence
South 16° 24´ West 3500 links to Hilele; thence
South 6° 54´ west 5760 links to Pipiwai; Thence
South 5° 39´ West 6440 links to Kahililoa; Thence
South 14° 36´ East 5000 links to Keoula; thence in a southeast direction along the ridge to gulch called Kawaialea. Thence up the ridge going aground the gulch to a place called Kaluapohakukee. Thence along ridge to Kawailoa; Thence to Hapuupuu; Thence along the ridge to Palehua; the junction with Hanalei, which is the southeast corner of this land. Thence following round range of mountains ~~a~~in a Northwest direction to Namoolokama, the end of survey, on eastern boundary of this land (see plan), and containing an area of Three thousand one hundred and Fifty acres, more or less, 3150 acres.

N.B. At all practical places on this survey and where desirable marks have been put in the ground either a stone with broken bottle beneath or a trench with a broken bottle in the center [diagram 3 petals in triangle or upside down Y] thus.

I hereby certify, that this is a correct survey of the boundary of this land as decided upon by Judge McBryde, Commissioner of Boundaries for the Island of Kauai.
James W. Gay, Surveyor, October 17th 1873
Approved, 30 June 1875
Duncan McBryde, Commissioner of Boundaries, Kauai.

[No.11, Lumahai Ahupua`a, District of Halelea, Island of Kauai, Boundary Commission, 3150 acres, 1873]

Appendix G
Summary of Avoidance, Minimization, and/or Mitigation Measures

Summary of Avoidance, Minimization, and/or Mitigation Measures

This appendix summarizes the avoidance, minimization and mitigation measures discussed in Chapter 3. Additional details regarding these measures are included in the applicable resource sections within Chapter 3.

Topography, Geology, and Soils

Impacts of the Action Alternative to topography, geology, and soils are less than significant and do not require specific mitigation measures. The project would be designed appropriately for site conditions in accordance with the 2014 AASHTO LRFD Bridge Design Specifications, Seventh Edition (AASHTO 2014).

Avoidance and minimization measures include the implementation of BMPs to minimize the soil erosion potential, and hence minimize potential air quality and water quality impacts. Sections 3.2, Climate and Air Quality and section 3.3, Water Resources provide a summary of these BMPs.

Climate and Air Quality

Construction activities would incorporate fugitive dust emission control measures in compliance with provisions of HAR Chapter 11-60.1, “Air Pollution Control,” Section 11-60.1-33 on Fugitive Dust and Kauai County Code, Chapter 22, Article 7. Measures that are expected to be used to control airborne emissions include the following:

- Use water, disturbance area limitations, and re-vegetation to minimize dust emissions.
- Stabilize all disturbed areas with erosion control measures.
- Cover open-bodied trucks and trailers whenever hauling material that can be blown away.
- Revegetate disturbed area as soon as practical after construction.
- Stabilize construction entrances to avoid offsite tracking of sediment.
- Maintain equipment in working order.

Water Resources

Surface Water

All avoidance and minimization efforts will be detailed in full within the 404 and 401 permit application and include, but are not limited to the following:

- Obtain a Section 404 Permit, a Section 401 Water Quality Certification, and a stream channel alteration permit, from the USACE, the DOH-CWB and the Hawaiʻi Commission on Water Resources Management, respectively, requesting authorization for impacts to jurisdictional waters. CLFHD will ensure all permit terms and conditions are met, including any mandated offsets to permanent impacts.
- The roadway alignment is being designed to follow the existing alignment as much as possible.
- The slopes are steepened to reduce and/or avoid impacts to jurisdictional features.
- The proposed alignment will be shifted in allowable areas to reduce and/or avoid impacts to jurisdictional features.
- Reinforced soil slopes and/or walls may be utilized in practicable areas along the roadway to reduce the slope and avoid impacts to jurisdictional features.
- Equipment shall not be operated, and materials shall not be discharged, within the boundaries of wetlands and waters of the United States without the proper permits. Fording of running streams with

construction equipment will not be allowed. Temporary bridges shall be used whenever crossing of the creek is necessary.

In addition, to ensure excavated soil is not disposed of in a manner or location to create indirect effects to other environmental resources (such as, wetlands and other waters), FHWA-CFLHD will require that the excavated soil be used onsite to the extent practicable, or properly disposed of in an approved and permitted location.

Ground Waters and Water Quality

Impacts related to water resources and water quality would be less than significant. The following measures would be implemented to avoid or minimize the potential for effects.

- Treatment BMPs have varying levels of effectiveness in treating specific pollutants. FHWA-CFLHD will consider this data when developing appropriate water quality treatment solutions for the project in close coordination with our contractor.

Potential water quality impacts to surface waters during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling.

A NPDES General Permit for Storm Water Associated with Construction Activity, as administered by the State DOH, will be required to control storm water discharges. Mitigation measures will be instituted in accordance with site-specific assessments, incorporating appropriate structural and/or non-structural BMPs, and minimizing time of exposure between construction and re-vegetation.

As part of the Stormwater Pollution Prevention Plan (SWPPP), the CFLHD will prepare and implement an erosion control and restoration plan to control short- and long-term erosion and sedimentation effects, and to restore vegetation and stabilize soils in areas affected by construction activities. The plan will include necessary requirements regarding erosion control, and will implement BMPs for erosion and sediment control as required. Following construction, restoration would occur to temporary work areas disturbed during construction. Only appropriate non-invasive plant material will be used for erosion control and restoration. BMPs will be placed on all disturbed slopes and material storage sites, as indicated by the FHWA Erosion Control Plan. FHWA-CFLHD also will ensure compliance with the FP-14 and the following measures:

- Apply best degree of treatment or control measures to the potential water pollutant discharges associated with the proposed construction activity(ies) that assures the discharges will meet requirements compatible with the basic water quality criteria applicable to all waters, uses and specific water quality criteria and recreational criteria established for the class of the receiving State waters. Best Management Practices (BMPs) shall be properly implemented and maintained during the entire construction period. The contractor shall completely isolate and confine all in-water work areas throughout the entire water column (surface to bottom) such that all potential water pollutants will not leave or enter the work area. The entire volume of water in the in-water work area needs to be isolated and confined. A vessel/barge may be operated outside of the isolated and confined in-water work area only if it is surrounded by a boom.
- Only utilize BMPs that are inert and not sources of pollution itself. (Examples of inappropriate in-water BMPs include, but are not limited to: compost biosocks since it is a source of nutrients; silt fence since the material is porous; and a soil berm since the soil particles will erode away). Ensure that all material(s) placed or to be placed in State waters are free of waste material, heavy metals, organic materials, debris and any water pollutants at toxic or potentially hazardous concentrations to aquatic life as specified in HAR, §11-54-4(b).
- Isolate and confine all upland activity to contain/retain water pollutants upland and not allow it to enter State waters, including the designated in-water work area. When it is necessary to conduct in-water work, the workspace shall be isolated to avoid construction activities in flowing water in compliance

with the following manual: An Integrated Storm Water Management Approach and a Summary of Clear Water Diversion and Isolation Best Management Practices for Use in the State of Hawaiʻi, by the Federal Highway Administration and Hawaiʻi Department of Transportation, Practitioners Guide”. The proposed project shall maintain aquatic organism passage through the project area. Adequate water depth and channel width must be maintained at all times for passing design flood discharges. Prior to construction activities, the workspace would be isolated from flowing water to prevent sedimentation and turbidity and avoid impacts to aquatic organisms and water quality. The diversion or isolation BMPs shall remain in place throughout the entire period of in-water work; and are not removed until the water quality in the in-water work area has returned to its pre-construction condition. In-water BMPs shall be removed immediately after work is completed in a manner that would allow flow to resume with the least disturbance to the substrate.

- For a river, stream, ditch, or gulch: Allow unimpeded flow around the isolated and confined in-water work area to allow for aquatic animal migration and/or to prevent downstream flooding situations. The unimpeded flow shall be equivalent to a two (2) year, 24 hour duration storm event and/or the existing flow capacity of the river, stream, ditch, or gulch, whichever is smaller.
- Collect water pollutants (including, but not be limited to, airborne particulate; dust, concrete slurry, concrete chips, concrete surface preparation washing effluent, construction debris, etc.) from localized work areas and not allow these water pollutants to enter or re-enter State waters, including the in-water work area.
- Ensure that all construction debris is contained and prevented from entering or re-entering State waters. During bridge removal, construct structurally adequate debris shields to contain debris. Do not permit debris to enter waterways, travel lanes open to public traffic, or areas designated not to be disturbed. If portions of the existing bridge do fall into a stream during demolition, they will be removed from the stream without dragging the material along the streambed.
- Ensure that all erosion and sediment BMPs around the perimeter of the project are deployed prior to the commencement of any construction work (including grading and grubbing); are properly maintained throughout the entire period of in-water work; and are not removed until the in-water work is completed and the water quality in the in-water work area has returned to its pre-construction condition as demonstrated by the monitoring results (if applicable).
- Comply and require all of their contractors and subcontractors to comply with all requirements of the Section 401 WQC; WQS in HAR, Chapter 11-54; and all information submitted to the DOH-CWB for compliance with the Notification and Reporting Requirements. Ensure that the activity will not result in non-compliance or violations to the applicable State WQS. Ensure that all discharges associated with the proposed construction activities are conducted in a manner that will comply with "Basic Water Quality Criteria Applicable to All Waters" as specified in HAR, §11-54-4. During construction Impact Station water quality parameter levels that are greater than during construction upstream/updrift water quality parameter levels constitute a non-compliance of HAR, § 11-54-4(a) requirements that prohibits substances attributable to domestic, industrial, or other controllable sources of pollutants, which includes but is not limited to materials that will settle to form objectionable sludge or bottom deposits; visible floating debris, oil, grease, scum, other floating materials; and objectionable color or turbidity plumes. Comply with all new State WQS adopted by the DOH after the effective date of WQC.
- If required, conduct or contract with a qualified laboratory/environmental consultant to conduct the pre-construction, during construction, and post construction monitoring requirements in the Applicable Monitoring and Assessment Plan. Test methods promulgated in 40 CFR Part 136 effective on July 1, 2011, and when applicable, the chemical methodology for sea water analyses (HAR, § 11-54-1 0) shall be used. The detection limits of the test methods used shall be equal to or lower than the applicable WQS as specified in HAR, Chapter 11-54. For situations where the applicable WQS is below the detection

limits of the available test methods, the test method which has the detection limit closest to the applicable WQS shall be used. If a test method has not been promulgated for a particular parameter, the applicant may submit an application through the Director for approval of an alternate test procedure by following 40 CFR 136.4. Comply with any modification to the sampling locations, frequencies, and/or parameters as instructed by the DOH-CWB for corrective/remedial action.

- Immediately cease the portion of the construction work if water quality monitoring or daily inspection or observation result(s) indicates that noncompliance to HAR, §11-54-4(a) or §11-54-4(b), will occur or is occurring. The construction activity shall not resume until adequate measures are implemented and appropriate corrective actions are taken and water quality monitoring demonstrates that the non-compliance has ceased. Note: These actions shall not preclude the DOH-CWB from taking enforcement action authorized by law.
- The area beyond the construction limits will not be disturbed. Trees, shrubs or vegetated areas temporarily damaged by construction operations will be re-vegetated.
- Hold clearing and grubbing to a minimum.
- Temporary soil stabilization shall be applied on areas that will remain unfinished for more than 14 calendar days. Vegetated areas temporarily impacted will be revegetated by planting and seeding with non-invasive trees, shrubs and/or herbaceous perennials and annuals. Permanent soil stabilization shall be applied as soon as practicable after final grading.
- Turf establishment will be applied to finished slopes and ditches within 14 days after completion.
- Certified weed free permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction according to the contract erosion control plan, contract permits, FP Section 107, FP Section 157 and SCR Section 157 will be provided.
- Seeded areas will be protected and cared for, including watering when needed until final acceptance. All damages to seeded areas will be repaired by reseeding, re-fertilizing and re-mulching.
- Ensure that all temporarily constructed structures, such as the silt containment device(s), floating oil and grease as well as construction debris containment device(s), berm, cofferdam, sheet pile, stream flow diversion structure(s), and/or sediment and soil erosion control structure(s), etc., are properly removed immediately after the completion of the construction work and when the affected water body has returned to its pre-construction condition or better, as demonstrated by the monitoring results, including color photographs.
- Ensure that the proposed construction activities related discharges not covered under the applicable permits will also comply with State water pollution control permitting requirements under National Pollutant Discharge Elimination System (NPDES) as established in HAR, Chapter 11-55:
- Obtain NPDES permit for storm water discharges associated with construction activities when the proposed construction activities will disturb one (1) or more acres of land area before initiating any construction activities;
- Pesticides application in State waters shall comply with HAR, §§11-54-4(a), 11-54-4(b), 11-54-4(c), 11-54-4(f) and/or Chapter 11-55, Appendix M - NPDES General Permit Authorizing Point Source Discharges from the Application of Pesticides.
- Ensure that no concrete truck wash water is disposed by percolation into the ground.
- Maintain and require all of their contractor(s) and the subcontractor(s),that are performing work covered under the applicable permits, to maintain at the construction site or in the nearby field office, a copy of all permits, all Notification and Compliance Reporting Requirements, and all records demonstrating that every requirement of the permits have been complied with.

- Ensure that all areas temporarily impacted, either directly or indirectly, by the project construction activities are fully restored to its pre-construction conditions. For example: Incidental construction debris is cleaned up prior to removal of BMPs.
- Discontinue work during storm events or during flood condition.
- Modify environmental protection measures, including BMPs and monitoring requirements, when instructed by the DOH-CWB for corrective action/remedial actions.
- Allow the USACE, DOH-CWB, or other regulatory agencies to conduct routine inspections of the construction site in accordance with applicable permits and HRS, §342D-8.
- Complete and submit a Solid Waste Disclosure Form for Construction Sites to the DOH, Solid and Hazardous Waste Branch, Solid Waste Section. The form can be downloaded at: http://health.Hawaiʻi.gov/shwb/files/2013/06/swdiscformnov2008.pdf.
- Do not stockpile, store, or place construction material or construction activity-related materials in State waters or in ways that will disturb or adversely impact the aquatic environment.
- Dispose of construction debris, waste products, vegetation and/or dredged material removed from the construction site at upland State and County approved sites.
- Contain on land and not allow to enter or re-enter State waters any runoff, return flow, or airborne particulate pollutants, if any, from the excavated/dredged material dewatering process or from the stockpiling site.
- Ensure that their discharge activity shall not interfere with or become injurious to any designated uses (HAR, §11-54-1 and HAR, §11-54-3), or existing uses (HAR, § 11-54-1 and HAR, § 11-54-1 .1). The owner of the discharge shall maintain and protect all designated and existing uses.
- Do not discharge any effluent associated with the proposed construction activities, such as dewatering effluent, effluent resulting from hydroblasting, saw cutting, concrete surface preparation, rock washing, concrete and rock truck washing effluent or any other similar regulated activity(ies). Effluent shall be properly contained, collected and prevented from entering, either directly or indirectly, State waters, except for those discharges that have received authorization issued by the DOH-CWB under the NPDES Permit as applicable.
- Allow concrete surfaces to cure for seven (7) days prior to contact with any flowing or open water.
- For dewatering that may be required during excavation or construction of the project, a NDPES General Permit for Construction Activity Dewatering would be required for discharging dewatering effluent into waters of the U.S. The permit will require appropriate BMPs, an erosion control plan, and a water quality monitoring plan to mitigate any impacts on receiving waters.
- Appropriate and effective measure(s) shall be implemented to properly contain/collect the potential water pollutant discharges resulting from the application of concrete corrosion inhibitor; or from the scrubbing, chipping, cutting, rebar reinforcing, grouting, filling activities needed for the permitted construction activity(ies).
- In Hawaiʻi, the Commission on Water Resource Management (CWRM) issues permits regulating withdrawals of surface and groundwater. If water drafting is necessary, CFLHD will ensure this water use is approved in accordance with a streamwater use permit obtained from the CWRM (HRS §174C-48 (1987)).
- Structures designed to minimize sediment and pollutant runoff from sensitive areas such as settling ponds, vehicle and fuel storage areas, hazardous materials storage sites, erosion control structures, and coffer dams shall be visually monitored daily, especially following precipitation events to ensure these structures are functioning property.

- Temporary erosion control measures will be maintained in working condition until the project is complete or the measures are no longer needed as outlined in FP Section 15.
- Rain Event Action Plan (REAP) will be developed prior to Notice to Proceed. The REAP will be reviewed and structured to address project specific actions that are needed to prevent pollutants from reaching surface waters during the rain event. The REAP will be executed within 48 hours prior to a forecast rain event of 50% chance of precipitation or more. BMPs in the REAP include:
    - Place temporary stabilization BMPs (i.e. mulch) on the area that has been cleared to prevent raindrop erosion.
    - Any area that has soil disturbances will be stabilized prior to rain events with mulch, wood chips, or other protective covers.
    - Sediment traps will be placed to collect the water and allow sediment to settle out. If sediment traps are not possible, other settling and filtering devices will be used to slow water down and remove sediments.
    - Operations will shut down during extreme rain events.
    - Fueling and equipment repair areas will be covered and surrounded by a secondary containment BMP (i.e. impermeable berm designed to hold volume of fuel stored in area).
    - Exposed soil will be covered and/or stabilized.
    - Treated materials will be covered or placed in a shed.
    - Dumpsters will be covered at all times.
    - Drain holes will be plugged.
    - Control perimeters will be established around stockpiles of material.
- Submit a Spill Prevention, Control, and Countermeasure (SPCC) Plan at least 2 days before beginning work.
- Any spill of petroleum products, hazardous materials, or other chemical or biological products released from stationary sources or construction, fleet, or other support vehicles shall be properly cleaned, mitigated, and remedied, if necessary. Any spill of petroleum products or a hazardous material shall be reported to the appropriate federal, state, and local authorities, if the spill is a reportable quantity. Response shall occur in accordance with federal, state, and local regulations.
- In general, when gasoline, diesel fuel, antifreeze, hydraulic fluid or any other chemical contained within the vehicle is released to the pavement or the ground, proper, corrective, clean-up and safety actions specified in the SPCC and SWPPP will be immediately implemented. All vehicles with load rating of two tons or greater will carry, at minimum, enough absorbent materials to effectively immobilize the total volume of fluids contained within the vehicle.
- Leaks will be repaired immediately on discovery. Equipment that leaks will not be used. Oil pans and absorbent material will be in place prior to beginning repair work. The contractor will be required to provide the “on-scene” capability of catching and absorbing leaks or spillage of petroleum products including antifreeze from breakdowns or repair actions with approved absorbent materials. A supply of acceptable absorbent materials at the job site in the event of spills, as defined in the SWPPP will be available. Sand and soil are not approved absorbent materials. Soils contaminated with fluids will be removed, placed in appropriate safety containers, and disposed of according to state and/or federal regulations.

All waste fuels, lubricating fluids, and other chemicals will be collected and disposed of in a manner that ensures that no adverse environmental impact will occur. Construction equipment will be inspected daily to ensure hydraulic, fuel and lubrication systems are in good condition and free of leaks to prevent these materials from entering any stream. Vehicle servicing and refueling areas, fuel storage areas, and construction staging and materials storage areas will be sited a minimum of (50 feet) 15 meters from ordinary high water, typically referred to as the Q2 elevation, wetlands, and contained properly to ensure that spilled fluids or stored materials do not enter any stream or wetland.

Coastal Zone

Mitigation is not required due to the lack of significant adverse impacts to the Coastal Resources from the action alternative. Avoidance, minimization, and mitigation measures summarized for Water Resources, Plants and Animals, and Social and Economic Resources would also avoid or minimize impacts to the coastal zone.

Natural Hazards

Impacts to topography, geology, and soils do not require specific mitigation measures. The project would be designed appropriately for site conditions in accordance with the 2014 AASHTO LRFD Bridge Design Specifications, Seventh Edition (AASHTO 2014).

Noise

No noise abatement is required. Short-term impacts would be minimized through the following commitments.

A Community Noise Permit would be obtained, and all provisions would be complied with. In addition to the noise permit, a noise variance may be requested from HDOH for specific occasions when work hours need to be extended into the evenings and/or on Sundays to implement the overall construction schedule.

Additional BMPs to minimize construction related noise would include, but are not limited to, the following:

- The project team would coordinate with local residents and businesses to inform them of the construction schedule, and when loud construction activities can be expected.
- Enforcement of HDOH occupational noise exposure regulations would be the responsibility of the construction contractor. If workers experience noise exceeding HDOH standards, administrative or engineering controls would be implemented. Use of personal protective equipment such as earplugs or muffs may also be required.
- To reduce nearby residential noise exposure, construction activities would be conducted during normal working hours to the extent possible. For any work that would occur after normal working hours (that is, on weekends), or if permissible noise levels are exceeded, appropriate permitting and monitoring as well as development and implementation of administrative and engineering controls would be employed.
- The contractor is responsible for minimizing noise by properly maintaining noise mufflers and other noise-attenuating equipment, and maintaining noise levels within regulatory limits.

Hazardous Materials

The following measures would be implemented to avoid or minimize the potential for effects.

- A hazardous materials spill plan would be developed that describes spill prevention measures regarding the location of refueling and storage facilities and the handling of hazardous materials. The hazardous materials spill plan would describe actions to be taken in case of a spill. The contents and requirements of the hazardous materials spill plan include the following:
  - The project manager and heavy equipment operators would perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations would be postponed or

halted should a leak be detected, and they would not proceed until the leak is repaired and the equipment is cleaned.
    - Absorbent material manufactured for containment and cleanup of small hazardous materials spills would be kept at the project site.
- In the event of a large hazardous materials spill or if unanticipated hazardous materials are encountered within the project site, the HDOH Hazard Evaluation and Emergency Response Office and the HDOT Hazard Evaluation and Environmental Response Office would be contacted immediately.

Plants and Animals

Implementation of the proposed action would include a variety of avoidance, minimization, and/or mitigation measures to reduce or eliminate project-related impacts. Impacts would be less than significant with implementation of the following:

Waterbirds

- In areas where vegetated streambanks would be disturbed, waterbird nest searches would be conducted by a qualified biologist before any work is conducted and after any subsequent delay in work of 3 or more days (during which birds may attempt nesting). The results of the pre-construction survey would be submitted to the USFWS.
- If a waterbird nest with eggs or chicks/ducklings is discovered in the project area, work would not begin until the chicks/ducklings have fledged.
- Waterbird nests, chicks, or broods found in the survey area before or during construction would be reported to the USFWS within 48 hours.

Nēnē or Hawaiian Goose (*Branta sandvicensis*)

- A qualified biologist would survey the area for nesting nēnē before construction (in coordination with the waterbird surveys), and after any subsequent delay in work of 3 or more days (during which birds may attempt nesting). The results of the pre-construction survey would be submitted to the USFWS.
- If a nēnē is found in the area during ongoing activities, all activities within 100 feet (30 m) of the bird would cease, and the bird would not be approached. If a nest is discovered, USFWS would be notified. If a nest is not discovered, work may continue after the bird leaves the area of its own accord.
- All regular on-site staff would be trained to identify nēnē and would know the appropriate steps to take if nēnē are present on-site. Training would not be necessary if a biological monitor is present for the duration of the construction.
- If a nēnē is found in the area during ongoing activities, all activities within 100 feet (30 m) of the bird would cease, and the bird would not be approached. If a nest is discovered, USFWS would be notified. If a nest is not discovered, work may continue after the bird leaves the area of its own accord.
- Temporary construction fencing would be erected around the Waiʻoli and Waikoko Bridge construction zones to minimize the potential for nēnē to enter the project area.

Seabirds

- Construction activity would be restricted to daylight hours during the seabird peak fallout period (September 15–December 15) to avoid the use of nighttime lighting that could attract seabirds.
- All outdoor lights would be shielded to prevent upward radiation. This has been shown to reduce the potential for seabird attraction (Reed et al. 1985; Telfer et al. 1987). A selection of acceptable seabird-friendly lights can be found online at the Kauaʻi Seabird Habitat Conservation website (2013).

Hawaiian Hoary Bat (*Lasiurus cinereus semotus*)

- Any fences that are erected as part of the project would have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. No fences in the survey area were observed with barbed wire during the survey; however, if fences are present, the top strand of barbed wire would be removed or replaced with barbless wire.

- No trees taller than 15 feet (4.6 m) would be trimmed or removed as a result of this project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees.

Hawaiian Monk Seal (*Neomonachus schauinslandi*) and Sea Turtles

- All regular on-site staff would be trained to identify the Hawaiian monk seal and sea turtles, and trained on what appropriate steps to take if these species are present on-site.
- Construction activities would not take place if a Hawaiian monk seal or sea turtle is in the construction area or within 150 feet (46 m) of the construction area. Construction can only begin after the animal voluntarily leaves the area. If a monk seal/pup pair is present, a minimum 300-foot (91-m) buffer would be observed. If a Hawaiian monk seal or sea turtle is noticed after work has already begun, that work may continue only if, in the best judgment of the biological monitor, that there is no way for the activity to adversely affect the animal(s).
- Any construction-related debris that may pose an entanglement threat to Hawaiian monk seals and sea turtles would be removed from the construction area at the end of each day and at the conclusion of the construction project.
- Workers would not attempt to feed, touch, ride, or otherwise intentionally interact with any listed species.
- Shielded lighting would be used to reduce direct and ambient light to potential nearby beach habitat. Lighting would be directed away from the beach.
- In-water work at night would be avoided, unless emergency maintenance and repair of erosion and sediment controls are necessary to meet permit conditions. The CO would be notified prior to any such work.

The following BMPs would be implemented to prevent the introduction and/or spread of invasive species:

- Temporarily disturbed areas would be revegetated with non-invasive plant species appropriate for the project area.
- To avoid the unintentional introduction or transport of new terrestrial invasive species, all construction equipment and vehicles arriving from outside Kauaʻi would be washed and inspected before entering the project area. In addition, construction materials arriving from outside Kauaʻi would also be washed and/or visually inspected (as appropriate) for excessive debris, plant materials, and invasive or harmful non-native species (plants, amphibians, reptiles, and insects). When possible, raw materials (gravel, rock, and soil) would be purchased from a local supplier on Kauaʻi to avoid introducing non-native species not present on the island. Inspection and cleaning activities would be conducted at a designated location.

In addition to the above measures, the following BMPs would be implemented to protect water quality, as recommended by the NMFS Protected Resources Division (NOAA NMFS 2015a) and USFWS (USFWS 2014b). The applicability of these measures to the proposed project would depend on the site-specific construction means and methods chosen. The project would also adhere to the requirements of all applicable permits.

- Turbidity and siltation from project-related work would be minimized and contained through the appropriate use of erosion control practices, effective silt containment devices, and the curtailment of work during adverse weather and tidal/flow conditions.

- Erosion and sediment control measures would be in place before initiating earth-moving activities. Functionality would be maintained throughout the construction period.
- When it is not possible to schedule work to avoid times of the year when high rainfall is expected, then enhancing the capacity of existing controls, adding additional control measures, or installing contingency measures would be implemented.
- Inspection would be documented, and records for all inspections and repairs would be maintained on-site. When a device proves inadequate, it would be immediately redesigned or replaced until it is effective.
- Control measures (i.e., silt fences, sand bag barriers, sediment traps, geotextile mats, and other measures intended for soil/sediment trapping) would be inspected and repaired as needed within 24 hours after a rainfall event of 0.25 inch or greater over a 24-hour period. During periods of prolonged rainfall, a daily inspection would occur, unless extended heavy rainfall makes access impossible or hazardous.
- Construction would be sequenced to minimize the exposure time of the cleared surface area.
- The contractor would be required to prepare a spill prevention, control and countermeasure (SPCC) plan before beginning work. The SPCC would describe preventative measures including the location of refueling and storage facilities and the handling of hazardous material. The SPCC would describe actions to be taken in case of a spill. Hazardous materials would be properly stored and managed in accordance with local, state, and Federal regulations.
- Appropriate materials to contain and clean potential spills would be stored at the work site and be readily available. Spill kits would be available on-site at locations where hazardous materials are used. Spill kits would be inspected regularly and supplies replaced as needed. Staff would be trained on spill prevention and cleanup.
- All project-related materials and equipment placed in the water would be free of pollutants.
- The project manager or heavy equipment operators would perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations would be postponed or halted should a leak be detected, and they would not proceed until the leak is repaired and the equipment is cleaned.
- Fueling of land-based vehicles and equipment would take place at least 50 feet (15.24 m) away from the water, preferably over an impervious surface. Fueling of vessels would be done at approved fueling facilities.
- Portable toilets for sanitary waste management would be serviced regularly.
- A plan would be developed to prevent debris and other wastes from entering or remaining in the marine environment during the project.
- No project-related materials (fill, revetment rock, pipe, etc.) would be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.) or on beach habitats.
- No contamination (trash or debris disposal, invasive species introductions, attraction of non-native pests, etc.) of adjacent habitats (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests, etc.) shall result from project-related activities.
- Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with native or non-invasive vegetation matting, hydroseeding, etc.).

- All debris removed from the marine/aquatic environment shall be disposed of at an approved site. Solid waste and construction and demolition debris would be properly managed.
- Clearing and grubbing would be held to the minimum necessary for grading, access, and equipment operation.
- Revegetation success would be monitored to ensure sufficient vegetation cover has established, consistent with the NPDES permit for the project. Relevant erosion and sediment control BMPs would not be removed until sufficient vegetative cover is re-established. If vegetation fails to establish, corrective actions would be taken where necessary.
- Soil stockpiles would be located away at least 50 feet from concentrated runoff and water features, covered with plastic or other waterproof material when practicable, and surrounded by silt fences or other erosion control BMPs.
- Concrete wash-outs would be located 50 feet from storm drain inlets, open drainage areas, and waterbodies, and would be maintained as needed.
- All in-water work areas would be isolated and confined from open water habitats through the use of approved isolation techniques including filter fabrics, turbidity curtains, K-rails, Cofferdams, Sheet Piles, Gravel/Rock berms, Gravel/Sandbag berms, Stream diversions (Pumped, pipe/flume, or excavated) or other approved means. Frequent inspections of these BMPs would be conducted to determine if devices are operating effectively. When a device proves inadequate, work would cease and it would be immediately redesigned or replaced until it is effective.
- Flow around the isolated and confined in-water work area would be unimpeded to allow for aquatic animal migration and/or to prevent downstream flooding situations. The unimpeded flow shall be equivalent to a two (2) year, 24 hour duration storm event and/or the existing flow capacity of the stream, ditch, or gulch.
- In addition to diversion and isolation of the project area, dewatering of work zones would also be completed. Dewatering would follow the procedures outlined in SM-17 of the 2008 HDOT Construction BMP Field Manual and Section 208 of the FP-14. Treatment of dewatering effluent would conform to Federal, state, and local regulations.

Archaeological and Historic Architectural Resources

Impacts to archaeological and historic architectural resources would be less than significant. The following measures would be implemented for the project:

- The Waiʻoli, Waikoko, and Waipā Bridges would be preserved in place. Special contract requirements would be incorporated into the project to ensure no inadvertent damage occurs to these structures.
- Archaeological monitoring would be performed during ground-disturbing activities. If cultural resources or human remains are inadvertently discovered, work would immediately cease and all laws and administrative rules would be followed.
- Project design elements would continue to be coordinated through final design with the project's consulting parties.
- FHWA-CFLHD would strive to avoid the roadway culvert's basalt and mortared stone feature approaching Bridge 2. However, if it is determined that potential damage is unavoidable, the feature would be documented with photographs, and materials would be salvaged and rebuilt to mimic their original appearance. If some stone is damaged beyond re-use, materials would be used for repair that match the old in design, color, texture, and other visual qualities and, where possible, materials, consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties.

Cultural Resources

- Archaeological monitoring would be performed during ground-disturbing activities. If cultural resources or human remains are inadvertently discovered, work would immediately cease and all laws and administrative rules would be followed. Construction personnel would be educated on appropriate protocols in the event of an inadvertent discovery.

Social and Economic Resources

- Adequate notification of construction related delays and short-term closures would be provided to the traveling public, local government, and emergency service providers.
- A Traffic Management Plan would be developed and implemented for the project that would identify the location and timing of temporary road closures and delays, signage use and placement, and advanced notification procedures. The plan would also include an Emergency Services component that specifies how the contractor shall maintain access in the event of an emergency.
- A Public Involvement Program would also be developed and implemented in coordination with the contractor. The program would involve extensive public outreach to ensure the public, landowners, businesses, tourism industry, emergency services providers, schools, and local government officials are aware of project activities and scheduling of roadway closures and delays.
- Construction activities would be sequenced and scheduled, when possible, during periods of lower traffic volumes to minimize impacts to the traveling public.

Visual and Aesthetic Resources

- Aesthetic design elements would continue to be coordinated with the project consulting parties through final design.
- Temporary bridges, bypasses, and other constructed elements would be removed upon completion of the project. Temporarily disturbed areas would be re-vegetated with non-invasive plant species appropriate for the project area.

Parks, Recreation Facilities, and Section 4(f) Properties

Measures discussed for Social and Economic Resources would minimize impacts adequately. No additional measures have been identified.

Solid Waste Management

Avoidance and minimization measures would involve the following:

- The contractor would be required to appropriately handle, transport, and recycle and/or dispose of project materials in accordance with local, state, and Federal regulations.

Real Property and Utilities

The following avoidance and minimization measures apply to the project.

- FHWA-CFLHD would attempt to reduce and minimize the amount of right-of-way required for implementation of the Action Alternative. The following provisions would be implemented to ensure fair and consistent treatment:
    - Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 (P.L. 91-646) as amended by the Uniform Relocation Act Amendments of 1987 (P.L. 100-17); and
    - 49 CFR Part 24, Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally-assisted Programs.

    - Implement a comprehensive community outreach program, including ongoing outreach and coordination with affected property owners to minimize the impacts of access disruption or alterations as part of both project design and during construction.

- Project design would continue to consider the effects to utilities. Conflicts with existing utilities would be minimized in design to the extent practicable. Coordination with utility providers would continue to ensure all conflicts are identified in design and necessary utility relocations are scheduled to minimize potential service disruptions.