DEPARTMENT OF THE ARMY
U.S. ARMY INSTALLATION MANAGEMENT COMMAND-PACIFIC
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
745 WRIGHT AVENUE, BUILDING 107, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5000

Mr. Keith Kawaoka, Director
Office of Environmental Quality Control
Department of Health, State of Hawai‘i
235 South Beretania Street, Room 702
Honolulu, Hawai‘i 96813

Dear Mr. Kawaoka:

U.S. Army Garrison, Hawaii (USAG-HI) respectfully request publication of the Environmental Assessment (EA) and Draft Finding of No Significant Impact (FNSI) for the Proposed Breach of Ku Tree Dam in the National Environmental Policy Act (NEPA) Actions section of the August 23, 2020 edition of *The Environmental Notice*. Enclosed is a completed Publication Form and a copy of the EA and Draft FNSI.

Should you have any questions, please contact Mr. Greg Wahl, NEPA Program Manager, USAG-HI, Directorate of Public Works, Environmental Division by email at Gregory.t.wahl.civ@mail.mil or phone at 808-656-3093.

Sincerely,

DANIEL MISIGOY
COL, LG
Commanding
U.S. Army Garrison Hawaii

Enclosures

NEPA Action EA/EIS
Publication Form

Project Name: Proposed Breach of Ku Tree Dam at Schofield Barracks-East Range Environmental Assessment and Draft Finding of No Significant Impact

Island: O‘ahu

District: Wahiawa

TMK: (1) 7-6-001 :001

Permits: Various (see document)

Applicant or Proposing Agency:
U.S. Army Garrison, Hawaii (USAG-HI)
Greg Wahl, NEPA Program Manager, USAG-HI
947 Wright Avenue
Bldg. 105 3rd Floor,
Wheeler Army Airfield,
Schofield Barracks, Hawaii 96857-5013
usarmy.hawaii.nepa@mail.mil

Approving Agency:
U.S. Army Garrison, Hawaii (USAG-HI)
Greg Wahl, NEPA Program Manager, USAG-HI
947 Wright Avenue
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Consultant:
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(808) 842-1133

Status: Comment Period: August 23, 2020 to September 22, 2020
Written comments must be received or postmarked by September 22, 2020 to be considered.

Comments may be provided via email to: usarmy.hawaii.nepa@mail.mil or mailed to: Directorate of Public Works, Environmental Division (IMHW-PWE), Attn: Greg Wahl, 947 Wright Avenue, Wheeler Army Airfield, Schofield Barracks, HI 96857-5013.

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

Pursuant to the National Environmental Policy Act, U.S. Army Garrison, Hawaiʻi provides notice that a Draft Finding of No Significant Impact (FNSI) has been prepared based on the findings of an Environmental Assessment (EA) and that an Environmental Impact Statement is not required for the Proposed Breach of Ku Tree Dam, Schofield Barracks, Oʻahu Island, Hawaiʻi.

The proposed action would include breaching the dam by excavating a 500-foot long natural channel through the hillside that supports the existing spillway. The excavation of the hillside would match the elevation of the existing streambed allowing water flows to be diverted to the natural channel, skirting the dam, thus permanently removing the threat of dam failure and the associated safety hazards that could impact downstream areas.

Copies of the EA and Draft FNSI are available for public review at the Wahiawa Public Library and Mililani Public Library. Copies can also be obtained by contacting the Army via email at usarmy.hawaii.nepa@mail.mil or online at https://home.army.mil/hawaii/index.php/garrison/dpw/nepa.

Written comments on the Draft FNSI must be received within 30 days of the publication of this notice (no later than September 22, 2020) and should be directed to the email address above or mailed to: Directorate of Public Works, Environmental Division (IMHW-PWE), Attn: Greg Wahl, 947 Wright Avenue, Bldg. 105 3rd Floor, Wheeler Army Airfield, Schofield Barracks, HI 96857-5013.

ENVIRONMENTAL ASSESSMENT AND DRAFT FINDING OF NO SIGNIFICANT IMPACT

PROPOSED BREACH OF KU TREE DAM AT EAST RANGE, SCHOFIELD BARRACKS, OAHU ISLAND, HAWAII

JULY 2020

Prepared By: U.S. Army Corps of Engineers, Honolulu District

Prepared For: U.S. Army Garrison, Hawaii

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Draft Finding of No Significant Impact
Proposed Breach of Ku Tree Dam
Oʻahu Island, Hawaiʻi

AUTHORITY

Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 USC § 4321-4347) (NEPA), the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR § 1500-1508), and the Final Rule on Environmental Analysis of Army Actions (32 CFR § 651), the United States Army Garrison Hawaiʻi (USAG-HI) gives notice that an Environmental Assessment (EA) has been prepared for adoption of the Proposed Breach of Ku Tree Dam, Oʻahu Island, Hawaiʻi.

PROPOSED ACTION AND ALTERNATIVES CONSIDERED

USAG-HI proposes to breach Ku Tree Dam. Ku Tree Dam and (now) former reservoir are located on a part of the Schofield Barracks Military Reservation known as the East Range, along the leeward (westward) slope of the Koʻolau mountains in Central Oʻahu. The dam and former reservoir were constructed in 1925 on an unnamed perennial tributary of the South Fork of Kaukonahua Stream to form a reservoir to supply water to the Central Oʻahu U.S. Army facility. In 1938, the Army developed a deep-well pump station which eliminated the original purpose of the dam. The reservoir was significantly drawn down in 1978 due to preliminary dam safety concerns. In 1983, the reservoir was completely drawn down and emptied when dam safety risks were confirmed. A recent inspection in July 2017 concluded the dam is in critical condition and should receive immediate attention to minimize the risk of structural failure. Currently, there is no impounded water behind the dam structure. To prevent the refilling of the reservoir influent stream water currently enters a drainage tunnel at the deepest point of the basin, flows under the dam, and reenters the stream channel approximately 1,640 feet below the dam structure. If this drainage tunnel were to clog and fail to transmit water beneath the dam, the reservoir would inadvertently refill, and catastrophic failure of the dam could result. Given the safety hazards posed by the dam, and that maintenance activities to ensure the dam's performance have not been performed for many years, the USAG-HI is evaluating breaching the dam to permanently remove the dangers and safety hazards that could result should Ku Tree Dam fail. Additionally, reconnecting the natural stream channel above and below the dam would restore the stream's natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

The EA evaluates the environmental impacts of breaching Ku Tree Dam, specifically the preferred alternative and three alternative actions.

The preferred alternative is to breach the dam by excavating an approximately 500-foot long natural channel through the hillside that supports the existing spillway. The excavation of the hillside would match the elevation of the existing streambed allowing water flows to be diverted to the natural channel, skirting the dam, thus permanently removing the threat of dam failure and the associated safety hazards that could impact downstream areas. In areas subject to streamflow, turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be

anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. The remainder of the earthen dam structure would remain in place, and the dam's appurtenant structures (spillway, valve control tower, and footbridges) would be demolished. The preferred alternative would be located entirely within federally-owned land and constructed in accordance with all applicable laws.

USAG-HI analyzed a no-action alternative. Under the no-action alternative, there would be no improvement or maintenance actions and the dam and its appurtenant structures would continue to deteriorate, resulting in continued accumulation of debris in the outlet structure and the potential for the existing drainage tunnel to collapse, become filled with sediment, or otherwise become inoperable, which could lead to the refilling of the reservoir. The unintentional impounding of water could tax the structural integrity of the dam, and result in the release of a large uncontrolled flow with adverse impacts downstream. Based on this, the no-action alternative would not meet the project purpose and need to eliminate the risk of potential dam failure. Additionally, under this alternative, there would be no restoration of connectivity for water, and no habitat or aquatic improvement.

In addition to the preferred alternative and no-action alternative, USAG-HI analyzed two additional alternatives to breach Ku Tree Dam, including notching the dam and complete dam removal and site restoration.

The notching the dam-alternative would involve notching the existing dam crest structure to allow water to flow along its original flow path skirting the dam, thus permanently removing the threat of dam failure and the associated safety hazards that could impact downstream areas. Under this alternative, the upstream side of the dam would be the main flow path to allow passage through the notch and the dam's appurtenant structures (spillway, valve control tower, and footbridges) would be demolished. Construction activities required for this alternative would likely have a greater effect on short term water quality impacts than the preferred alternative due to larger quantity of sediment to be excavated and more in-stream work. Once the notch is installed along the original stream course it is expected that the original grade and meanders of the stream channel would be recreated.

The dam removal and site restoration-alternative would involve complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions ("natural" conditions), thus permanently removing the threat of dam failure and the associated safety hazards that could impact downstream areas. Construction activities would likely have a greater effect on short term water quality impacts than the preferred alternative due to the complete removal of the dam, larger quantity of sediment to be excavated, and more in-stream work. Stream channel restoration would be accomplished by removing the embankment material and the redwood core wall located at the center of the dam. A portion of the concrete cut-off wall would also need to be removed to allow for natural passage of stream flow. The concrete spillway and drainage tunnels would be abandoned. Due to the large volume of material that would be removed under this alternative, implementation would undoubtedly lead to increased release of sediments to the stream both during direct construction work (removal of the dam structure), associated construction work (potential ancillary construction activities, such as widening and improving the access road), and future exposure of the accumulated reservoir sediments to erosion.

SUMMARY OF ENVIRONMENTAL ANALYSIS

Based on the analysis contained in the EA, USAG-HI has determined that implementation of the preferred alternative would result in impacts that are less than significant.

The implementation of best management practices and other measures during construction would avoid and/or minimize potential impacts to soils, air quality, noise, water resources, hazardous substances, biological resources, and traffic. The preferred alternative would have long-term beneficial impacts to public health and safety, water resources, biological resources, and the visual environment. The preferred alternative, when combined with past, present, and reasonably foreseeable future actions, would have less than significant cumulative impact.

In January 2020, in accordance with the Fish and Wildlife Coordination Act (FWCA), USAG-HI consulted with the U.S. Fish and Wildlife Service (USFWS) and State of Hawaiʻi's Department of Land and Natural Resources (DLNR). On February 13, 2020, USAG-HI, USFWS biologists, and staff from the State of Hawaiʻi's Division of Forestry and Wildlife, and the State's Division of Aquatic Resources made a one-day visit to the project site along a tributary to the South Fork of Kaukonahua Stream. In March 2020, the USFWS provided USAG-HI a *Draft Fish and Wildlife Coordination Act Planning Aid Report* for the proposed breaching of the Ku Tree Dam to evaluate the project impacts in accordance with provisions of the FWCA. In general, the report found that based on the disturbed nature of the stream channels examined during the site visit, which formerly lay under the reservoir pool, coupled with the current diversion of the stream waters into the drain tunnel for an extensive distance, and the presence of invasive fishes, that the habitat to be impacted in the vicinity of the project is of medium to low value for species of concern. The USFWS 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* concluded that breaching the Ku Tree Dam as proposed would have minimal impact to aquatic trust resources and would in fact, potentially enhance aquatic habitat values.

In March 2020, USAG-HI conducted informal consultation under Section 7 of the Endangered Species Act with the USFWS. USAG-HI notified the USFWS that a preferred alternative had been selected and that a no effect determination was made as the project would avoid tree felling during Hawaiian hoary bat pupping season. Once construction is completed, the preferred alternative would have no new impacts to sensitive wildlife and their habitats.

In a letter dated April 9, 2020, USAG-HI conducted consultation under Section 106 of the National Historic Preservation Act with the Hawaiʻi State Historic Preservation Officer (SHPO) and other consulting parties. In a letter dated May 11, 2020, the SHPO acknowledged USAG-HI's determination that Ku Tree Dam is not eligible for inclusion on the National Register of Historic Places and finding of no historic properties affected for the undertaking. In the letter, the State Historic Preservation Division (SHPD) requested that USAG-HI consult with the parties previously consulted for the project and recommended that consultation be extended to include the Historic Hawaii Foundation. In a letter dated May 29, 2020, USAG-HI reminded the SHPD that consultation documentation, including a list of all parties invited to consult, had been previously submitted. The list of parties USAG-HI consulted for the Ku Tree Dam Breach project during the April 9, 2020 consultation included the parties previously consulted, Historic Hawaii Foundation, and 21 additional consulting parties who

had since expressed a general interest in undertakings at Schofield Barracks East Range. Noting no objection from SHPD to the adequately documented determination of eligibility and the finding of no historic properties affected for the proposed Ku Tree Dam Breach Project, USAG-HI has fulfilled the responsibilities under Section 106 of the National Historic Preservation Act pursuant to 36 CFR § 800.4(d)(1)(i).

The USAG-HI reviewed the preferred alternative for consistency with the Hawaiʻi Coastal Zone Management Program (HCZMP). Construction is not expected to affect coastal uses or resources.

PUBLIC REVIEW AND COMMENT

This Draft Finding of No Significant Impact (FNSI) has been issued in conjunction with the EA and incorporates it by reference. Notice of Availability of the EA and Draft FNSI will be published in the Honolulu Star-Advertiser newspaper and in the edition of The Environmental Notice (Office of Environmental Quality Control [OEQC], State of Hawaiʻi Department of Health). Copies of the notice of availability will also be mailed to public and private stakeholders believed to have an interest in the proposed action.

The EA and Draft FNSI are available for download for 30 days from the publication of this notice at: https://home.army.mil/hawaii/index.php/garrison/dpw/nepa as well as via download from the OEQC website: http://health.hawaii.gov/oeqc. Paper copies of the EA and Draft FNSI are also available for public review at the following public libraries: Wahiawa Public Library and Mililani Public Library.

Written comments on this Draft FNSI must be received within 30 calendar days after its initial publication. Comments can be emailed to usarmy.hawaii.nepa@mail.mil (reference “Ku Tree Dam EA” in subject line) or mailed to the Directorate of Public Works, Environmental Division (IMHW-PWE), Attn: Greg Wahl, 947 Wright Avenue, Bldg. 105 3rd Floor, Wheeler Army Airfield, Schofield Barracks, HI 96857-5013.

FINDING

After careful review of the EA, I have concluded that implementation of the Proposed Action would not have a significant impact on the quality of the human or natural environment. Per 32 CFR § 651, the EA and Draft FNSI will be made available for a 30-day public review and comment period. Once any public comments have been addressed, and if a determination is made that the Proposed Action will have no significant impact, the FNSI will be signed and the action will be implemented. This analysis fulfills the requirement of NEPA and CEQ Regulations. Therefore, an environmental impact statement is not required.

This **Finding of No Significant Impact** has therefore been prepared and is submitted to document environmental review and evaluation in compliance with NEPA.

_____ _____

Daniel Misigoy [Date]
Colonel, U.S. Army
Commanding
U.S. Army Garrison – Hawai‘i

ENVIRONMENTAL ASSESSMENT

PROPOSED BREACH OF KU TREE DAM AT EAST RANGE, SCHOFIELD BARRACKS, OAHU ISLAND, HAWAII

JULY 2020

Prepared By: U.S. Army Corps of Engineers, Honolulu District

Prepared For: U.S. Army Garrison, Hawaii

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Environmental Assessment for
Proposed Breach of Ku Tree Dam
O'ahu Island, Hawai'i
July 9, 2020

REVIEWED BY:

11AUG20

Gregory T. Wahl
NEPA Program Manager
Directorate of Public Works
U.S. Army Garrison – Hawaii

Date

SUBMITTED BY PROPONENT:

11 Aug 20

Rhonda L. Suzuki
Environmental Division Chief
Directorate of Public Works
U.S. Army Garrison – Hawaii

Date

APPROVED BY:

14 Aug 20

Daniel Misigoy
Colonel, U.S. Army
Commanding
U.S. Army Garrison – Hawaii

Date

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Plates

Acronyms and Abbreviations

1V:1H	1 Vertical to 1 Horizontal
AAQS	Ambient Air Quality Standard
ACE	Annual Chance of Exceedance
ACHP	Advisory Council on Historic Preservation
BMP	Best Management Practices
BWS	Board of Water Supply
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	decibel
DBEDT	Department of Business, Economic Development, and Tourism
DLNR	Department of Land and Natural Resources
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOH	Hawai‘i State Department of Health
DPP	Department of Planning and Permitting
EA	environmental assessment
EIS	environmental impact statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FNSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
HAR	Hawai‘i Administrative Rules
HAER	Historic American Engineering Record
HLMG	Helemano silty clay with 30 to 90 percent slopes
HSBP	Hawai‘i Stream Bioassessment Protocol
ICRMP	Integrated Cultural Resources Management Plan
IRP	Installation Restoration Program
INRMP	Integrated Natural Resources Management Plan
MBTA	Migratory Bird Treaty Act
mgd	million gallons per day
mph	miles per hour
msl	mean sea level
NAGPRA	Native American Graves Protection and Repatriation Act

NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
OHA	Office of Hawaiian Affairs
OMPO	O‘ahu Metropolitan Planning Organization
PMF	probable maximum flood
RCRA	Resource Recovery and Conservation Act
ROI	Region of Influence
rRT	Rough Mountainous Land
SBMR	Schofield Barracks Military Reservation
SCS	Scientific Consulting Services
SHPD	State Historic Preservation Division
SHPO	State Historic Preservation Officer
SPF	Standard Project Flood
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
U.S.	United States
U.S.C	United States Code
USACE	United States Army Corps of Engineers
USAG-HI	United States Army Garrison – Hawai‘i
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
VEC	valued environmental component

EXECUTIVE SUMMARY

This environmental assessment (EA) addresses the proposed breach of Ku Tree Dam. Breaching the dam is being proposed to eliminate the hazards associated with potential catastrophic dam failure and the resultant risks to human health and safety.

PROPOSED ACTION

The U.S. Army Garrison Hawai‘i (USAG-HI), Directorate of Public Works is proposing to breach Ku Tree Dam. Breaching the dam would eliminate the hazards associated with potential catastrophic dam failure and the resultant risks to human health and safety. The Ku Tree Dam is severely deteriorated and designated a high-hazard dam since 1978. Breaching the dam would be accomplished by excavating an approximately 500-foot long natural channel through the hillside that supports the existing spillway. The excavation of the hillside would match the elevation of the existing streambed allowing water flows to be diverted to the natural channel, skirting the dam, thus permanently removing the threat of dam failure and the associated safety hazards that could impact downstream areas. The remainder of the earthen dam structure would remain in place, and the dam’s appurtenant structures (spillway, valve control tower, and footbridges) would be demolished.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the project is to eliminate the risk of potential dam failure. Dam failure is defined as the overtopping of the dam during storm events and in a worst-case scenario, catastrophic failure of the dam structure (i.e., sudden release and surge of water). Both events would result in an uncontrolled release of water and possible flooding downstream. The project is needed because Ku Tree Dam is severely deteriorated and designated a high hazard dam, the failure of which would cause property damage and risk human safety. Breaching the dam would permanently remove the dangers and safety hazards that could result should the Ku Tree Dam fail. Additionally, reconnecting the natural stream channel above and below the dam through the existing spillway would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

PROJECT BACKGROUND

In 1925, the Ku Tree Dam was constructed on an unnamed tributary of the South Fork of Kaukonahua Stream, in the East Range of the Schofield Barracks. The original purpose of the dam and reservoir was to provide a water supply source for Schofield Barracks. Ku Tree Dam is a hydraulic earth-filled dam that is approximately 550 feet long by 90 feet high with a crest width of 30 feet. Looking downstream, a concrete converging spillway is located on the left abutment of the dam. The spillway has a 160-foot ogee weir (i.e., low head dam) and drop section into a stilling basin. In 1938, the Army developed a deep-well pump station which eliminated the original purpose of the dam. In 1978, the dam was designated a high-hazard and the water level in the basin was drawn down to a reservoir depth of 50 feet. In 1983, the reservoir was completely drained. The Army has since used the dam and reservoir area for training

operations and exercises. Necessary and routine maintenance activities to ensure the dam's performance have not been performed for many years. A recent inspection of the Ku Tree Dam in July 2017 concluded that it was in critical condition and should receive immediate attention to minimize the risk of structural failure.

In 2004-2005, an environmental impact analysis for the proposed breaching of the Ku Tree Dam was initiated by Kimura International, Inc. That document was developed to the draft stage, at which point the project and the EA were put on hold. In 2011, Wil Chee - Planning, Inc. resumed the preparation of the project EA to address issues raised from the 2004 scoping and consultation process. The project, however, was later put on hold and the draft EA was never published for public review and comment. In 2018 the project was resumed. This EA document builds upon and carries forward the EA process starting from 2004 and continues to the 2019-2020 timeframe with the documentation of prior and current issues raised during the scoping and consultation of this project.

This EA examines the environmental impacts of the Proposed Action and three alternative actions.

OVERVIEW OF THE PROPOSED ACTION AND ALTERNATIVES CONSIDERED

Proposed Action: Breaching the Dam with a Natural Channel Through the Spillway

The Proposed Action would breach the Ku Tree Dam by demolishing the spillway and excavating an approximately 500-foot long natural channel through the hillside that supports the existing spillway. The hillside would be excavated to a depth of roughly 75 feet beneath the existing spillway entrance to match the elevation of the existing streambed. The natural channel would have a bottom width of approximately 50 feet with 1 Vertical to 1 Horizontal (1V:1H) side slopes, benched every 20 feet to minimize erosion. The invert elevations of the new channel would range from approximately 1,015 feet above mean sea level (msl) at its upstream end to about 990 feet above msl at the tie-in to the existing spillway channel. Provisions would ensure slope stability and establishment of vegetation. In areas subject to streamflow, turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. Over time, the expectation is that the environment would transition into one that replicates naturally mature, vegetative conditions, further reducing erosion. Under this alternative, Ku Tree Dam would remain in place. Approximately 112,000 cubic yards of excavated earth and construction debris would fill the upstream dam to block off water flow and prevent its entry into the filled dam passageway.

The demolition of the footbridges and a portion of the valve tower will be required. The remainder of the valve tower left in place would be plugged and abandoned. The upstream inlet to the drain tunnel that currently conveys stream waters under the dam and drainage tunnel would be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower would remain in-place. Additionally, vegetation removal would be necessary to implement the Proposed Action; however, vegetation in the project vicinity is dominated by introduced or alien species.

The project will use two fill locations, the “upstream fill area” and “alternate fill area.” To the extent possible, excavated material would be reused on-site or placed on the upstream side of the dam (upstream fill area) to minimize any off-site disposal. The alternate fill area would serve as a second fill location for the placement of excavated material necessary to finish construction of the natural channel, allowing the Contractor to remove the construction equipment from the site. Demolished concrete would serve as fill at the upstream and alternate fill location. The disposal of expended rebar/metal would be off-site.

The new channel through the existing spillway is the most efficient route as it utilizes the existing hillside slope to reduce the quantity of excavation and earth disturbance to achieve the goal of removing the risk of dam failure. During construction, Ku Tree Dam will remain in its current drawn-down state with stream flows continuing to be diverted through the drain tunnel. This would reduce the potential for sedimentation during excavation and construction in the spillway area. As a result, only short-term periods of actual in-stream work would be required. Additionally, under the Proposed Action, because the Ku Tree Dam structure would remain in place, soils impounded behind the dam will not be disturbed, allowing the dam to serve as a sedimentation basin, minimizing the potential for material transported downstream. By completing the dam breach in this manner, no surge of released loose sediment is expected.

Once completed, the Proposed Action would have beneficial impacts by improving stream ecological and hydrological functions, such as floodplain water storage and detention, and groundwater recharge. The Proposed Action would allow for the reconnection of formerly severed stream channels and floodplains by reconnecting the natural stream channel above and below the dam through the existing spillway. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

Once the natural channel is constructed, water flow would be diverted to the natural channel, skirting the dam, and little or no maintenance would be required to ensure sufficient drainage is maintained. Under this alternative, the dam and reservoir would not retain any storage capacity, and the catastrophic failure of the dam and the safety hazards that could impact downstream areas would be averted since the dam would be permanently breached.

Alternative A: No Action

The No Action alternative would leave the dam in place without any changes. Under this alternative, there would be no improvement or maintenance actions, and the dam and its appurtenant structures would continue to deteriorate. The reservoir is currently in a drawn down, dewatered state with no impounded water behind the dam structure. As long as the existing drain tunnel remains open, this alternative would lead to no substantial environmental changes. The reservoir would stay in this condition with no impoundment of water. However, because there will be no maintenance, debris could continue to accumulate in the outlet structure, which could lead to the refilling of the reservoir.

Further, if the existing drain tunnel collapses, becomes filled with sediment, or otherwise becomes inoperable, the reservoir could refill. The unintentional impounding of water could tax the structural integrity of the dam, and result in the release of a large uncontrolled flow with adverse impacts downstream. The lack of maintenance, unknown condition of the drain tunnel, inadequate spillway capacity, the potential for overtopping, and downstream slope seepage problems can all contribute to dam failure. Additionally, under this alternative, there would be no restoration of connectivity for water, and no habitat or aquatic improvement.

Alternative B: Notching the Dam

Alternative B would involve notching the existing dam crest structure to allow water to flow along its original path. Under this alternative, the upstream side of the dam would be the main path allowing flows to pass through the notch. Construction activities required for Alternative B would likely have a more significant impact on short-term water quality than the Proposed Action due to a larger quantity of sediment to be excavated and more in-stream work. A trapezoidal-shaped notch would be cut into the existing streambed. The notch would be 50-feet wide at its base with 1V:2H side slopes, benched every 20 feet to minimize erosion. The design will include the use of slope stabilization and vegetative controls. Over time, the intention is for the environment in the vicinity of the natural channel through the dam crest to transition into one that replicates naturally mature, vegetative conditions, further reducing erosion.

The valve tower, spillway, and footbridges would be demolished. The drain tunnel and drain discharge tunnel would be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower would remain in-place.

This alternative will require the removal of approximately 356,000 cubic yards of excavated earth. To the extent possible, excavated and demolished concrete material would be reused on-site or placed at an approved site within the installation to minimize any off-site disposal. However, if the on-site placement of excavated material is not feasible, it will require off-site disposal. The disposal of expended rebar/metal would be off-site.

Once the notched dam is constructed and the flow of water restored along its path, the conditions will be present to recreate part of the original grade and meanders of the stream channel. Overall, Alternative B would have beneficial impacts to surrounding water resources by reconnecting the stream channel above and below the dam to restore the stream’s natural hydrology (movement of water), the aquatic and riparian habitat, the ability to more effectively transport sediment and nutrients, and re-water a currently dry stream reach below the reservoir. This alternative would further require little or no maintenance as the vegetation becomes established, and the condition of the stream channel becomes stabilized. Because the Ku Tree dam and reservoir would not retain storage capacity as it would be permanently breached, the risk of catastrophic failure of the dam would be averted.

Alternative C: Dam Removal and Site Restoration

Alternative C would involve the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions (“natural” conditions). Construction activities required for Alternative C would likely have a greater effect on short term water quality impacts than the Proposed Action due to the complete removal of the dam, larger quantity of sediment to be excavated, and more in-stream work. Stream channel restoration would be accomplished by removing the embankment material and the redwood core wall located at the center of the dam. A portion of the concrete cut-off wall, approximately 10 feet high by 80 feet long, would also need to be removed to allow for natural passage of stream flow. The concrete spillway and drainage tunnels would be abandoned.

Under this alternative, approximately 246,000 cubic yards of excavated earth would be removed. Demolished material would be disposed of in an appropriate manner and to the extent possible, excavated material would be reused on site to minimize the amount of off-site disposal required. Excavated material that cannot be disposed of on-site will require off-site disposal. Rebar/metal would be disposed of off-site. Due to the large volume of material that will be removed under this alternative, implementation would undoubtedly lead to increased release of sediments to the stream both during direct construction work (removal of the dam structure), associated construction work (potential ancillary construction activities, such as widening and improving the access road), and future exposure of the accumulated reservoir sediments to erosion.

Under this alternative, reconnecting the natural stream channel above and below the dam would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. Over time, the environment in the vicinity of the restored stream is expected to transition into one that replicates naturally mature, vegetative conditions.

SUMMARY OF IMPACTS TO VALUED ENVIRONMENTAL COMPONENTS

Table ES-1 is a summary of the impacts that would result from implementation of the Proposed Action, Alternative Action A, Alternative Action B, Alternative Action C, and potential Cumulative Impacts. As is presented in Table ES-1, there would be less than significant impacts to most Valued Environmental Components (VEC) under the Proposed Action, each alternative action, and under cumulative impacts.

Table ES-1. Executive-Summary of Anticipated Impacts

Valued Environmental Component (VECs)	**Proposed Action** Natural Channel through Spillway	**Alt. A:** No Action	**Alt. B:** Notch through Dam	**Alt. C:** Dam Removal and Site Restoration	**Cumulative Impacts**
Geology, Soils and Seismicity	⊙	⊙	⊙	⊙	⊙
Air Quality	⊙	○	⊙	⊙	○
Noise Effects	⊙	○	⊙	⊙	○
Water Resources	⊙/+	⊙	⊙/+	⊘/+	⊙

Valued Environmental Component (VECs)	**Proposed Action** Natural Channel through Spillway	**Alt. A:** No Action	**Alt. B:** Notch through Dam	**Alt. C:** Dam Removal and Site Restoration	**Cumulative Impacts**
Hazardous Materials/Hazardous Waste	⊙	○	⊙	⊙	○
Biological Resources	⊙/+	⊙	⊙/+	⊙/+	○
Socio-Economic Environment	+	○	+	+	+
Environmental Justice	○	⊙	○	○	○
Land Use	⊙	○	⊙	⊙	○
Visual and Aesthetic Resources	+	⊙	+	+	○
Cultural Resources	○	○	○	○	○
Traffic and Transportation Systems	⊙	○	⊙	⊙	○
Recreational Resources	⊙	⊙	⊙	⊙	⊙
Utilities and Public Services	○	○	○	○	○

⊗ Significant Impact
⦸ Significant impact but mitigable to less than significant
⊙ Less than significant impact
○ No impact
\+ Beneficial Impact

Proposed Action: Breaching the Dam with a Natural Channel Through the Spillway

Under the Proposed Action, impacts to 7 of the 14 VECs would be considered less than significant. There would be no impacts related to Environmental Justice; Cultural Resources; or on Utilities and Public Services. Impacts to Water Resources and Biological Resources would be considered both less than significant and beneficial. Impacts to Water Resources and Biological Resources would result in less than significant impacts during construction; however, engineering controls and BMPs would be implemented to mitigate construction related impacts. Long-term beneficial impacts to Water Resources and Biological Resources would result since the natural stream channel above and below the dam would be reconnected restoring the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and removing the potential risk of catastrophic dam failure. Impacts to the Socio-Economic Environment would be considered beneficial through the provision of construction jobs, the procurement of local goods and services and increased tax revenue. Impacts to Visual and Aesthetic Resources would be considered beneficial due to demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir and allowing the project site to return to the appearance of a more natural environment.

Alternative A: No Action

Under the No Action alternative, there would be no impact to 8 of the 14 VECs, and impacts to the remaining 6 VECs would be considered less than significant. No significant impacts are anticipated.

Alternative B: Notching the Dam

Under Alternative B, impacts to 7 of the 14 VECs would be considered less than significant. There would be no impacts related to Environmental Justice; Cultural Resources; or on Utilities and Public Services. Beneficial impacts would result on the Socio-Economic Environment, and Visual and Aesthetic resources. Impacts to Water Resources and Biological Resources would be considered both less than significant and beneficial. As with the Proposed Action, impacts to Water Resources and Biological Resources would result in less than significant impacts for during construction; however, engineering controls and BMPs would be implemented to mitigate construction related impacts. Long-term beneficial impacts to Water Resources and Biological Resources would result since the natural stream channel above and below the dam would be reconnected restoring the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and removing the potential risk of catastrophic dam failure.

Alternative C: Dam Removal and Site Restoration

Alternative C, like the other actions reviewed, would have no impact related to Environmental Justice; Cultural Resources; or on Utilities and Public Services. Impacts to 7 of the 14 VECs would be considered less than significant. Impacts on the Socio-Economic Environment and Visual and Aesthetic Resources would be beneficial. Impacts to Water Resources would be both beneficial and significant but mitigable to less than significant. Impacts to Biological Resources would be considered both less than significant and beneficial. Due to the large volume of material that will be removed under this alternative, implementation would undoubtedly lead to increased release of sediments to the stream during construction. The fate of the large quantities or sediment and organic trash currently deposited in the reservoir site when the dam is breached and flows restored is of particular concern. Release of this material downstream may lead to sediment deposition in various unpredictable locations in lower Kaukonahua Stream and perhaps even Wahiawā Reservoir. These impacts would be mitigated to less than significant by implementation of appropriate engineering controls to minimize erosion of the accumulated sediments located behind the existing dam structure. Long-term beneficial impacts to Water Resources and Biological Resources would result by restoring the site to pre-dam conditions and reconnecting the stream channel above and below the dam, which would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and remove the potential risk of catastrophic dam failure.

Cumulative Impacts

Based on the findings of the cumulative impacts analysis, the Proposed Action would not cumulatively impact 10 of the 14 VECs, and would contribute to less than significant cumulative impacts to 3 of the 14 VECs. Impacts to the Socio-Economic Environment would be considered beneficial through the provision of construction jobs, the procurement of local goods and services and increased tax revenue.

1.0 Introduction and Project Description

1.1 Introduction

This Environmental Assessment (EA) addresses the proposed Breach of the Ku Tree Dam. Breaching the dam is being proposed to eliminate the hazards associated with potential catastrophic dam failure and the resultant risks to human health and safety. The Ku Tree Dam is severely deteriorated and has been designated a high-hazard dam since 1978.

The USAG-HI, Directorate of Public Works has prepared this EA pursuant to the National Environmental Policy Act (NEPA), as amended (42 United States Code [U.S.C.] § 4321 et seq.); and its implementing regulations issued by the Council on Environmental Quality (CEQ) (40 CFR Part 1500 - 1508). This document was also prepared in accordance with Department of Defense (DoD) Directive 6050.1, *Environmental Effects in the United States of DOD Actions* and 32 CFR Part 651 *Environmental Analysis of Army Actions*.

The purpose of this EA is to ensure that comprehensive and systematic consideration is given to potential impacts that may result from implementing the proposed action. A range of reasonable alternative actions, as well as their effect upon the natural, man-made, and social environment are also discussed. The findings presented in this EA will result in either a Finding of No Significant Impact (FNSI), lead to preparation of an environmental impact statement (EIS), or no action on the proposal.

An environmental impact analysis for the proposed breach of the Ku Tree Dam was initiated in 2004-2005 by Kimura International, Inc. The EA was developed to the draft stage, at which point the project and the EA were put on hold. In 2011 the project was resumed and a revised draft EA prepared by Wil Chee - Planning, Inc. to address issues that were raised during the 2004 scoping and consultation. The project, however, was again put on hold and the draft EA was never published for public review and comment. This document builds upon and carries forward the initial EA effort and seeks to address issues raised during additional scoping and consultation for the project. Thus, much of the material from the initial EA efforts is incorporated into this EA document.

1.2 Proposed Action

The USAG-HI, Directorate of Public Works is proposing to breach Ku Tree Dam to eliminate the hazards associated with potential catastrophic dam failure and the resultant risks to human health and safety. Breaching the dam would be accomplished by demolishing the spillway and excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway.

The hillside would be excavated to a depth of roughly 75 feet beneath the existing spillway entrance to match the elevation of the existing streambed. The natural channel would have a bottom width of approximately 50 feet with 1V:1H side slopes, benched every 20 feet to

minimize erosion. The invert elevations of the new channel would range from approximately 1,015 feet above msl at its upstream end to about 990 feet above msl at the tie-in to the existing spillway channel. Provisions would ensure slope stability and establishment of vegetation. In areas subject to streamflow, turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. Over time, the expectation is that the environment would transition into one that replicates naturally mature, vegetative conditions, further reducing erosion. Under this alternative, Ku Tree Dam would remain in place. Approximately 112,000 cubic yards of excavated earth and construction debris would fill the upstream dam to block off water flow and prevent its entry into the filled dam passageway.

The demolition of the footbridges and a portion of the valve tower will be required. The remainder of the valve tower left in place would be plugged and abandoned. The upstream inlet to the drain tunnel that currently conveys stream waters under the dam and drainage tunnel would be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower would remain in-place. Additionally, vegetation removal would be necessary to implement the Proposed Action; however, vegetation in the project vicinity is dominated by introduced or alien species.

The project will use two fill locations, the “upstream fill area” and “alternate fill area.” To the extent possible, excavated material would be reused on-site or placed on the upstream side of the dam (upstream fill area) to minimize any off-site disposal. The alternate fill area would serve as a second fill location for the placement of excavated material necessary to finish construction of the natural channel, allowing the Contractor to remove the construction equipment from the site. Demolished concrete would serve as fill at the upstream and alternate fill location. The disposal of expended rebar/metal would be off-site.

The new channel through the existing spillway is the most efficient route as it utilizes the existing hillside slope to reduce the quantity of excavation and earth disturbance to achieve the goal of removing the risk of dam failure. During construction, Ku Tree Dam will remain in its current drawn-down state with stream flows continuing to be diverted through the drain tunnel. This would reduce the potential for sedimentation during excavation and construction in the spillway area. As a result, only short-term periods of actual in-stream work would be required. Additionally, under the Proposed Action, because the Ku Tree Dam structure would remain in place, soils impounded behind the dam will not be disturbed, allowing the dam to serve as a sedimentation basin, minimizing the potential for material transported downstream. By completing the dam breach in this manner, no surge of released loose sediment is expected.

Once completed, the Proposed Action would have beneficial impacts by improving stream ecological and hydrological functions, such as floodplain water storage and detention, and groundwater recharge. The Proposed Action would allow for the reconnection of formerly severed stream channels and floodplains by reconnecting the natural stream channel above and below the dam through the existing spillway. This would restore the stream’s natural hydrology

(movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

Once the natural channel is constructed, water flow would be diverted to the natural channel, skirting the dam, and little or no maintenance would be required to ensure sufficient drainage is maintained. Under this alternative, the dam and reservoir would not retain any storage capacity, and the catastrophic failure of the dam and the safety hazards that could impact downstream areas would be averted since the dam would be permanently breached.

1.3 Purpose of and Need for the Proposed Action

The purpose of the project is to eliminate the risk of potential dam failure. Dam failure is defined as overtopping of the dam during storm events and in a worst case scenario, catastrophic failure (i.e., sudden release and surge of water). Both events would result in an uncontrolled release of water and possible flooding downstream. The project is needed because Ku Tree Dam is severely deteriorated and has been designated a high hazard dam, failure of which could cause property damage and risk human safety. Breaching the dam would permanently remove the dangers and safety hazards that could result should Ku Tree Dam fail.

1.4 Project Background

Ku Tree Dam and (now) former reservoir are located on a part of the Schofield Barracks Military Reservation known as the East Range, along the leeward (or westward) slope of the Ko‘olau mountain in Central O‘ahu. The dam and former reservoir were constructed in 1925 on an unnamed perennial tributary of the South Fork of Kaukonahua Stream to form a reservoir to supply water to the central O‘ahu U.S. Army facility.

The Kaukonahua Watershed stream system is formed by two major tributaries, South Fork and North Fork Kaukonahua Streams. South Fork Kaukonahua Stream is made up of several tributaries, two of which join together just upstream from the Ku Tree Dam which is at an elevation of approximately 1,080 feet. The Ku Tree Dam, reservoir, and streams are in narrow, meandering, forested gulches, populated primarily by alien plant species. Upstream from the convergence of the two tributaries, water is shunted into the reservoir from the windward face of the Ko‘olaus via Ko‘olau Ditch Tunnel system. After passing through Ku Tree Dam, South Fork Kaukonahua Stream joins with North Fork Kaukonahua Stream just upstream of the Wahiawā Reservoir. Kaukonahua Stream then flows from the Wahiawā reservoir and joins Poamoho Stream to become Ki‘iki‘i Stream a short distance upstream of the Ki‘iki‘i confluence with the sea at Kaiaka Bay on O’ahu’s North Shore.

Kaukonahua Stream is the longest stream in the State of Hawai‘i at 19.3 miles from the headwaters to its confluence with the sea, and is, therefore, considered one of the most significant surface water features in the State. The Kaukonahua system is also one of the most extensively altered stream systems in the State. Water development projects for industrial-scale sugarcane and pineapple agriculture, domestic water supply, and wastewater treatment have fundamentally altered the physical, chemical and biological features of the system for well over a

hundred years. These alterations include the Wahiawā Dam and Reservoir, irrigation withdrawals that are licensed with no requirement for in-stream conservation flows, input of treated domestic wastewater, and input of stormwater from impervious streets and structures in the proximity of urban areas of Wahiawā, Schofield Barracks, and Waialua.

Ku Tree Dam is a hydraulic earth-filled dam that is approximately 550 feet long by 90 feet high with a crest width of 30 feet. Construction of the dam crest blocked the original flow path of South Kaukonahua Stream, impounding water behind the dam, and creating Ku Tree Reservoir which drowned the two meandering tributaries of South Kaukonahua Stream behind the dam at the 1,159-foot elevation. Looking downstream, a concrete converging spillway is located on the left abutment of the dam. The spillway has a 160-foot ogee weir and drop section into a stilling basin. Figure 1 below shows the relationship of the original flow path to the dam and spillway.

At maximum capacity, the reservoir pool was 32 acres (13 hectares) in size and provided storage of 900 acre-feet (293 million gallons) of water. Plate 1 below shows dam and reservoir at full capacity.

Plate 1. **Ku Tree Reservoir** (date unknown)
Source: Phase I Inspection Report, National Dam Safety Program (C-E Maguire, Inc., 1978)

In 1938, the Army developed a deep-well pump station which eliminated the original purpose of the dam. The reservoir was significantly drawn down in 1978 due to preliminary dam safety concerns. In 1983, the reservoir was completely drawn down and emptied when dam safety risks were confirmed. Currently, there is no impounded water behind the dam structure. The Army has since used the dam and reservoir area for training operations and exercises.

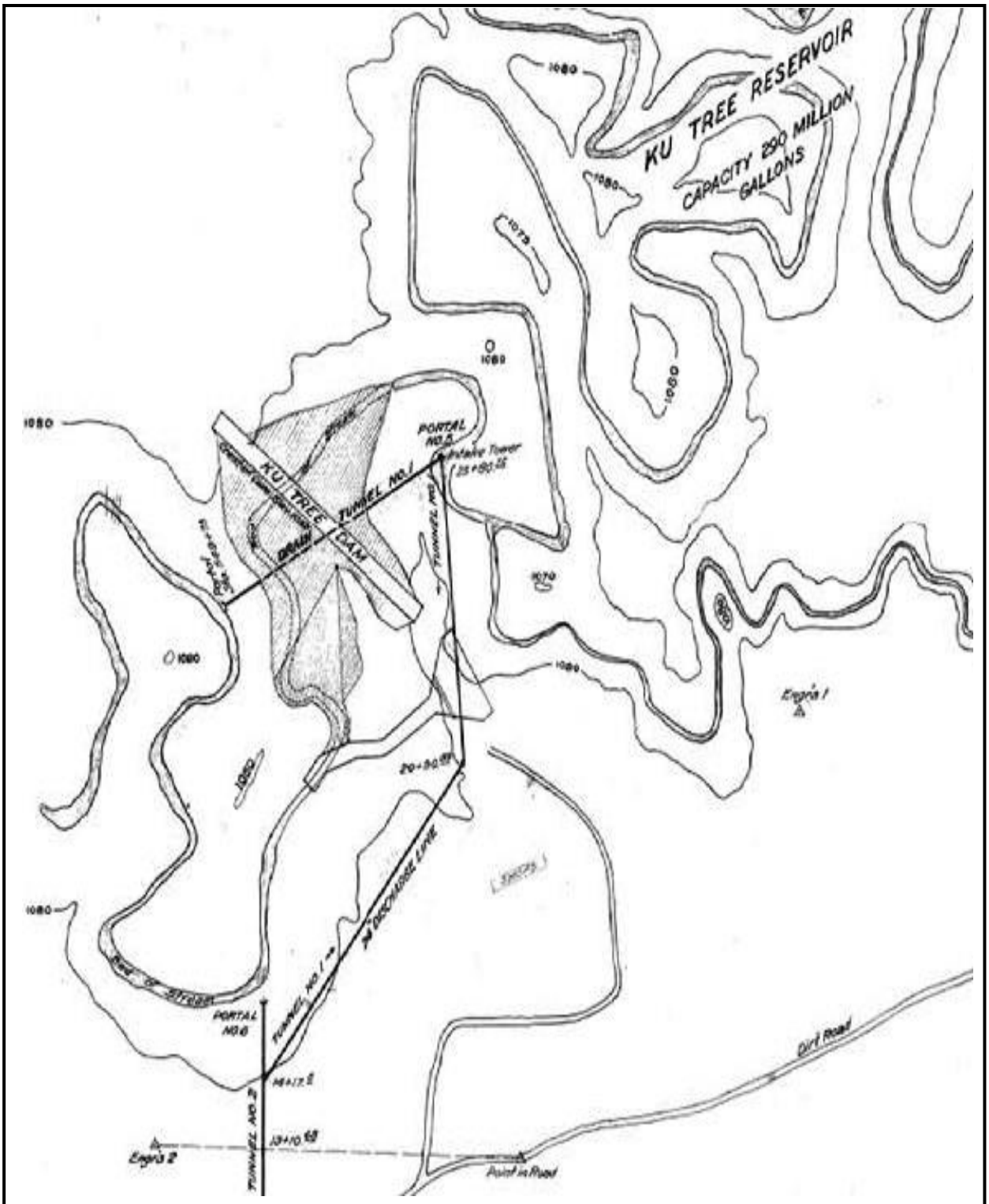

Figure 1. Relationship of Original Flow Path to Dam and Spillway

Since 1978 various studies have been undertaken to evaluate management options for the dam and reservoir:

- In 1978 the dam was deemed unsafe following an inspection under the National Dam Safety Program. The report concluded that the dam was in very poor condition and cites the dam’s lack of maintenance. The poor structural integrity of the dam and its appurtenant structures (the valve control tower, spillway, and the drain and discharge tunnels) could lead to dam failure, which could have potentially adverse impacts downstream. Further, the seepage along the downstream slope of the dam and the inability of the spillway to pass the Probable Maximum Flood (PMF) contribute to its degraded state. The PMF is the largest flood that may be reasonably expected to occur from the most severe combination of critical meteorological and hydrologic conditions that is reasonably possible within a particular watershed. To reduce the amount of seepage along the dam’s downstream slope, the dam was drawn down to a reservoir depth of 50 feet, as was recommended by the 1978 report.

- In 1983, the dam’s basin was completely drained to facilitate further inspections and engineering analysis of the dam and its appurtenant structures. The 1983 inspection of the dam concluded the following major structural defects: surface erosion, spalling, cavities and rusted reinforcing of the concrete structures; several areas of fallouts or cave-ins within the discharge tunnel; a collapsed suspension span and badly deteriorated approach spans of the tower foot bridge; and sluice gates that were missing, jammed, rusted, or in poor working condition. Since the 1983 inspection, the reservoir has remained completely drawn down and the dam’s appurtenant structures have continued to deteriorate.

- In 1984 and 1986 studies of the dam estimated that a piping failure and breach at the Ku Tree Reservoir would lead to a rise in channel stage of 12 to 13 feet upstream of the Wahiawā Reservoir above the base condition. This flood event would lead to an estimated rise of 0.4 feet at Wahiawā Dam and an increase in peak discharge of 1,500 cubic feet per second (cfs). These studies concluded that the 900 acre-feet of water released by a failure of Ku Tree Dam could easily be absorbed by the 2,940 acre-feet of flood surcharge storage at Wahiawā Reservoir, even during typical basin-wide flood events (USACE, 1984c). These studies did note, however, that various U.S. Army facilities, namely bridge structures located in the East Range, could be damaged by such a release event.

- An emergency inspection of the physical condition of Ku Tree Dam was conducted in 2006 (USACE, 2006) and a follow on inspection by a contractor hired by the State of Hawai‘i Department of Land and Natural Resources (DLNR) performed in 2007 (Gannett and Fleming, 2008). The 2007 safety inspection noted that the dam’s embankment and appurtenant structures have not been maintained and are overgrown with vegetation, including trees. Trees, if uprooted during high winds, can cause severe damage to the dam embankment. Further, vegetation and soil deposits in the spillway and its approach channel obstruct flow and promote accumulation of floating debris. Consequently, the

spillway’s discharge capacity and reliability are reduced and the potential for unintentional impoundment of water behind the dam, overtopping of the dam, or catastrophic failure of the dam is increased. Because the dam was not inspected under normal or operational conditions (i.e. impoundment of a normal or full reservoir), the report further stated that there may be other conditions or defects present but cannot be determined due to the dam’s drawn-down state. Thus, the full extent of the dam’s deteriorated condition is unknown. The findings of the inspection report deemed Ku Tree Dam to be *unsafe, non-emergency.* The inspection report utilized classification language commonly used by the United States Army Corps of Engineers (USACE) and other regulatory agencies. As defined in the report “unsafe” means that safety deficiencies in the dam or spillway are assumed to be of such a nature that, if not corrected, could result in failure of the dam with subsequent loss of human life and significant property damage. “Non-emergency” is defined as a condition in which the dam does not constitute as unsafe or threatening to life and property. One of the recommendations in the inspection report was that the reservoir should be maintained in its drained condition and that breaching of the dam should be aggressively pursued.

The State of Hawai‘i DLNR classified the dam as a High Hazard dam. DLNR defines a “High Hazard” dam to mean a dam’s or reservoir’s failure will result in probable loss of human life. The classification does not reflect the condition of the dam or reservoir and appurtenant structures, but is based upon potential adverse consequences that would result from dam failure or malfunction of the dam, reservoir or appurtenant structures.

- The most recent safety inspection of the dam was completed in July 2017. The findings of the inspection report determined that Ku Tree Reservoir is in critical condition due to inoperable outlet works, difficult site access, and overgrown vegetation. At the time of the inspection, the reservoir was dry and the reservoir area was filled with large trees. The inspection of the dam concluded that the reservoir should receive immediate attention to minimize risk of structure failure (USACE, 2017a). The report noted the following major structural defects: the dam’s low-level outlet works are currently abandoned and not functioning, very heavy vegetation covers the entire dam structure, the spillway channel is clogged with heavy vegetation and silt deposits, and five (5) to ten (10) feet deep erosion gullies are located in the right downstream groin. The report noted that due to heavy vegetation the condition of the discharge tunnel is unknown. Per the inspection out-brief, it was determined that the intake tower with its valve in the current position can pass the PMF. However, if the gates were to close or become clogged, the dam would impound water. Failure of the outlet works could lead to overtopping of the structure, leading to failure of the dam. Ku Tree dam is in a very remote location and in the case of an emergency it would be nearly impossible to take remedial action. For this reason, it is imperative that vegetation clearing, maintenance, and inspections are conducted for the intake tower and structure to be certain the outlet works can continue to pass the PMF. Additionally, since there is no intention of using the dam embankment to impound water in the future, dam removal should be fast tracked to eliminate risk associated with water impoundment.

Currently, the reservoir is completely drawn down and no water is impounded behind the dam structure. To prevent the refilling of the reservoir influent stream water currently enters a drainage tunnel at the deepest point of the basin, flows under the dam, and reenters the stream channel approximately 1,640 feet below the dam structure. If this drainage tunnel were to clog and fail to transmit water beneath the dam, the reservoir would inadvertently refill, and catastrophic failure of the dam could result. In such an event, the flood waters resulting from the dam failure would flow downstream into Wahiawā Reservoir. The potential flood zone extending from Ku Tree Dam downstream to Wahiawā Reservoir is not inhabited and the relative risk to lives and property due to dam failure is not high, however, the potential for such an event to affect the safety of Wahiawā Dam and Reservoir could be significant. Previous studies have indicated that it is highly improbable that the dam could survive until the moment of the PMF. Therefore, maintaining the reservoir in its drawn down state offers only a temporary reduction of unsafe conditions at the reservoir and is not a long-term solution.

Given the safety hazards posed by the dam, the USAG-HI Directorate of Public Works is reevaluating management options to identify a course of action to eliminate the hazards associated with potential catastrophic dam failure and the resultant risks to human health and safety. Breaching the dam would permanently remove the dangers and safety hazards that could result should Ku Tree Dam fail. Breaching the dam would be accomplished by demolishing the spillway and excavating a natural channel through the natural hillside that supports the existing spillway. Once the natural channel is constructed, the drainage tunnel would be plugged and water flows would be diverted through the natural channel into the existing stream channel, skirting the dam, thus permanently removing the threat of potential dam failure and associated safety hazards that could impact downstream areas. The proposed natural channel would return the site to a more natural condition (i.e., natural water flows and transport of sediment and nutrients, etc.) and provide a more favorable environment to native species returning to the area.

1.5 Project Location and Surrounding Environment

The project site is located approximately three miles east of Kamehameha Highway, which is the nearest public roadway. From Kamehameha Highway, access to the project site is via Higgins Road (also known as East Range Road), which is under the jurisdiction of the U.S. Army. Higgins Road is paved for approximately 2 miles until it reaches a locked gate (Pineapple Junction Gate), which provides an access point to gain entry into Schofield Barrack’s East Range. Beyond the gate, the road is unimproved and requires travel by four-wheel drive vehicles. The gate remains locked and is controlled by Schofield Barracks Range Control. Within the gated area, the unimproved main road follows along the top of the ridge line with several spur roads branching to the north and south. One of the branch roads leads to the Ku Tree Dam and Reservoir. Figure 2 shows the location of Ku Tree Dam.

Ku Tree Dam is a hydraulic earth-filled dam that is approximately 550 feet long by 90 feet high with a crest width of 30 feet. Looking downstream, a concrete converging spillway is located on the left abutment of the dam. The spillway has a 160-foot ogee weir and drop section into a stilling basin.

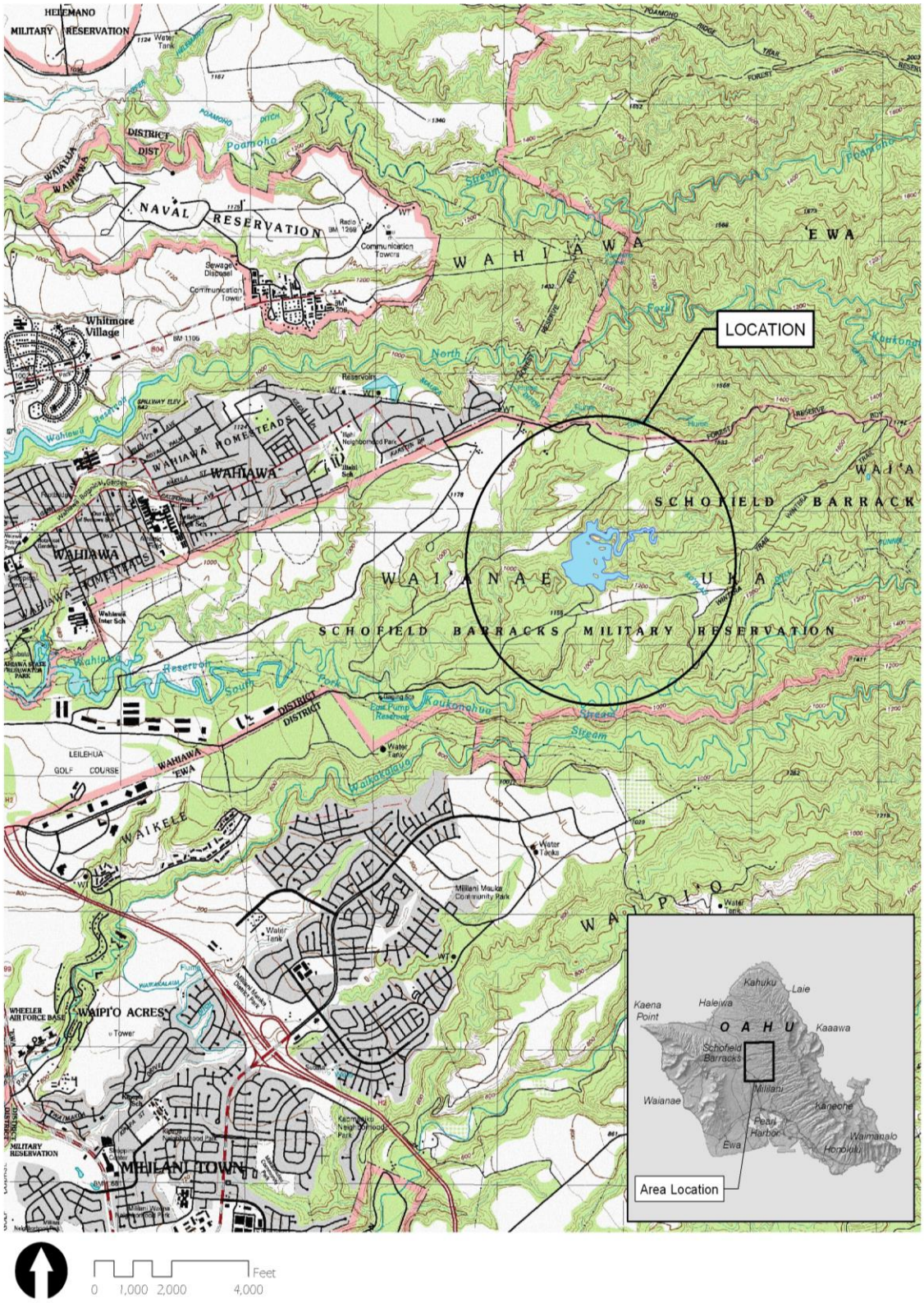

Figure 2. Location Map

The project site is situated along the eastern extremity of the Schofield Plateau in an area characterized by rough and heavily vegetated terrain. The topography of the area is characterized by V-shaped valley walls typically sloping 45 degrees or greater and with a vertical relief of approximately 100 feet. Views of the dam and the former reservoir are obscured by tall trees and heavy vegetation. The project site is also in an isolated area that is heavily forested and cannot be seen from any public area (e.g., public road, scenic corridor, or vantage point). Due to the heavy vegetation, there are no scenic vistas or vantage points from the dam and reservoir site.

The dam and former reservoir are located within the inland portion of the 24,876-acre Kaukonahua Stream watershed at the foot of the Ko‘olau Range. Kaukonahua Stream is the longest stream in the State of Hawai‘i at 19.3 miles from the headwaters to its confluence with the sea, and is, therefore, considered one of the most significant surface water features in the State.

The Kaukonahua system is also one of the most extensively altered stream systems in the State. Water development projects for industrial-scale sugarcane and pineapple agriculture, domestic water supply, and wastewater treatment have fundamentally altered the physical, chemical and biological features of the system for well over a hundred years. These alterations include the Wahiawā Dam and Reservoir, irrigation withdrawals that are licensed with no requirement for in-stream conservation flows, input of treated domestic wastewater, and input of stormwater from impervious streets and structures in the proximity of urban areas of Wahiawā, Schofield Barracks, and Waialua. The upper portion of this watershed consists of two primary sub-basins of 3,651 and 3,860 acres, which are drained by the North and South Forks of Kaukonahua Stream, respectively. These stream channels flow into the north and south arms of Wahiawā Reservoir, respectively, which was created by the damming and drowning of these streams near the town of Wahiawā around 1904.

Ku Tree Reservoir was created by drowning two meandering unnamed perennial tributaries of South Fork Kaukonahua Stream behind a dam at the approximately 1,159-foot elevation. The captured streams are located in narrow, meandering, forested gulches, populated primarily by alien plant species, which cover 0.83 square miles (531 acres) of drainage area (AECOS, 1984). The drainage area associated with Ku Tree Reservoir represents approximately 5 percent of the drainage basin that supplies water to Wahiawā Reservoir. The median annual precipitation over the Ku Tree Drainage Basin is about 120 inches.

In 1938, the Army developed a deep-well pump station which eliminated the original purpose of the dam. The reservoir was significantly drawn down in 1978 due to preliminary dam safety concerns. In 1983, the reservoir was completely drawn down and emptied when dam safety risks were confirmed. Currently, there is no impounded water behind the dam structure. The Army has since used the dam and reservoir area for training operations and exercises.

1.6 EXISTING CONDITIONS

The Ku Tree Dam and Reservoir is composed of several structural components, which are described below. Figure 3 shows a site plan of the dam and appurtenant structures.

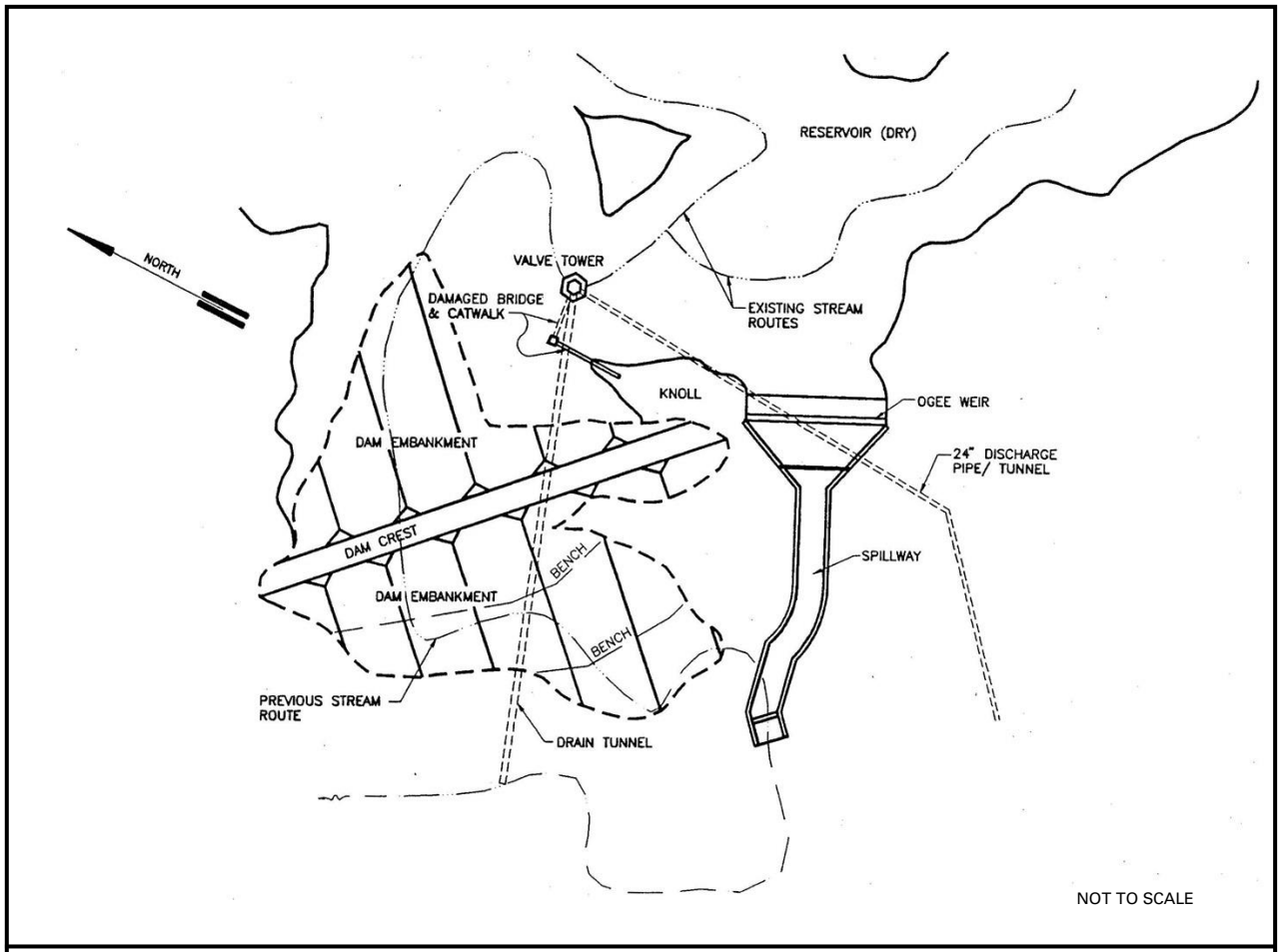

Figure 3. Existing Conditions Site Plan
Source: Hydraulic Report for the Removal of Ku Tree Dam (USACE, 2011)

RESERVOIR AND DAM

The Ku Tree Dam is approximately 550 feet long and 90 feet high with a crest width of 30 feet. Both the upstream and downstream faces are sloped one vertical to three horizontal. The upstream slope is protected by riprap and the crest and downstream slope is grassed. Plates 2 through 4 show the current condition of the dam’s crest and upstream slope. The embankment is homogeneous with the timber diaphragm core wall. The embankment crest is at elevation 1,085 feet above mean seal level (msl). Figure 4 shows a section and elevation of the existing dam structure. At full capacity, the dam was capable of impounding a 0.5-mile long reservoir with an estimated storage volume of 293,000,000 gallons or 900 acre-feet. At crest elevation, the depth of the reservoir was approximately 85 feet at its deepest point. The total surface area at spillway elevation was approximately 32 acres with a drainage area encompassing approximately 531 acres.

Plate 2. **Dam Crest**
Source: Phase I Investigation Report (Gannett Fleming, 2008)

Plate 3. **Upstream Slope Looking Up Toward the Dam Crest**

Plate 4. **Upstream Slope from the Dam Crest**

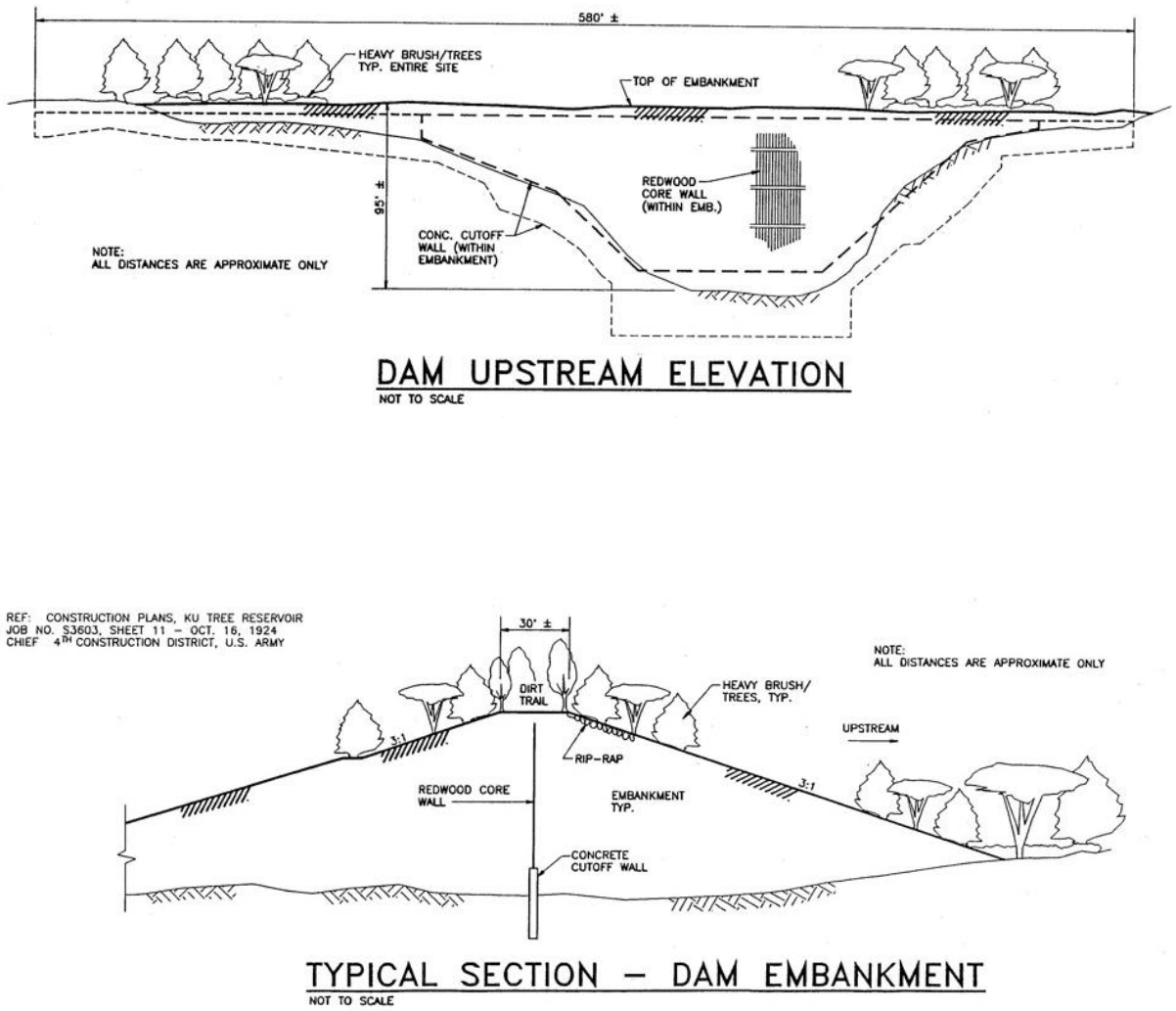

Figure 4. Ku Tree Dam Elevation and Section
Source: Hydraulic Report for the Removal of Ku Tree Dam (USACE, 2011)

VALVE CONTROL TOWER

The valve control tower contains the outlet works that regulated drainage for the Ku Tree Reservoir when it was in use (Plates 5 and 6). The tower is a hexagonal-shaped, reinforced concrete structure standing 102 feet in height. Five sluice gates are located on the various faces of the structure at incremental elevations of 1,065, 1,050, 1,035, 1,020, and 1,005 feet above msl. The gates are vertical slide mechanisms 18 inches x 24 inches with trash screens to block debris from clogging the outlet. Once manually-operated, the gates are currently inoperable and remain open to allow any retained water to pass through. When it was operational and the water level of the reservoir was at spillway crest-height, the outlet was able to pass a maximum of 619 cfs. At the base of the valve tower are inlets to the drain and discharge tunnels. Since being drawn down, water is discharged back to the stream below the dam through the drain tunnel. It is estimated that approximately 2.47 cfs or 1.6 million gallons per day (mgd) of flow enters the intake structure from the two streams above the reservoir (Kido, 2004).

Plate 5. **Base of the Valve Control Tower**
Source: Limited Visual Inspection Report (USACE and DLNR, 2006)

Plate 6 **Valve Control Tower**
Source: Limited Visual Inspection Report (USACE and DLNR, 2006)

TOWER FOOT BRIDGE

The tower foot bridge provided access from the dam to the wood-framed control room atop the valve control tower (Plates 7 and 8). It extended from a natural knoll along the left abutment of the dam. The bridge system was composed of an approach walk and a suspension bridge span. The 8-spanned approach walk was 80 feet long and had a wood deck. The suspension bridge was 67 feet long and was suspended by a pair of 1-inch diameter steel cables. The suspension spans have collapsed and the approach spans are seriously deteriorated. The wooden deck of the approach walk is no longer existent.

Plate 7. **Remnants of Tower Footbridge from Dam Abutment**

Plate 8. **Tower Footbridge Approach Spans**

DISCHARGE AND DRAIN TUNNELS

The discharge tunnel was primarily used to transport water from the reservoir to the Schofield Barracks water system (Plates 9 and 10). It is approximately 5 feet x 6 feet in diameter and accommodates a 24-inch diameter cast-iron pipe that transitions to a 20-inch pipe, which eventually leads to the Schofield Barracks water main. The total length of the tunnel is approximately 2,600 feet. The discharge tunnel is no longer in use.

The drain tunnel is approximately 6 feet x 6 feet with a lined, arched roof and extends approximately 540 feet in length through the dam and discharges water to the stream below. The tunnel connects to the bottom of the valve control tower through a 3-foot x 6-foot sluice gate.

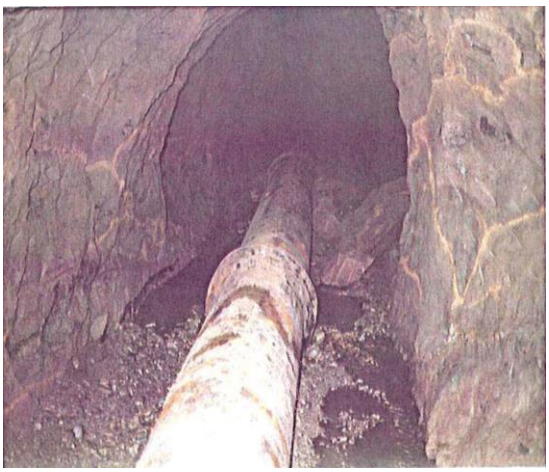

Plate 9. **Discharge Tunnel**
Source: Inspection and Structural Evaluation of Undocumented Appurtenant Concrete Features (Walter Lum Assoc., Inc., 1983)

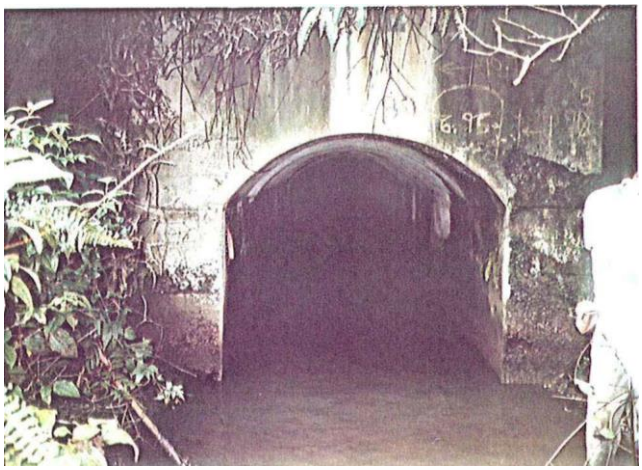

Plate 10. **Downstream End of the Drain Tunnel**
Source: Inspection and Structural Evaluation of Undocumented Appurtenant Concrete Features (Walter Lum Assoc., Inc., 1983)

SPILLWAY

Looking downstream, the reinforced concrete spillway is located at the left abutment of the dam, on a natural hillside (Plate 11). The spillway is 160 feet wide, has a 20-foot concrete apron and an 8-foot ogee weir (Plates 12 and 13). The spillway structure converges from 160 feet at its crest to a 30-foot wide chute that drops to a stilling basin, which is approximately 100 feet below the crest. A 3.5-foot high weir is situated about 40 feet from the bottom end of the spillway chute. Refer to Figure 5.

The spillway training walls vary in height—about 6 feet at the apron, 13 feet after the ogee weir, to approximately 5 to 7 feet at the top of the chute. The height of the chute walls vary from approximately 5 feet along the slope to about 7 to 9 feet at the lower, flat end of the chute. Figure 5 below shows a cross section, a longitudinal section and the plan of the existing spillway.

According to the 1978 inspection report (C-E Maguire, Inc.), hydraulic analyses indicated that the spillway can discharge capacity of 5,600 cfs at elevation 1,085 feet above msl (top of dam). It further noted that a flood equal to the PMF (8,300 cfs) would over top the dam by 0.87 feet.

Plate 11. **Footbridge Across Spillway**

Plate 12. **Ogee Weir from Spillway Footbridge**

Plate 13. **Ogee Weir**

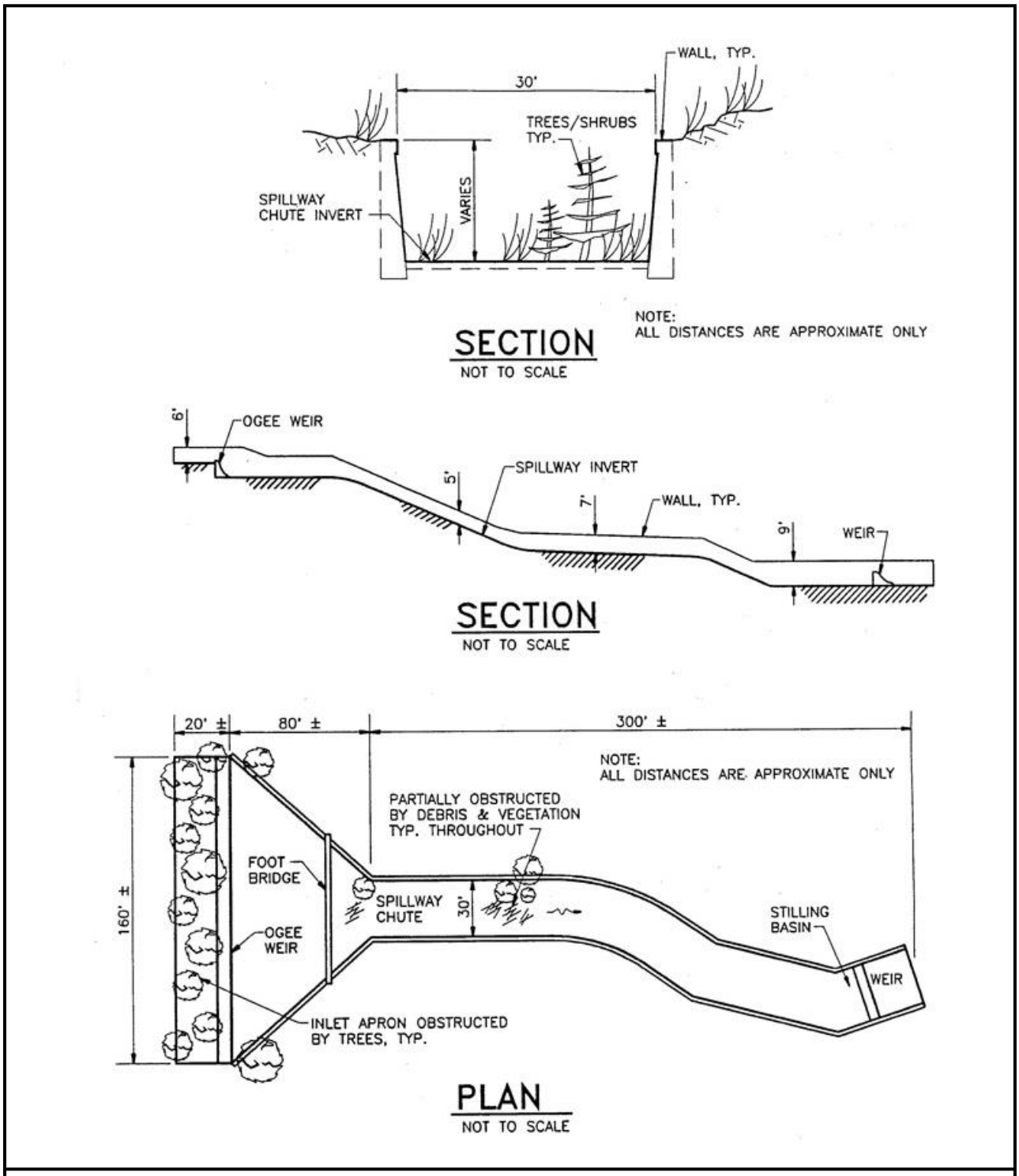

Figure 5. Spillway Plan and Sections
Source: Hydraulic Report for the Removal of Ku Tree Dam, USACE, 2011

1.7 Scope and Organization of the Document

This EA identifies, evaluates, and documents the environmental consequences of the Proposed Action (Preferred Alternative), alternatives to the Proposed Action, and the No Action alternative. Valued environmental components (VECs) at Ku Tree Dam are described in Chapter 3, Affected Environment and Environmental Consequences. These conditions constitute the baseline for analyzing environmental consequences of the Proposed Action and alternatives. The VECs discussed in Chapter 3 are as follows:

- Geology, Soils and Seismicity
- Air Quality
- Noise effects
- Water Resources
- Hazardous materials/hazardous waste
- Biological Resources
- Socio-economic Environment
- Environmental Justice
- Land use
- Visual and Aesthetic Resources
- Cultural Resources
- Traffic and Transportation systems
- Recreational Facilities
- Utilities and Public Services

The anticipated environmental consequences from the Proposed Action, alternatives to the Proposed Action and the No Action alternative are also described in Chapter 3. This analysis includes direct impacts (those directly caused by a specific action and occurring at the same time and place) and indirect impacts (those caused by an action that occurs later or physically disconnected but within a reasonably foreseeable time or geographic area). Chapter 4 describes the cumulative impacts of the Proposed Action when considered in the context of other past, present, and reasonably foreseeable future actions, regardless of whether they are federal or nonfederal. Actions and measures that could mitigate impacts are identified, where appropriate.

1.8 Public Involvement

The United States (US) Army provides opportunities for the public to participate in the NEPA process to promote open communication and improve the decision-making process. All persons and organizations having potential interest in the Proposed Action are encouraged to participate

in the environmental analysis process. The formal opportunity to comment involves a 30-day period for public review of the final EA and draft FNSI. A notice of availability of the final EA and draft FNSI will be published in the State of Hawaii’s Office of Environmental Quality Control’s *Environmental Notice*. A notice will also be published in local newspapers to ensure that interested persons and organizations are notified.

Copies of the final EA and draft FNSI will be provided to some local libraries and will be mailed to interested individuals, organizations, Native Hawaiian organizations, and government agencies, if requested. USAG-HI will review the comments received during the public comment period and will determine whether the Proposed Action could have significant impacts that cannot be reduced to less than significant with appropriate mitigation. If impacts have the potential to be significant after the application of mitigation, USAG-HI would publish a notice of intent (NOI) to prepare an environmental impact statement in the Federal Register. If it is determined that no significant impacts would result from implementing the Proposed Action, the USAG-HI would prepare and sign a FNSI and would implement the action.

As part of the initial EA effort conducted by Kimura International, Inc., presentations were made in March 2004 to the Wahiawā and the Mililani Mauka/Launani Valley Neighborhood Boards apprising them of the USAG-HI’s plans to breach the dam. A site visit, organized by the USACE, was also conducted on June 18, 2004 for interested members of both neighborhood boards, as well as representatives from the State Department of Health (DOH) and the Office of Hawaiian Affairs (OHA).

1.9 Regulatory Framework

A decision on whether to proceed with the Proposed Action depends on numerous factors, such as mission requirements, availability of funds, and environmental considerations. In addressing environmental considerations, the USAG-HI is guided by several relevant statutes (and their implementing regulations) and Executive Orders (EO) that establishes standards and provides direction on environmental and natural resource management and planning. For this project, these include, the Clean Air Act (CAA), the Clean Water Act (CWA), the Coastal Zone Management Act (CZMA), the Noise Control Act, the Resource Recovery and Conservation Act (RCRA), the Endangered Species Act (ESA), the Fish and Wildlife Coordination Act (FWCA), the Migratory Bird Treaty Act (MBTA), the National Historic Preservation Act (NHPA), EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations), and 13045 (Protection of Children from Environmental Health Risks and Safety Risks).

The Proposed Action would be implemented only after applicable regulatory agencies have been consulted and required permits have been obtained. In some cases, additional detailed analysis may be required to satisfy permitting or approval requirements. Consultation and permitting through these agencies may result in changes to the BMPs proposed in this document.

The following regulatory agencies have been or will be consulted for the proposed project:

- Hawai‘i State Historic Preservation Officer (SHPO), in accordance with Section 106 of the NHPA;
- Hawai‘i State Office of Planning pursuant to the Coastal Zone Management Program;
- Hawai‘i State Department of Health, Clean Water Branch, pursuant to the National Pollutant Discharge Elimination System (NPDES) program and Section 401 Water Quality Certification;
- Hawai‘i State DLNR, Commission on Water Resource Management, in accordance with the Stream Channel Alteration Permit;
- Hawai‘i State DLNR, in accordance with Dam Construction, Enlargement, Repair, Alteration, or Removal Approval;
- United States Fish and Wildlife Service (USFWS), and Hawai‘i State DLNR, in accordance with the FWCA;
- USACE, Honolulu District, Regulatory Branch, Department of the Army, pursuant to the Section 404 Permit.

2.0 Description of Proposed Action and Alternatives

2.1 Alternative Selection Criteria

To satisfy the purpose and need for the project, minimum project objectives were defined and a set of screening criteria by which to evaluate the various alternatives were developed. Alternatives that did not satisfactorily meet minimum project objectives and all screening criteria were eliminated from further detailed study. Alternatives that satisfactorily met the minimum project objectives and the screening criteria listed below were forwarded for further evaluation and inclusion in this EA.

- Must be a permanent solution to the safety hazard.
- Must be consistent with the U.S. Army and the USAG-HI’s mission.
- Due to the poor structural integrity of the dam and appurtenant structures, alternatives cannot impose further stress on these structures.
- Must be justifiable from an economic standpoint.
- Due to the remote location of the dam, maintenance effort and cost must be minimal; an alternative requiring no long-term maintenance is preferred.

Because of the dam’s degraded state, combined with the inability to ascertain the exact condition of the dam, any impoundment of water could tax the structure such that catastrophic failure could occur. Thus, any permanent solution ideally should not allow for any retention (intentional or unintentional) of water behind the dam.

2.2 Description of the Proposed Action: Breaching the Dam with a Natural Channel through the Existing Spillway

The Proposed Action would breach Ku Tree Dam by demolishing the spillway and excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway. The hillside would be excavated to a depth of approximately 75 feet beneath the existing spillway entrance to match the elevation of the existing streambed. The natural channel would have a bottom width of approximately 50 feet with 1V:1H side slopes, benched every 20 feet to minimize erosion. The invert elevations of the new channel would range from approximately 1,015 feet above msl at its upstream end to approximately 990 feet above msl at the tie-in to the existing spillway channel. Provisions would be provided to ensure slope stability and establishment of vegetation. In areas subject to stream flow, turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. Over time, the environment in the vicinity of the natural channel is expected to transition into one that replicates naturally mature, vegetative conditions, further reducing erosion. Under this alternative, Ku Tree Dam would remain in place. The upstream dam would be filled with construction debris and approximately 112,000 cubic yards of excavated earth to block off water flow from entering the filled dam passage way. Figure 6 shows a conceptual section of the dam breach.

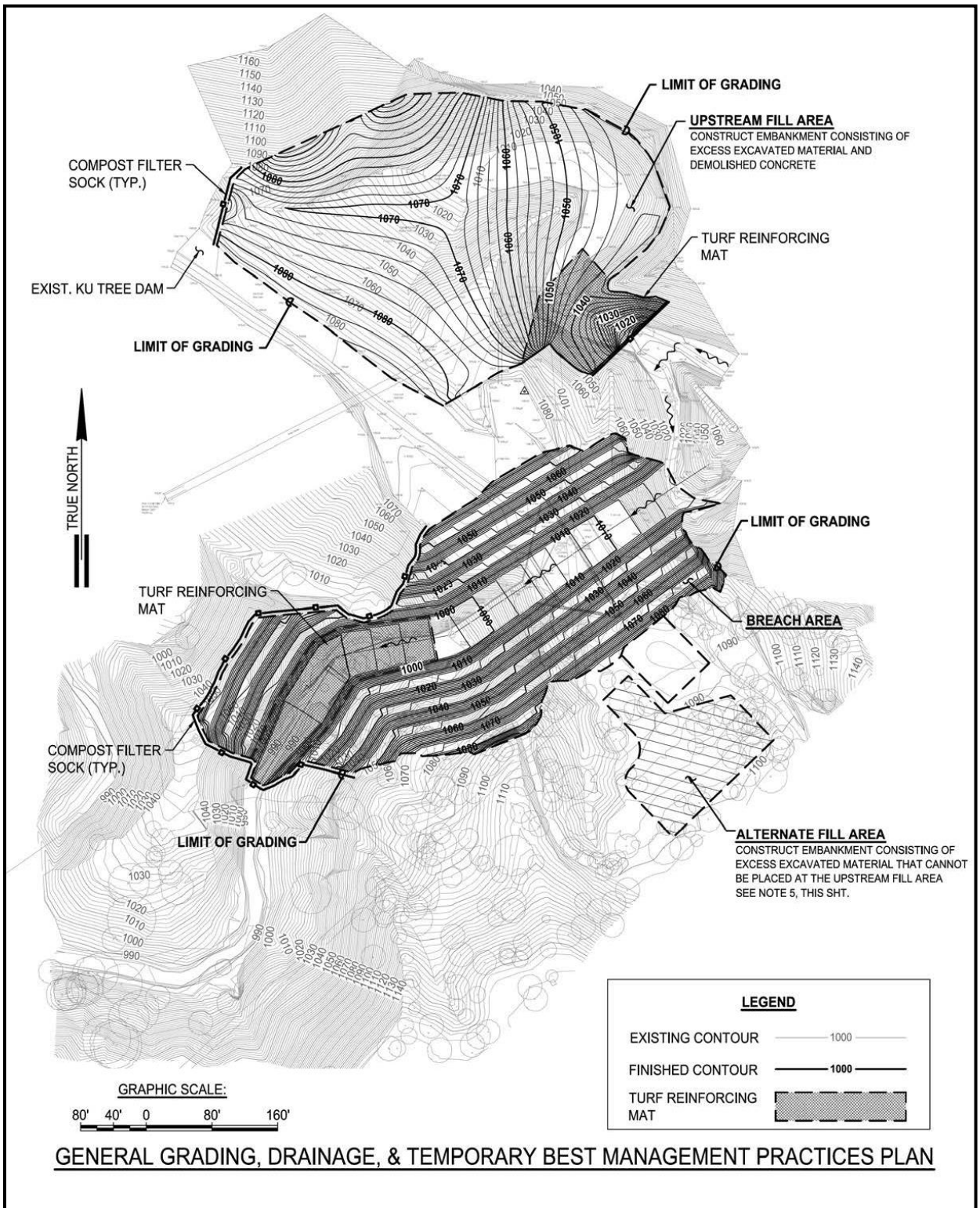

Figure 6. Breaching the Dam – 50-Foot-Wide Natural Channel

The footbridges and a portion of the valve tower would be demolished. The remainder of the valve tower that is left in place would be plugged/abandoned. The upstream inlet to the drain tunnel that currently conveys stream waters under the dam and drain discharge tunnel would be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower would remain in-place. Additionally, vegetation removal would be necessary to implement the Proposed Action; however, vegetation in the project vicinity is dominated by introduced or alien species.

Two fill locations would be utilized for the project, the “upstream fill area” and “alternate fill area.” The proposed fill locations are identified on Figure 6. To the largest extent possible, excavated material would be reused on site or wasted on the upstream side of the dam (upstream fill area) to minimize any off-site disposal. The alternate fill area would serve as a secondary fill location for the placement of excavated material necessary to finish construction of the natural channel and allow for the Contractor to remove the construction equipment from the site. Demolished concrete would be used as fill at the upstream and alternate fill location. Rebar/metal would be disposed of off-site.

The new channel through the existing spillway is the most efficient route as it utilizes the existing hillside slope to reduce the quantity of excavation and earth disturbance to achieve the goal of removing the risk associated with the dam. To reduce the potential for sedimentation during excavation and construction in the spillway area, Ku Tree Dam will remain in its current drawn down state with stream flows continuing to be diverted through the drain tunnel. As a result, only short-term periods of actual in-stream construction would occur. Additionally, under the Proposed Action, because the Ku Tree Dam structure would remain in place the sediment that is impounded behind the dam is expected to remain in its existing location minimizing the potential for deposited material to be transported downstream. By completing the dam breach in this manner, no surge of released loose sediment is expected.

Once completed, the Proposed Action is expected to have beneficial impacts on water resources by improving stream ecological and hydrological functions, such as flood plain water storage and detention, and ground water recharge. The Proposed Action would allow for the reconnection of formerly severed stream channels and floodplains by reconnecting the natural stream channel above and below the dam through the existing spillway. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

Once the natural channel is constructed, water flow would be diverted to the natural channel, skirting the dam, and little or no maintenance would be required to ensure sufficient drainage is maintained. Under this alternative, the dam and reservoir would not retain any storage capacity and catastrophic failure of the dam and the associated safety hazards that could impact downstream areas would be averted since the dam would be permanently breached. The estimated cost to implement the Proposed Action is $25,000,000.

2.3 Alternative A: No Action

The No Action alternative would leave the dam in place without any changes. Under this alternative, no improvements and/or maintenance would be undertaken and the dam and its appurtenant structures would continue to deteriorate. The reservoir is currently in a drawn down, dewatered state with no impounded water behind the dam structure. As long as the existing drain tunnel remained open, this alternative would lead to no substantial environmental changes. The reservoir would remain that way with no water intentionally impounded. However, because no maintenance would be undertaken, debris would continue to accumulate in the outlet structure, which could lead to refilling of the reservoir. Further, if the existing drain tunnel collapses, became filled with sediment, or otherwise becomes inoperable, this could lead to refilling of the reservoir. The unintentional impounding of the water could tax the structural integrity of the dam, which could result in the release of a large uncontrolled flow that may have adverse impacts downstream. Lack of maintenance, the unknown condition of the drain tunnel, inadequate spillway capacity, potential for overtopping, and downstream slope seepage problems are contributors to dam failure. Additionally, under this alternative, there would be no restoration of connectivity for water, and no habitat or aquatic improvements. The No Action alternative would not mitigate the dam’s safety hazards and thus does not meet the purpose and need for the proposed action, but is included for analysis purposes as required by 32 CFR Part 651 *Environmental Analysis of Army Actions*. The cost of the No Action alternative is $0.

2.4 Alternative B: Notching the Dam

Alternative B would involve notching the existing dam crest structure to allow water to flow along its original flow path. Under this alternative, the upstream side of the dam would be the main flow path to allow passage through the notch. Construction activities required for Alternative B would likely have a greater effect on short term water quality impacts than the Proposed Action due to larger quantity of sediment to be excavated and more in-stream work. The trapezoidal-shaped notch would be cut to the existing streambed. The notch would be 50-feet wide at its base with 1V:2H side slopes, benched every 20 feet to minimize erosion. Provisions would be provided to ensure slope stability and establishment of vegetation. Over time, the environment in the vicinity of the natural channel through the dam crest is expected to transition into one that replicates naturally mature, vegetative conditions, further reducing erosion.

The valve tower, spillway, and footbridges would be demolished. The drain tunnel and drain discharge tunnel would be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower would remain in-place.

Under this alternative, approximately 356,000 cubic yards of excavated earth would be removed. To the largest extent possible, excavated material and demolished concrete would be reused on-site or placed at an approved site within the installation, as allowed, to minimize off-site disposal. Excavated material that cannot be disposed of on-site will require off-site disposal. Rebar/metal would be disposed of off-site.

Once the notch is installed along the original stream course it is expected that the original grade and meanders of the stream channel would be recreated. Overall, Alternative B would have beneficial impacts on water resources by reconnecting the stream channel above and below the dam, which would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. Once vegetation establishes and the original stream channel restores itself and stabilizes, this alternative would likely require little or no maintenance. Under this alternative, the dam and reservoir would not retain any storage capacity and catastrophic failure of the dam would be averted since the dam would be permanently breached.

The estimated cost to implement the Alternative B is $56,000,000. The increased cost is primarily due to the increased costs for disposal of excavated material. This cost was based on a preliminary concept without any substantive design development. This cost was developed for use in a gross cost comparison with the other alternatives and should not be used for future budgeting purposes.

2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would involve the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions (“natural” conditions). Construction activities required for Alternative C would likely have a greater effect on short term water quality impacts than the Proposed Action due to the complete removal of the dam, larger quantity of sediment to be excavated, and more in-stream work. Stream channel restoration would be accomplished by removing the embankment material and the redwood core wall located at the center of the dam. A portion of the concrete cut-off wall, approximately 10 feet high by 80 feet long, would also need to be removed to allow for natural passage of stream flow. The concrete spillway and drainage tunnels would be abandoned.

Under this alternative, approximately 246,000 cubic yards of excavated earth would be removed. Demolished material would be disposed of in an appropriate manner and to the largest extent possible, excavated material would be reused on site to minimize the amount of off-site disposal required. Excavated material that cannot be disposed of on-site would require off-site disposal. Rebar/metal would be disposed of off-site. Due to the large volume of material that would be removed under this alternative, implementation would undoubtedly lead to increased release of sediments to the stream both during direct construction work (removal of the dam structure), associated construction work (potential ancillary construction activities, such as widening and improving the access road), and future exposure of the accumulated reservoir sediments to erosion.

Under this alternative, reconnecting the natural stream channel above and below the dam would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. Over time, the environment in the vicinity of the restored stream is expected to transition into one that replicates naturally mature, vegetative conditions.

The estimated cost to implement the Alternative C is $49,000,000. The increased cost is primarily due to the increased costs for disposal of excavated material. This cost was based on a preliminary concept without any substantive design development. This cost was developed for use in a gross cost comparison with the other alternatives and should not be used for future budgeting purposes.

2.6 Alternatives Considered but Eliminated from Further Analysis

Since the 1978 Inspection Report, several courses of action to remedy the dam’s safety issues have been studied. The following alternatives were considered, but eliminated from further detailed evaluation as they did not sufficiently satisfy the minimum project objectives and screening criteria.

2.6.1 Restoration of Ku Tree Reservoir

Restoration of Ku Tree Reservoir would involve either 1) retrofitting the existing dam structure to meet current-day standards, or 2) completely removing and constructing a new dam in the same location as the existing dam. This would also require a major retrofit or wholesale replacement of the appurtenant structures (the spillway, valve tower, intakes, and drain tunnel). Retrofitting the dam would include, among other things, raising the dam height six feet in order to provide a five-foot freeboard during the PMF. The spillway and chute system are also inadequate to pass the PMF. In order to meet this standard, the spillway walls would have to be raised six to 18 feet along the entire length (Walter Lum Associates, 1983). Restoration of Ku Tree Reservoir would require extensive earthmoving and vegetation clearing. Amongst all alternatives, this would likely be the costliest to implement. This alternative would require detailed design analysis to determine the feasibility and cost of implementation.

The purpose for which the dam and reservoir was originally constructed no longer exists and restoration of the reservoir would not be consistent with the Army’s mission. Given that this alternative does not support the Army’s mission, the financial burden of major reconstruction and the continuing cost for operation and maintenance are not warranted. The USAG-HI currently has no need for dam water for potable use. A previous feasibility analysis (USACE, 1986) of this alternative concluded that water from the reservoir would not be used as a source of potable water and most likely would be used to irrigate the Leilehua Golf Course. The cost/benefit analysis concluded that from an economic standpoint, restoration and continued use of the reservoir for golf course irrigation was not justified. More recently, the USAG-HI has been looking to use R-1 water to irrigate the golf course, which further negates the potential for using reservoir water for this purpose.

Restoration of the reservoir, as well as the ongoing maintenance that would be required, would necessitate an obligation of financial resources beyond that which is reasonable for a structure that serves no USAG-HI function and does not support the Garrison’s mission. For these reasons, this alternative was eliminated from further consideration because it fails to meet the Army’s mission, project objectives and screening criteria.

2.6.2 Breaching the Dam with a Concrete Channel through the Existing Spillway

Breaching the dam with a concrete channel would be accomplished by excavating an approximately 500-foot long channel through the hillside which supports the existing spillway. The concrete-lined channel would be rectangular in shape with a bottom width of 30 feet. The upstream dam would be filled and a riprap concrete wall constructed to block off water flow from entering the filled dam passage way. To prevent scour at the downstream end of the channel, a riprap basin would be constructed to reduce flow velocity. Under this alternative, the valve tower, spillway, and footbridges would be demolished and disposed of in an appropriate manner. Demolished concrete would be used as on-site backfill and rebar/metal would be disposed of off-site. The valve tower would be permanently plugged at or near the base of the tower. The drain tunnel outlet downstream of the dam also would be permanently plugged. The drain tunnel and drain discharge tunnel would be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry.

Under this alternative, the dam and reservoir would not retain any storage capacity and the dam would be permanently breached. However, because the concrete lined bypass channel would necessitate ongoing inspection/maintenance this alternative would require an obligation of financial resources beyond that which is reasonable and does not support the Garrison’s mission. Due to the long-term maintenance that would be required, this alternative does not meet project objectives and screening criteria, thus it was eliminated from further consideration.

2.6.3 Breaching the Dam with a 15 Foot Bottom Width Natural Channel

Breaching the dam with a 15 foot bottom width natural channel would involve either: 1) excavating an approximately 500-ft long natural channel with a 15 foot wide base through the natural hillside that supports the existing spillway; 2) cutting a trapezoidal-shaped notch with a 15 foot wide base in the existing dam to allow water to flow along its original path; or 3) cutting a trapezoidal-shaped notch with a 15 foot wide base in the existing upstream portion of the dam to allow water to flow in a straight run bypassing about 1,900 feet of the stream channel. Under this alternative, Ku Tree Dam would remain in place. The valve tower, spillway, and footbridges would be demolished and disposed of in an appropriate manner. To the largest extent possible, excavated material and demolished concrete would be reused on-site or placed at an approved site within the installation, as allowed, to minimize off-site disposal. Excavated material that cannot be disposed of on-site will require off-site disposal. Rebar/metal would be disposed of off-site. The valve tower would be permanently plugged at or near the base of the tower. The drain tunnel and drain discharge tunnel would also be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry.

Under this alternative, the dam and reservoir would not retain any storage capacity and the dam would be permanently breached. However, due to the minimal 15-foot bottom width of the channel higher flow velocities would result and would necessitate ongoing maintenance of the channel to ensure that blockages within the channel do not occur. This would require an obligation of financial resources beyond that which is reasonable and does not support the Garrison’s mission. Additionally, the Hawai‘i Administrative Rules, Title 13, DLNR, Subtitle 7, Chapter 190.1, requires the dam breach channel to pass the flow associated with a 100-year, 24-hour storm event (1% annual chance exceedance storm event) with less than 5 feet of depth of

water in the remaining reservoir. Breaching the dam with a natural channel with a 15-foot wide base would not meet the criteria for the 5-foot depth requirement. Furthermore, the option to notch the upstream portion of the dam and bypass approximately 1,900 feet of stream channel would not be environmentally acceptable. Due to the continued stress imposed on the dam, environmental factors, and long-term maintenance required, this alternative does not meet project objectives and screening criteria, thus it was eliminated from further consideration.

2.6.4 Partial Breaching

Partial breaching of the dam would involve maintaining the Ku Tree Reservoir at an intermediate level. A portion of the reservoir storage capacity would be utilized under this alternative. Breaching of the dam would be accomplished by excavating a channel through the hillside which supports the existing spillway. The intake channel bottom would be located at an elevation higher than the existing streambed. The concrete-lined channel would be rectangular in shape with a bottom width of 30 feet. Under this alternative, the valve tower would be permanently plugged at or near the base of the tower. The drain tunnel and drain discharge tunnel would also be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry.

Under this alternative, the dam would retain some storage capacity. A pool would develop; its size dependent upon the channel invert elevation. Partial breaching of the dam would result in some sediment retention capabilities; therefore, the potential for downwash of sediment and debris would be reduced. However, because of the poor structural integrity of the dam, any pooling of water could tax the dam, potentially resulting in dam failure. Due to the continued stress imposed on the dam, this alternative does not meet project objectives and screening criteria, thus it was eliminated from further consideration.

2.6.5 Installation of Drainage Culverts through the Dam

Under this alternative, new drainage culverts, approximately 500 feet long, would be installed through the dam by means of trenchless technology. Directional drilling techniques were determined to be the most feasible trenchless method due to limited site access, micro-tunneling restrictions and equipment requirements. Directional drilling can alter or deflect pipeline alignments as necessary to meet grade requirements; however, with this method, pipeline diameters are limited to a maximum of 42 inches. A minimum of nine 42-inch culverts would be needed to pass the 100-year flood event; however, the reservoir would still fill to approximately 50-feet in depth. In order to pass the 100-year flood without utilizing reservoir storage, thirteen 42-inch culverts would be needed.

Once installed, the drainage culverts would require routine maintenance to ensure sufficient drainage through the dam. However, unlike an open channel, culverts are difficult to visually inspect. The culverts would require inspections with a camera annually, and after heavy rains, to ensure they remain clear of debris and sediment. Additionally, the culverts would need to be flushed periodically, perhaps every five years. Blockage of the culverts by debris and sediment may cause inadequate drainage, which could lead to refilling of the reservoir, weakening of the dam core, and potential dam failure. Due to the high level of effort required to inspect and maintain the culverts and the high potential for blockage that could result in the unintended

impoundment of water and stress on dam structures, this alternative was eliminated from further consideration as it did not meet the screening criteria.

2.6.6 Maintaining Dewatered State

Any alternative that breaches the dam would essentially preclude any future use of the reservoir. This alternative was developed and evaluated in the context of sustainability. As such, this alternative seeks to minimally maintain the dam and its appurtenant structures, should there be a future need to utilize it (e.g., part of a regional stormwater management system, water supply source, etc.).

Under this alternative, the reservoir would remain drawn down and minimal maintenance would be provided. Minimal maintenance would include implementing the recommendations enumerated in the most recent Phase I Investigation report (Gannet Fleming, 2008). Recommendations include, among other things, routinely inspecting and maintaining the base of the valve control tower to keep it clear of debris; clearing and grubbing vegetation, including trees, from the spillway and the dam (upstream and downstream embankments and the crest); instituting a regular inspection program; and preparing an emergency action plan.

USAG-HI has not conducted any maintenance on the dam and the appurtenant structures for over to 30 years. There is no guarantee that there would always be funds and personnel available to undertake these maintenance actions in a timely manner. Because of the safety hazards involved and the potential impacts to property and human safety if maintenance cannot be kept up, the repercussions of dam failure are not acceptable. Even with regular inspections and maintenance, a major storm event and the associated debris and sediment movement could block the drain inlet allowing the reservoir to inadvertently refill. Inadvertent refilling of the reservoir could tax the dam, potentially resulting in dam failure.

Given that the condition of the dam is not fully known, coupled with the potential risk of catastrophic dam failure, maintaining the dam to keep available future options is not a viable alternative because it does not meet the screening criteria. Providing maintenance to keep available future options is not considered a permanent solution to resolving the safety issues posed by the dam. It is only postponing identification and selection of a course of action to determine the ultimate fate of the dam and reservoir. This alternative also fails to meet other screening criteria by not being consistent with the USAG-HI’s mission and has the potential to impose further stress on the dam and its appurtenant structures.

3.0 Affected Environment and Environmental Consequences

3.1 Terminology

This chapter describes the baseline natural and human environments. The VECs in this chapter are presented to provide an understanding of the existing environment and a basis by which to evaluate the environmental consequences of the Proposed Action and alternatives.

To determine whether an impact is major, CEQ regulations require the consideration of context and intensity of potential impacts (40 CFR 1508.27). Context normally refers to the setting, whether the impact is local or regional, and intensity refers to the severity and duration of the impact. This EA also includes a discussion of the possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans and policies for the area concerned (40 CFR 1502.16(c)).

Potential impacts are defined by the following levels of significance:

- Significant impact;
- Significant impact but mitigable to less than significant;
- Less than significant impact; or
- No impact.

An impact may be described as beneficial or adverse. For some VECs, it may be possible to have both adverse and beneficial impacts. Where there are adverse and beneficial impacts, both are described. Levels of significance are defined only for adverse impacts (significant, significant but mitigable to less than significant, and less than significant). Mitigation is identified where it may reduce the significance of an impact.

3.2 Geology, Soils and Seismicity

3.2.1 Affected Environment

3.2.1.1 Region of Influence

The Region of Influence (ROI) for analyzing potential impacts related to geology, soils and seismicity is limited to the project site where ground disturbing and construction or demolition activities would occur.

3.2.1.2 Existing Conditions

Geology and Soils

The project site is located within the Schofield Barrack’s East Range, which is situated along the eastern extremity of the Schofield Plateau in an area characterized by rough and heavily vegetated terrain. The topography of the area is characterized by V-shaped valley walls typically sloping 45 degrees or greater and with a vertical relief of approximately 100 feet.

The project site is located in the physiographic zone identified as the Kawailoa Deeply Dissected Upland. This zone consists of basaltic lava formations from the Ko‘olau shield volcano. According to the *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (United States Department of Agriculture Soil Conservation Service, 1972) soil classifications in the vicinity of Ku Tree Dam include Rough Mountainous Land (rRT) and Helemano Silty Clay with 30 to 90 percent slopes (HLMG). Rough Mountainous Land consists of very steep land that is broken up by intermittent drainage channels. The terrain in which this soil type occurs is characterized by deep, V-shaped valleys, with extremely steep side slopes and narrow ridges. Typically, the soil mantle is very thin, ranging from one to 10 inches thick overlaying saprolite. The Helemano Silty Clay is found on the sides of V-shaped gulches. A representative profile includes a dark reddish-brown silty clay surface layer roughly 10 inches thick. The subsoil is also a dark reddish-brown and a dark-red silty clay. This soil type has moderately rapid permeability, runoff is medium to very rapid, and the erosion hazard is severe to very severe.

Geotechnical surveys of the project site were conducted in 1984 and 2004 (USACE, 1984b and Ernest K. Hirata & Associates, Inc.) Both of these surveys focused primarily on the spillway area of the project site. Soil borings from the 2004 survey indicated that subsurface conditions consisted of completely weathered basalt, which is defined as rock that has decomposed to soil, but retains its fabric and structure (saprolite). Harder, less weathered sections of soil were occasionally encountered.

The 1984 survey found that subsurface materials at the project site generally consist of clayey to sandy silts which are residual highly weathered basalt rock (basaltic saprolite) with a thin 5- to 10-foot thick soil cover. The subsurface material at the site is essentially one formation basalt in various stages of weathering. The weathering of basalt under the rainfall and temperature conditions common to O‘ahu has resulted in leaching of silica and silicates from the rock. The resulting clayey sandy silt material, enriched with aluminum and iron oxides, becomes a “lateritic” soil consisting of clayey silt. At the project site, the weathering has progressed to depths in excess of 100 feet. The general characteristics of these fine-grained lateritic soils varies from the medium stiff plastic to non-plastic, fairly uniform material; to a hard, mottled soil containing large rock particles.

Seismic Activity

The entire state of Hawai‘i is susceptible to seismic activity. Most earthquakes in Hawai‘i are harmonic tremors associated with volcanic activity. Severe seismic activity can damage or destroy buildings and other structures, including infrastructure, which often results in disruption of service. Although O‘ahu is not associated with a particular fault zone, some researchers predict that larger earthquakes likely to affect the island would originate along the Molokai Fracture Zone (a deep seated structural anomaly at about the latitude of Northern Maui). The distance from this source area to the Ku Tree Dam site is about 80 to 130 miles (USACE, Engineering Division, Foundations, Materials, & Survey Branch, 1984). The most recent earthquake of note that was felt on O‘ahu occurred on October 15, 2006. This earthquake was centered off Kiholo Bay on the island of Hawai‘i and had a magnitude of 6.7. The International Building Code provides minimum structural design requirements to resist the effects of

earthquakes. Structural requirements vary and are based on the predicted potential strength of ground movement in a particular geographic area.

3.2.2 Environmental Consequences

3.2.2.1 Impact Methodology

Project actions are evaluated by the amount of change relevant to these resource components as a result of implementation. Actions are determined to have a significant impact on soils if there is a substantial loss of soil through increased erosion and transport of soils off site, particularly if the resulting transport of soils would cause adverse impacts on water quality or aquatic habitats. Significant impacts would also occur if land modifications are of such a degree that it creates unstable ground conditions, adversely affects drainage patterns, or increases exposure to geologic or seismic hazards.

3.2.2.2 Proposed Action

The Proposed Action is intended to breach Ku Tree Dam by excavating an approximately 500-foot long natural channel through the natural hillside that supports the existing spillway. The upstream inlet to the drain tunnel that currently conveys stream waters under the dam would be blocked, and the valve tower and associated walkways would be demolished. The remainder of the Ku Tree Dam would stay in place. To ensure slope stability and enable the natural channel to withstand the erosion forces from the high energy flows created by the steep, straight nature of the channel, design provisions would be provided including benching the 1V:1H side slopes every 20 feet. The invert elevations of the new channel would range from approximately 1,015 feet above msl at its upstream end to approximately 990 feet above msl at the tie-in to the existing spillway channel. In areas subject to stream flow, turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. The upstream dam would be filled with construction debris and approximately 112,000 cubic yards of excavated earth to block off water flow from entering the filled dam passage way.

The new channel through the existing spillway is the most efficient route as it utilizes the existing hillside slope to reduce the quantity of excavation and earth disturbance to achieve the goal of removing the risk associated with the dam. Additionally, under the Proposed Action, because the Ku Tree Dam structure would remain in place the sediment that is impounded behind the dam is expected to remain in its existing location minimizing the potential for deposited material to be transported downstream. By completing the dam breach in this manner, no surge of released loose sediment is expected.

In the short-term, ground disturbing activities such as clearing, excavating, grading, and filling, would result in impacts on soils. Bare earth areas are susceptible to erosion, particularly during heavy rain, which may result in silt runoff. Wind erosion may also result in some unavoidable soil loss. Additionally, with respect to the impact on water quality, erosion and sedimentation during construction may occur, with particular concern during in-stream work. These impacts would be temporary and would cease when the construction period ends. Short-term impacts on

soils would be less than significant impact due to the temporary nature of the potential impacts and the adherence to standard construction site BMPs that would minimize the potential for any impacts to occur. BMPs would include the use of appropriate temporary and permanent erosion and sedimentation control measures to minimize soil loss, particularly during any in-stream work. Typical erosion control measures that may be applied include the use of berms, cut-off ditches, ground cover vegetation, and the application of water and/or soil stabilization and protection materials. If necessary, silt fences would be erected during construction and continuously inspected and repaired to minimize the potential for silt runoff to enter surface waterways. During construction, all project activities would be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control. Any area of disturbed ground would be stabilized immediately after construction activities halt to minimize erosion.

While the Proposed Action would involve some land modification, any alteration of drainage patterns would be limited to redirecting stream flow through the natural channel that supports the spillway. Once completed, the Proposed Action would reconnect the formerly severed stream channels and floodplains above and below the dam. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. Over time, the environment in the vicinity of the natural channel is expected to transition into one that replicates naturally mature, vegetative conditions, further reducing erosion. Surface drainage patterns within the larger surrounding area would not be affected. Therefore, long-term impacts are expected to be less than significant.

Exposure to geologic or seismic hazards would not be increased as a result of the Proposed Action. Once construction and demolition are complete, there would be no human occupation of the site and there would be no increased exposure to geologic or seismic hazards.

3.2.2.3 Alternative A: No Action

Under the No Action alternative, no ground disturbing or construction/demolition activities would occur and the dam and reservoir would remain in its abandoned state. Therefore, there would be no project related impacts related to geology, soils or seismicity. However, if the existing drain tunnel eventually collapsed, became filled with sediment or for some other reason became inoperable, this could lead to refilling of the reservoir, which could eventually lead to failure of the dam structure. If catastrophic dam failure were to occur under a full reservoir, it is expected areas downstream would sustain damage and human safety would be jeopardized. Due the continued potential for damage and impacts to human safety should Ku Tree Dam catastrophically fail No Action would have less than significant impacts.

3.2.2.4 Alternative B: Notching the Dam

Alternative B would involve notching the existing dam crest structure to allow water to flow along its original flow path. Under this alternative, the upstream side of the dam would be the main flow path to allow passage through the notch and approximately 356,000 cubic yards of excavated earth would be removed. To ensure slope stability under this alternative, the 1V:2H side slopes would be benched every 20 feet. Provisions would be provided to ensure slope

stability and establishment of vegetation. Construction activities required for Alternative B would likely have a greater effect on short term impacts than the Proposed Action due to larger quantity of sediment to be excavated and more in-stream work. Less than significant impacts would occur during the construction/demolition phase due to the potential for soil loss from ground disturbing activities. As with the Proposed Action, adherence to standard construction site BMPs would minimize the potential for any soil erosion-related impacts to occur. If necessary, silt fences would be erected during construction and continuously inspected and repaired to minimize the potential for silt runoff to enter surface waterways. During construction, all project activities would be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control. Any area of disturbed ground would be stabilized immediately after construction activities halt to minimize erosion. If ancillary construction activities, such as widening and improving the access road to the dam are required, BMPs and erosion control measures would also need to be implemented for these activities.

In the long term, Alternative B would allow Ku Tree Reservoir’s influent streams to return to their original flow path. Once completed, Alternative B would reconnect the formerly severed stream channels and floodplains above and below the dam. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. While Alternative B would involve some land modification to create conditions to reestablish the original flow path it would not adversely affect the area’s drainage patterns. Over time, the environment in the vicinity of the natural channel through the dam crest is expected to transition into one that replicates naturally mature, vegetative conditions, further reducing erosion. Therefore, long-term impacts are expected to be less than significant.

Once construction and demolition are complete, there would be no human occupation of the site and there would be no increased exposure to geologic or seismic hazards. Long-term impacts would be less than significant.

3.2.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would involve the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions (“natural” conditions). Stream channel restoration would be accomplished by removing the embankment material and the redwood core wall located at the center of the dam. A portion of the concrete cut-off wall, approximately 10 feet high by 80 feet long, would also need to be removed to allow for natural passage of stream flow. The concrete spillway and drainage tunnels would be abandoned.

Under this alternative, approximately 246,000 cubic yards of excavated earth would be removed. Construction activities required for Alternative C would likely have a greater effect on short term water quality impacts than the Proposed Action due to the complete removal of the dam, larger quantity of sediment to be excavated, and more in-stream work. Therefore, adhering to BMPs to address erosion, sedimentation, contaminants and surface runoff would be critical to preventing impacts on the water resources during construction. Due to the large volume of material that will be removed under this alternative, implementation would undoubtedly lead to increased release

of sediments to the stream both during direct construction work (removal of the dam structure), associated construction work (potential ancillary construction activities, such as widening and improving the access road), and future exposure of the accumulated reservoir sediments to erosion. The fate of the large quantities or sediment and organic trash currently deposited in the reservoir site when the dam is breached and flows restored is of particular concern. Release of this material downstream may lead to sediment deposition in various unpredictable locations in lower Kaukonahua Stream and perhaps even Wahiawā Reservoir. Thus, the overall quality of the stream water exiting the project site may be more turbid, resulting in significant impacts. These impacts would be mitigated to less than significant by implementation of appropriate engineering controls to minimize erosion of the accumulated sediments located behind the existing dam structure. To minimize the release and downstream transport of sediment, these accumulated sediments would need to be stabilized using various techniques, including laying down vegetative mats and landscaping.

As with the Proposed Action, standard construction site BMPs would be utilized to minimize the potential for any soil erosion-related impacts. If necessary, silt fences would be erected during construction and continuously inspected and repaired to minimize the potential for silt runoff to enter surface waterways. During construction, all project activities would be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control. Any area of disturbed ground would be stabilized immediately after construction activities halt to minimize erosion. If ancillary construction activities, such as widening and improving the access road to the dam are required, BMPs and erosion control measures would also need to be implemented for these activities.

In the long term, Alternative C would restore the site to pre-dam conditions. Once completed, Alternative C would reconnect the formerly severed stream channels and floodplains above and below the dam. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. While Alternative C would involve some land modification to create conditions to restore the site, including the natural streambed, to pre-dam conditions (“natural” conditions), it would not adversely affect drainage patterns within the larger surrounding area and would not increase exposure to geologic or seismic hazards. Over time, the environment in the vicinity of the restored stream is expected to transition into one that replicates naturally mature, vegetative conditions, further reducing erosion. Therefore, long-term impacts are expected to be less than significant.

3.3 Air Quality

3.3.1 Affected Environment

3.3.1.1 Region of Influence

Construction-related emissions are generally limited to the vicinity of the project area. Therefore, the ROI for air quality analysis is a circular zone delineated by a one-mile radius from the project site. Located within this area are portions of the East Range and portions of the nearby civilian communities of Mililani Mauka and Wahiawā. Refer to Figure 7 for the ROI.

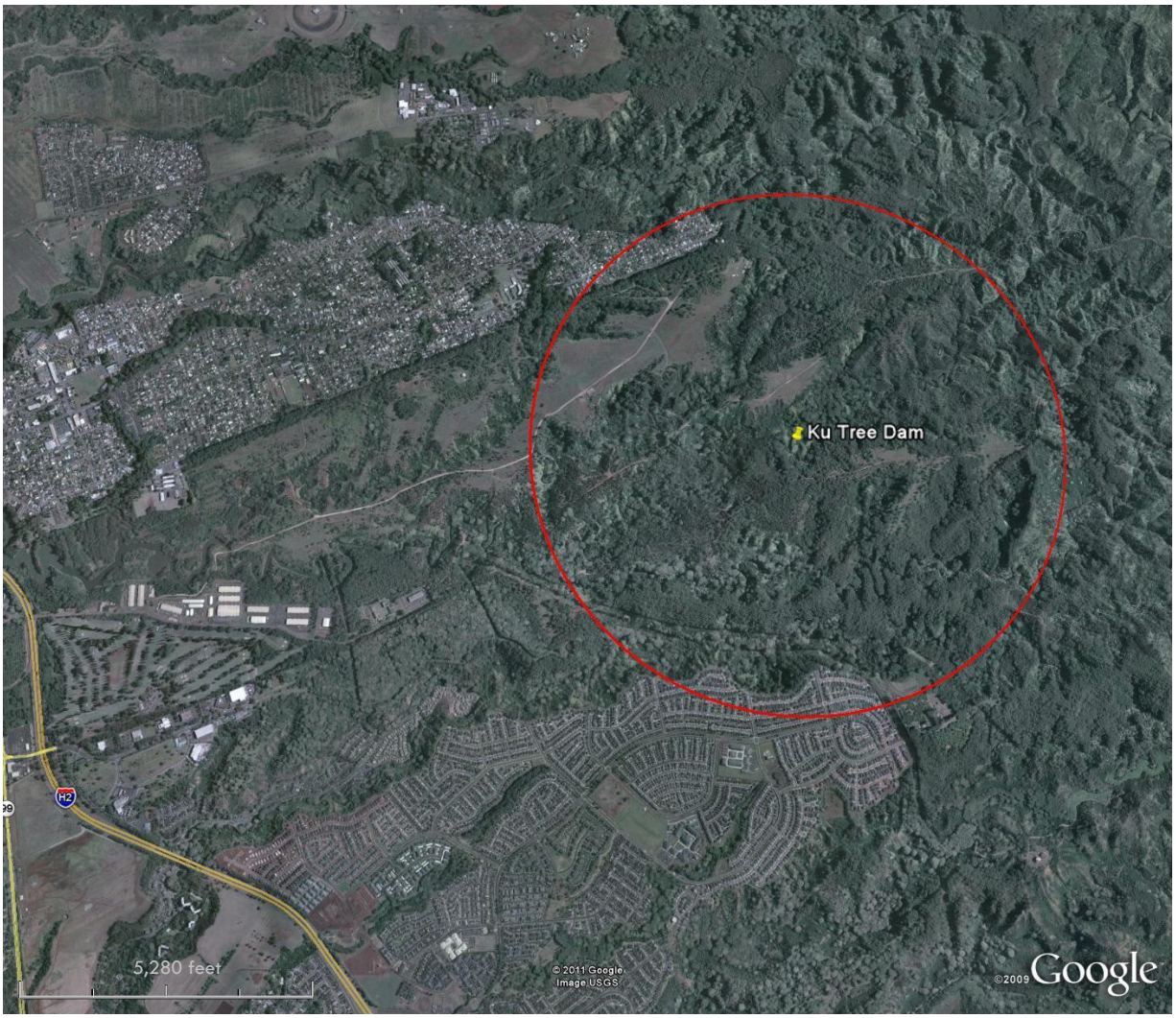

Figure 7. 1-Mile Radius Region of Influence

3.3.1.2 Existing Conditions

Wind speeds recorded at Schofield Barracks generally are light. At the Main Post, wind speeds generally average between one and seven miles per hour (mph). At the East Range, wind speeds generally average between one and eight mph. The project site is located in a protected valley where winds are buffered by tall trees. Maximum wind speeds are seldom expected to exceed the 15 mph threshold commonly associated with wind erosion processes.

Ambient air pollution concentrations are regulated under federal CAA regulations found in 40 CFR Part 50, and under the State of Hawai‘i Ambient Air Quality Standards (AAQS) found in Hawai‘i Administrative Rules (HAR) Chapter 11-59. National AAQS are divided into primary and secondary standards. The primary standards are intended to protect public health with an

adequate margin of safety, while secondary standards are intended to protect public welfare through the prevention of damage to soils, water, vegetation, animals, wildlife, man-made materials, visibility climate and economic values. State AAQS are intended to “protect public health and welfare and to prevent the significant deterioration of air quality.”

The State DOH operates a network of five air quality monitoring stations on O‘ahu. None are located in the immediate vicinity of Schofield Barracks, with the nearest being located in Pearl City, roughly seven miles away. Data from these monitoring stations indicate that the air quality on O‘ahu is generally good, which is primarily due to the prevailing trade winds that provide constant air circulation. In 2015, the state of Hawai‘i was in attainment of all national AAQS, except on occasion when volcanic activity on the island of Hawai‘i elevated levels of SO_2 and $PM_{2.5}$ above the national AAQS (DOH, 2016). DOH considers volcanic activity and its resultant emissions a natural and uncontrollable event and is seeking an exclusion of these exceedances of the national AAQS from its attainment/non-attainment determination. During periods of light to no wind, vog (volcanic emissions combined with exhaust, smoke, other pollutants and atmospheric water vapor) is noticeably present on O‘ahu. The Ku Tree Dam and Reservoir is neither a source of stationary nor mobile emissions.

Regulatory Framework

Clean Air Act

The Environmental Protection Agency (EPA) has the primary role in carrying out regulations under the Clean Air Act. The EPA sets permissible levels (national AAQS) on six common air pollutants, known as criteria pollutants. The six pollutants are particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. The EPA also has the authority to limit emissions of air pollutants coming from sources like chemical plants, utilities, and steel mills. Individual states may implement stronger air pollution laws, but they may not have weaker pollution limits than those set by EPA. Under §118(a) of the CAA federal agencies must comply with all federal, state, interstate, and local requirements; administrative authorities; and processes and sanctions in the same manner and to the same extent as any nongovernmental entity.

3.3.2 Environmental Consequences

3.3.2.1 Impact Methodology

Project actions are evaluated on the anticipated increase of criteria pollutants above existing ambient levels. Actions are determined to have a significant environmental impact on air quality if potential air emission concentrations predicted to occur from implementation of a project combined with the ambient concentrations for criteria pollutants exceed state or national AAQS or exposes the public (especially sensitive receptors such as schools, day care centers, hospitals, retirement homes, convalescence facilities, and residences) to substantial pollutant concentrations that are above acceptable health effect levels.

3.3.2.2 Proposed Action

The Proposed Action would have direct short-term impacts on localized air quality resulting from construction and demolition activities. Impacts would be less than significant.

Construction and demolition activities, including debris removal would generate dust emissions resulting in increased levels of particulate matter. Construction and demolition-related vehicular activity would also temporarily increase automotive pollutant concentrations at the project site and approach roadways. Emissions and fugitive dust from construction and demolition activities would occur in the immediate vicinity of the project area. Emissions in combination with ambient concentrations are not expected to reach a level causing an exceedance of either the state or national AAQS. The project site is located in an isolated area within Schofield Barrack’s East Range. The nearest sensitive receptors to the project site are over 4,000 feet away in Wahiawā; Mililani Mauka is located slightly farther away at approximately 4,500 feet. Due to the temporary duration of the impacts and the remote distance of the nearest sensitive receptors, impacts on air quality would be less than significant. Since Hawai‘i is not designated as a nonattainment area, a conformity determination under the CAA would not be required.

Implementation of construction site BMPs during the demolition and construction period would control emissions and dust. BMPs would include dust control measures such as the erection of dust screens around the construction site, wet suppression (e.g., wetting of exposed soils), or chemical stabilization. Dust can be further minimized by landscaping bare earth areas as soon as practicable. Vehicles and construction equipment would be properly maintained to minimize exhaust emissions. If warranted, a dust control plan would be prepared to guide activities during demolition and construction.

In the long-term, breaching the dam with a natural channel through the spillway would not be a source of stationary or mobile emissions. Once the natural channel is constructed, little or no maintenance would be required to ensure sufficient drainage is maintained. Thus, the Proposed Action would have no impacts on air quality in the long-term.

3.3.2.3 Alternative A: No Action

Under the No Action alternative, no construction or demolition would occur and there would be no emissions or dust from these activities. Therefore, No Action would be no impacts on air quality.

3.3.2.4 Alternative B: Notching the Dam

Similar to the Proposed Action, Alternative B would have less than significant impacts on air quality. During construction and demolition activities increased levels of particulate matter and exhaust emissions would occur within the immediate vicinity of the project area, but would be minimized by the application of standard construction site BMPs. In the long-term, the breach of Ku Tree Dam would not be a source of stationary or mobile emissions. Once vegetation establishes and the original stream channel restores itself and stabilizes, this alternative would likely require little or no maintenance. Therefore, Alternative B would have no impacts on air quality in the long-term.

3.3.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would have less than significant impacts on air quality. During construction and demolition activities increased levels of particulate matter and exhaust emissions would occur within the immediate vicinity of the project area, but would be minimized by the application of

standard construction site BMPs. Once the dam is removed and the site restored, there would be no stationary or mobile emissions associated with this alternative.

3.4 Noise Effects

3.4.1 Affected Environment

3.4.1.1 Region of Influence

Construction-related noise is generally limited to the vicinity of the project area. Therefore, the ROI for analyzing noise effects is a zone defined by a one-mile radius from the project site. Included within this radius would be portions of Schofield Barrack’s East Range and portions of the nearby civilian communities of Mililani Mauka and Wahiawā.

3.4.1.2 Existing Conditions

The impacts of sound on the environment are determined by several factors including sound level (loudness), duration of exposure to the noise, frequencies of the sound, and variations or fluctuations in noise levels during exposure. The noise descriptor currently used by federal agencies to assess environmental noise is the Day-Night Average Sound Level (DNL). DNL represents the average noise in decibels (dB) during a typical 24-hour day. DNL levels of 55 or less are typical of quiet rural or suburban areas. DNL levels of 55 to 65 are typical of urbanized areas with medium to high levels of activity and street noise.

Significant noise events at Schofield Barracks are generally associated with aircraft and artillery. Schofield Barracks has delineated three noise zones that are based on Army land use compatibility and guidelines developed by the Center for Health Promotion and Preventive Medicine. Zone III has the highest noise limits and Zone I, the lowest. The East Range is located in Zone I. Zone I areas have a DNL below 65 dBA. These areas are considered to be compatible with all types of land uses, including residential. There is no live-fire training in the East Range and vehicular traffic is limited. Thus, noise levels are low in the vicinity of the project site and are comprised largely of the sound of wind, rustling foliage, and birds. The project site is occasionally subject to aircraft noise due to its proximity to the flight paths for Wheeler Airfield.

Regulatory Framework

Noise Control Act

Under the Noise Control Act, the EPA has established noise emission standards for major noise sources, such as motors and electronic equipment. Stationary sources on federal facilities are subject to federal, state, and local noise ordinances, unless an exception is granted by the President.

3.4.2 Environmental Consequences

3.4.2.1 Impact Methodology

Project actions are evaluated against existing noise sources and ambient noise levels. Actions are determined to have a significant impact on noise quality if it results in a new substantial,

stationary noise source, if it exposes people to high levels of noise (beyond those recommended or permitted by applicable guidelines and regulations, such as DoD’s Operational Noise Manual) or increases the duration and intensity of exposure on sensitive noise receptors.

3.4.2.2 Proposed Action

The Proposed Action would have short-term, construction-related impacts on the noise environment. Construction equipment and vehicles would generate intermittently high noise levels. Construction equipment typically generates noise levels of 70 to 95 dB at a distance of 50 feet. With concurrent operation of several pieces of equipment, construction noise can be substantial; however, beyond 1,000 feet from the construction site noise levels generally are not significant. The nearest sensitive noise receptors are located over 4,000 feet away in Wahiawā. Mililani Mauka is even farther away, approximately 4,500 feet from the project area. Therefore, construction noise impacts are expected to be less than significant due to the degradation of the noise environment being limited to the immediate vicinity of the project site, the temporary nature of the work, and the distance of sensitive noise receptors.

Reducing construction noise to inaudible levels is not a realistic goal; however, there are BMPs that when be applied, would reduce noise impacts. Noise effects would be reduced by the use of newer and quieter equipment (or modifying older equipment with dampeners), the use of properly muffled construction equipment, properly maintaining construction equipment and vehicles, shutting off equipment when not in use and, if practical, the use of construction noise barriers. In accordance with the Noise Control Act, project activities would adhere to all applicable federal, state, and local noise regulations.

Once demolition and construction are complete, the Proposed Action would not be a source of either stationary or mobile noise and would have no impacts on the noise environment in the long-term.

3.4.2.3 Alternative A: No Action

Under the No Action alternative, no construction or demolition activities would occur and there would be no change to the noise environment in the ROI. The No Action alternative would also have no impacts on the noise environment.

3.4.2.4 Alternative B: Notching the Dam

Alternative B would have the same noise effects as the Proposed Action, which is limited to short-term construction-related noise effects. Impacts would be less than significant. Application of BMPs would minimize any construction-relate noise impacts. Alternative B would have no long-term impacts on the noise environment.

3.4.2.5 Alternative C: Dam Removal and Site Restoration

Similar to the Proposed Action, Alternative C would have short-term construction-related impacts. Due to the limited areal extent of the degradation of the noise environment, the temporary nature of the action, and the distance of sensitive noise receptors, impacts would be less than significant. Alternative C would have no long-term impacts on the noise environment.

3.5 WATER RESOURCES

3.5.1 AFFECTED ENVIRONMENT

3.5.1.1 Region of Influence

The ROI for analysis of potential impacts on water resources includes groundwater resources in the immediate vicinity of the Ku Tree Reservoir, as well as the down-gradient portions of the Upper and Lower Kaukonahua watersheds that receive surface water that currently passes through the reservoir. Both groundwater and surface water resources could be impacted by project actions.

3.5.1.2 Existing Conditions

The following sections provide descriptions of the water resources and hydrologic conditions that may be affected by the Proposed Action and the alternatives evaluated.

Groundwater

The Ku Tree Reservoir is located within the Upper Kaukonahua watershed on the eastern flank of Ko‘olau Volcano, one of two volcanoes that created the island of O‘ahu. The principal shield building lavas of Ko‘olau Volcano erupted roughly 1.8 to 2.3 million years ago, forming a 37-mile long range of mountains trending in a northwesterly direction, which extends parallel to the two principal rift zones of the original volcano. Over time, the once smooth volcanic dome underwent weathering and erosion, creating a deeply dissected topography comprised of steep ridges, valleys, and alluvial fans. The overall slope of the Upper Kaukonahua watershed has an average 10 percent grade with elevations ranging from around 850 to 2,681 feet at the crest of the volcano. The annual median rainfall over the Ku Tree drainage area varies from about 100 inches at the dam site to about 160 inches in its headwaters.

The primary modes of freshwater occurrence on O‘ahu are as a basal lens of fresh groundwater floating on saltwater, as dike-impounded groundwater, and as perched groundwater. The Water Resources Research Center (Mink and Lau, 1990) provides an aquifer classification for the area in the vicinity of the Ku Tree Reservoir of 30501212 (1111), which signifies that the reservoir overlies the Wahiawā Aquifer System of the Central Aquifer Sector. This aquifer consists of an unconfined, high-level aquifer system of freshwater not in contact with sea water, which is likely impounded by dike compartments (Mink and Lau, 1990). This aquifer is currently used as a drinking water source. The primary source of recharge to this volcanic aquifer is from infiltration of rainfall and stream runoff that occurs in the inland portions of the Ko‘olau range. Dikes, which are regions of low-permeability material forming groundwater dams, apparently act as barriers to north-south groundwater flow in the central plain portion of O‘ahu. Although the exact locations and nature of the groundwater dam boundaries are not known, the existence of these dams has been inferred by the observed large potentiometric head differences (greater than 250) feet between the high-level water body that underlies the site and the Honolulu-Pearl Harbor Basal Water Body to the south. The water level beneath the Schofield Barracks/Wheeler Airfield area is estimated to be approximately 270 to 300 feet above msl. The gradient within the high level Schofield water body is relatively flat, due to this water body being impounded. The elevation of the groundwater table in the vicinity of the Ku Tree Reservoir is estimated to be

on the order of 300 to 350 feet above msl, although no wells exist in the immediate vicinity of the reservoir to verify the actual elevation of the groundwater table at the site.

The Ku Tree Reservoir was created in 1925 by the U.S. Army to supply troops stationed at the recently constructed Schofield Barracks and Wheeler Airfield with potable water. In 1938, the Army discontinued use of the reservoir as a source of potable water due to the construction of a deep well pumping station that tapped the high level Wahiawā aquifer system that was located closer to the serviced military installations. The USACE conducted a study in the mid-1980s to evaluate the feasibility of whether the Ku Tree Reservoir was a viable potential water source (USACE, 1986). The most probable use of the water stored at Ku Tree Reservoir would be to provide irrigation water to Leilehua Golf Course, due to the modern-day requirements for significant post-storage treatment of this water prior to use for potable consumption. This study found that the reservoir could not reliably supply the irrigation requirements (up to 2 mgd during dry summer periods) at Leilehua Golf course 100 percent of the time. This study further concluded that the continued use of the Ku Tree Reservoir was not justified based upon economic considerations. This study also contained a letter from the Honolulu Board of Water Supply (BWS) that indicated that groundwater development in the area is presently the best method for supplying water in the long term and that the BWS did not consider the Ku Tree Reservoir to be a viable potential water source (USACE, 1986).

Surface Water and Drainage

Ku Tree Dam is a hydraulic earth-filled dam, approximately 550 feet long by 90 feet high with a crest width of 30 feet. Construction of the dam crest blocked the original flow path of South Kaukonahua Stream, impounding water behind the dam, and creating Ku Tree Reservoir which drowned the two meandering tributaries of South Kaukonahua Stream behind the dam at the 1,159-foot elevation. Figure 1 shows the relationship of the original flow path to the dam. The captured streams are located in narrow, meandering, forested gulches, populated primarily by alien plant species, which cover 0.83 square miles (531 acres) of drainage area (AECOS, 1984). The drainage area associated with Ku Tree Reservoir represents approximately 5 percent of the drainage basin that supplies water to Wahiawā Reservoir. Plates 14 and 15 below are aerial photos that show the dam, spillway and concrete control tower, which regulated the water levels within the reservoir, shortly after their construction in 1925. At maximum capacity, the reservoir pool was 32 acres (13 hectares) in size and provided storage of 900 acre-feet (293 million gallons) of water

The development of alternative water supplies in the 1950s eliminated the need for the Ku Tree Reservoir, and the pool behind the dam was progressively drawn down, with complete drainage by 1983. Since that time, the flow of the stream feeding the reservoir has been and is currently conveyed into an opening at the base of the valve tower, then under the dam via a drain tunnel that emerges about 1,640 feet downstream of the dam. In the absence of maintenance, debris accumulation in the outlet structure, or collapse or blockage of the drain tunnel, could lead to accidental re-filling of the reservoir. Such unanticipated impoundment is considered hazardous given the degraded structural integrity of the dam; unknown condition of the drain tunnel; and overgrown, inadequate condition of the dam spillway.

Plate 14 **Looking Upstream at Ku Tree Dam Shortly After Construction (c. 1925)**
Source: Phase I Inspection Report, National Dam Safety Program (C-E Maguire, Inc., 1978)

Plate 15 **Looking Downstream at Ku Tree Dam Shortly After Construction (c. 1925)**
Source: Phase I Inspection Report, National Dam Safety Program (C-E Maguire, Inc., 1978)

The Ku Tree Reservoir is located within the inland portion of the 24,876-acre Kaukonahua Stream watershed, which is the second largest watershed on O‘ahu, draining an extensive section of the leeward Ko‘olau Mountains. The median annual precipitation over the Ku Tree Drainage Basin is about 120 inches. The upper portion of the Kaukonahua Stream watershed consists of two primary sub-basins of 3,651 and 3,860 acres, which are drained by the North and South Forks of Kaukonahua Stream, each approximately 8 miles in length. These stream channels flow into the north and south arms of Wahiawā Reservoir, respectively, which was created by the damming and drowning of these streams near the town of Wahiawā around 1904.

Wahiawā Reservoir, locally known as Lake Wilson, is the largest freshwater impoundment in the State of Hawai‘i, with a surface area of around 330 acres and a storage capacity of three billion gallons (Tetra Tech, 2009). Water stored in Lake Wilson ultimately drains into Ki‘iki‘i Estuary and Kaiaka Bay, near the towns of Waialua and Hale‘iwa. Kaiaka Bay, the marine receiving water for Lower Kaukonahua and other streams in the larger watershed, has been identified for decades by DOH as a water quality limited segment, and is currently listed under Section 303(d) of the CWA as a water body in which water quality is impaired by excessive nutrients and turbidity (DOH, 2018). Figure 8 shows the location of the watershed that contributes water to the Ku Tree Reservoir in relation to the larger Upper Kaukonahua watersheds.

Kaukonahua Stream and its tributaries above Wahiawā Reservoir are perennial with baseflow provided by seepage of water from high level water impounded in the dike complex that runs parallel to the crest of Ko‘olau Volcano. The steep gradients in combination with the rocky character of the soil present in the watershed produce rapid runoff in spite of the dense vegetative cover. A U.S. Geological Survey gauge station (No. 16208000) is located on the South Fork of Kaukonahua Stream, downstream from Ku Tree Dam near the east pump at Wahiawā, at an elevation of 860 feet above msl. The annual mean streamflow measured at this station over the past fifty years (1968 to 2018) ranged from 7.87 to 37.2 cfs with an average annual streamflow of 19.8 cfs. For the period of record available for this station (1957 to 2010), the maximum measured daily streamflow was 1,050 cfs (on February 2, 1969) along with an estimated instantaneous peak discharge of over 5,000 cfs (on April 15, 1963) (USGS, 2019).

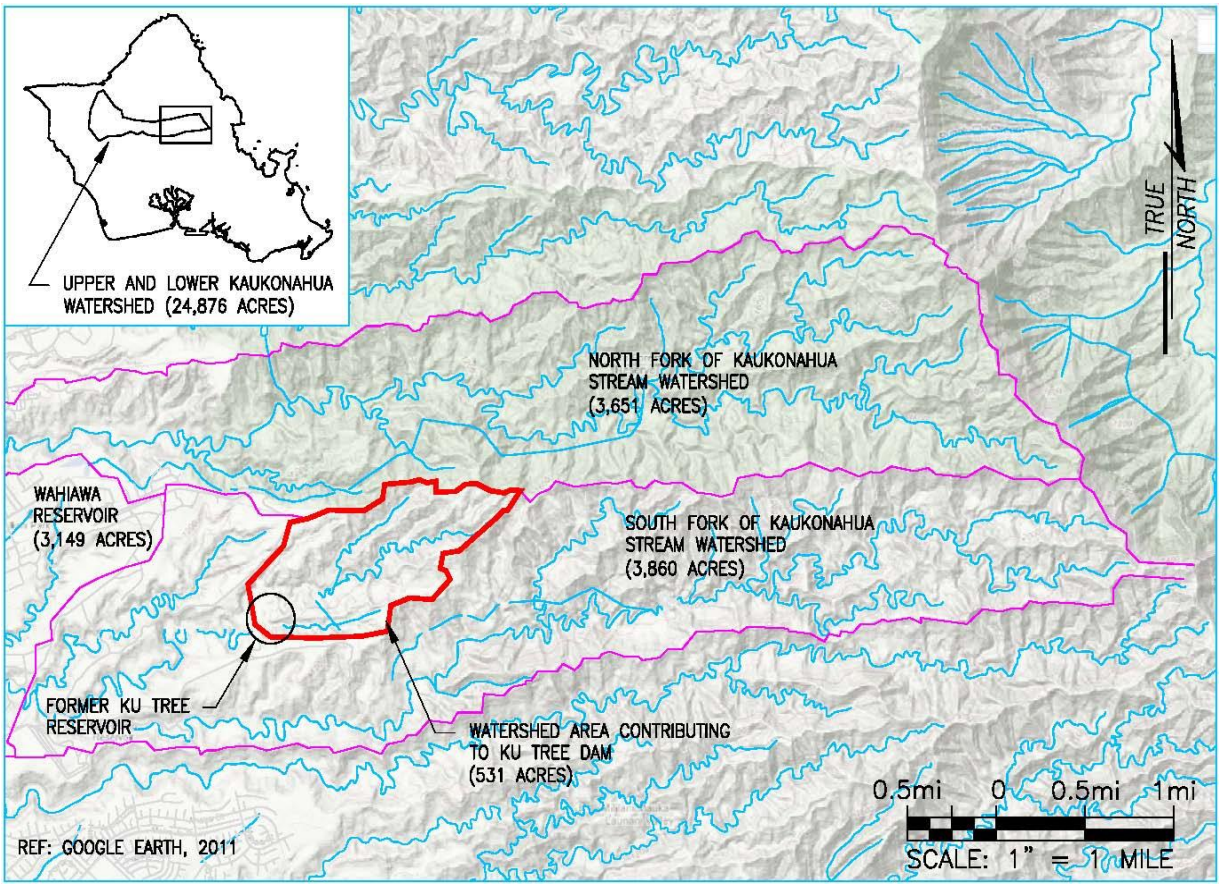

Figure 8. Ku Tree Reservoir Watershed

Surface Water Quality

AECOS collected a series of surface water samples at monitoring stations located both above the Ku Tree Reservoir and from just below the spillway structure in 1984 and 2004 as part of baseline water quality assessments. Stream water and bed sediment samples were collected from seven stations located just upstream of the former reservoir and an additional sample was collected from the base of the concrete spillway a couple of months after the reservoir had been drained in June 1984 (AECOS, 1984). Additional stream samples were collected from two stations located above the reservoir and one station located just below the spillway in 2004 (AECOS, 2004). The range in water quality parameters measured during these two sampling events is summarized in the table below and can be compared to the State of Hawai‘i’s water quality standards.

Table 1. Summary of Stream Water Quality Measurements Made at Ku Tree Reservoir

Sampling Event	Sampling Location	Number of Samples	Turbidity (NTU)	Total Suspended Solids (mg/L)	Total Nitrogen (µg N/l)	Nitrate + Nitrite (µg N/l)	Total Phosphorous (µg P/l)
June 1984	Above Reservoir	7	4.65 - 63	3.1 - 41.2	304 - 901	28 - 217	46 - 107
June 1984	Below Reservoir	1	30.3	14.8	342	22	95
January 2004	Above Reservoir	2	7.08 - 8.56	2.2 - 9.6	287 - 357	191 - 290	8 - 10
January 2004	Below Reservoir	1	9.02	7	304	204	11
State of Hawai‘i Wet Season Geometric Mean Criteria for Streams [1]			5.0	20	250	70	50
State of Hawai‘i Dry Season Geometric Mean Criteria for Streams [1]			2.0	10	180	30	30

[1]Hawai‘i Administrative Rules, Section 11-54-05.2(b)(1)

These previous stream monitoring events found that the stream water quality in the vicinity of the Ku Tree Reservoir had somewhat elevated turbidity levels but relatively low Total Suspended Solids (TSS) levels. The stream also had elevated levels of nitrate, nitrite, and total nitrogen, but low levels of total phosphorous (AECOS, 1984; 2004). AECOS noted that the nutrient levels measured in the stream were not unusual for O‘ahu streams and that there was no sign of algae in the streams during sampling.

The Kaukonahua watershed is classified as a second tier Category I watershed under the Hawai‘i Unified Watershed Assessment, while Kaukonahua Stream is listed as a Priority 2 impaired water body (Tetra Tech, 2009). The South Fork of Kaukonahua Stream, into which the streams from Ku Tree Reservoir flow, has been assigned a Geocode ID of 3-6-06.02.1 by the State Department of Health in the most recently approved 2018 State of Hawai‘i Water Quality Monitoring and Assessment Report (DOH, 2018). The downstream coastal waterbodies, Wailua and Kaiaka Bays, which receive water from this stream, are considered threatened or impaired based on non-attainment of water quality standards on the Section 303(d) list. The State of Hawai‘i completed a Total Maximum Daily Load (TMDL) analysis for the Upper Kaukonahua watershed in September 2009 (Tetra Tech, 2009). This analysis found that existing pollutant concentrations in the South Fork of Kaukonahua Stream exceeded wet and dry season water quality standards for turbidity and total nitrogen (Tetra Tech, 2009). This analysis suggested that elevated nutrient and turbidity levels measured in the South Fork compared to the North Fork of Kaukonahua stream indicates that the South Fork water quality may be more influenced by anthropogenic sources than the North Fork. This TMDL analysis called for 4.1 to 24.1 percent reductions of Total Nitrogen loads and 38.9 to 63.7 percent reductions in sediment load (under various flow conditions) during the wet season and 11.9 to 18.0 percent reductions of Total

Nitrogen loads and 84.6 to 86.1 percent reductions in suspended sediment load (under various flow conditions) during the dry season. The TMDLs established for the South Fork of Kaukonahua Stream were approved by the EPA and are summarized in Table 2 (EPA, 2010).

Table 2. Total Maximum Daily Loads, Existing Loads and Load Reductions Required for the South Fork of Kaukonahua Stream

Season		**Wet Season**			**Dry Season**		
Flow Duration Curve Interval[1]		**High**	**Elevated**	**Stable**	**High**	**Elevated**	**Stable**
Proposed TMDL (lbs/day)	Total Nitrogen	592	115	7.27	117	30.7	4.97
Existing Load (lbs/day)	Total Nitrogen	706	152	7.58	142	36.2	5.64
Load Reduction Required (lbs/day)	Total Nitrogen	114	37	0.31	25	5.5	0.67
Percent Reduction	Total Nitrogen	16.2%	24.1%	4.1%	18.0%	15.2%	11.9%
Proposed TMDL (tons/day)	NTU	8.61	1.23	0.07	2.24	0.74	0.02
Existing Load (tons/day)	NTU	14.09	2.15	0.194	16.1	4.83	0.13
Load Reduction Required (tons/day)	NTU	5.48	0.92	0.124	13.86	4.09	0.11
Percent Reduction	NTU	38.9%	42.7%	63.7%	86.1%	84.6%	85.0%

[1]Curve Intervals are 0-4% flow duration (High), 4-20% flow duration (Elevated), and 20-100% flow duration (Stable)

On February 13, 2020, USFWS biologists made a one-day visit to the proposed project site along a tributary to the South Fork of Kaukonahua Stream. Two individual sites were evaluated. The Kaukonahua Stream tributary above the dam was reached by walking along the top of the old spillway, then descending a steep trail down the former inner face of the dam to a point near the valve tower. It was confirmed that the stream waters were being collected at the base of the valve tower and being conveyed into the old drain tunnel. Visual and underwater camera surveys were made upstream from this point along the main flowing stream channel, and along a smaller, shallower tributary that entered from the right when looking upstream. The stream reaches examined were slightly turbid due to recent heavy rains, varying from 3–18 inches in depth. A brief visit was also made to the stream reach lying below the dam and the outlet of the drain tunnel, at a point where it is bridged by a road. The stream had notably higher volume here than above the dam, indicating confluence with another undermined tributary somewhere between the dam and the bridge. The stream channel bottom was natural consisting of boulder, cobble, gravel, and sand and covered with silt.

With respect to water quality, a major concern of the proposed alterations to the Ku Tree Reservoir is the fate of the large volume of sediment that has accumulated upstream of the reservoir and the changes to water quality that will occur upon either significant alteration or removal of this impoundment structure. The annual rate of sedimentation at Ku Tree Reservoir can be estimated by comparing the streambed elevations measured during topographic surveys in 1925, while the dam was being constructed, with surveys conducted in the same area shortly after the dam was drained in 1984. A total of 12.9 acre-feet of sediment accumulated in the

reservoir over this roughly 59-year period (USACE, 1986). This equates to an average annual sediment accumulation rate behind the reservoir of 0.22 acre-feet sediment/year, which corresponds to about 542,732 kilograms of sediment per year (assumed sediment density of 2 grams/cm^3):

(0.22 acre-feet sediment/year) x (2,000 kilogram/cubic meter sediment) x
(1,233.48 cubic meter/acre-feet) = 542,732 kilograms sediment per year

Flooding

According to the Federal Emergency Management Agency’s (FEMA) Flood Insurance Rate Map 15003C0227F, Ku Tree Dam is situated within an area designated as Zone D. Zone D are areas in which flood hazards are undetermined, but possible.

Ku Tree Dam and Reservoir was originally built to provide a source of potable water to Schofield Barracks and Wheeler Army Airfield, but does have a limited effect on potential floods by either reducing or delaying flood peaks originating in the 531-acre watershed. The structure’s ability to reduce and delay flood peaks is dependent on the storage availability in the reservoir, configuration of the outlet works and the spillway size at the time of the flood event. The reservoir waters overflowed through the spillway many times during the operational history of the dam. However, the highest historic water level in the reservoir is unknown (C-E Maguire, 1978).

The USACE has conducted a series of flood analysis for the reservoir. The Standard Project Flood (SPF) for the Ku Tree Dam watershed has been estimated to be equal to 3,900 cfs. SPF represents the fold that would result from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the region. Additionally, the runoff associated with the 1% annual chance of exceedance (ACE), 24-hour peak flow event (100-year, 24-hour storm event) was calculated to be 1,520 cfs, respectively (USACE, 1984c; USACE, 2010; USACE, 2016). These estimated PMF events are conservative since the maximum daily streamflow and estimated instantaneous peak discharge (1,050 and ~5,000 cfs, respectively) measured at the gauging station located along the South Fork of Kaukonahua Stream (which receives runoff from the entire watershed, which is roughly seven times larger than the watershed that contributes to Ku Tree reservoir) are similar to the SPF value used in the flood routing analyses for the reservoir. These analyses found that the spillway at Ku Tree Reservoir could not control the PMF, which would lead to the dam being overtopped by 0.87 feet (C-E Mcguire, 1979; USACE 1984c).

The 1984 and 1986 USACE studies estimated that a piping failure and breach at the Ku Tree Reservoir would lead to a rise in channel stage of 12 to 13 feet upstream of the Wahiawā Reservoir above the base condition. This flood event would lead to an estimated rise of 0.4 feet at Wahiawā Dam and an increase in peak discharge of 1,500 cfs. These studies concluded that the 900 acre-feet of water released by a failure of Ku Tree Dam could easily be absorbed by the 2,940 acre-feet of flood surcharge storage at Wahiawā Reservoir, even during typical basin-wide flood events (USACE, 1984c). These studies did note, however, that various U.S. Army facilities, namely bridge structures located in the East Range, could be damaged by such a

release event. The disaster at Kaloko dam on Kauai prompted an emergency inspection of the physical condition of Ku Tree Dam in 2006 (USACE, 2006) and a follow on inspection by a contractor in 2007 hired by the State of Hawai‘i DLNR (Gannett and Fleming, 2008). A recent inspection of the Ku Tree Dam in July 2017 concluded that it was in critical condition and should receive immediate attention to minimize the risk of structural failure. The results of the 2017 dam safety inspections are discussed in Section 1.4.

Regulatory Framework

The Clean Water Act

The CWA, 33 U.S.C. § 1251 et seq. is the major piece of federal legislation which makes it illegal for any person, including federal agencies, to discharge pollutants from a point source into waters of the U.S. without a permit. The CWA also provides for establishment of the NPDES program for issuance of such permits. The CWA Amendments of 1987 also require that the NPDES permitting program include permits for the discharge of storm water (non-point sources of water pollution). These storm water sources covered by NPDES permits encompass all construction activities including clearing, grading, and excavation, that result in the disturbance of at least one acre must apply for NPDES permit coverage.

3.5.2 Environmental Consequences

3.5.2.1 Impact Methodology

Impacts on water resources are evaluated based on the project’s potential to affect water quality, surface water runoff volumes and drainage patterns, and flood hazards. Due to the limited amount of information available for each of the alternatives, a qualitative evaluation was conducted. Project actions would have significant environmental impacts if any of the following occur:

- ✓ Significant change in the volume of surface water runoff from the site;
- ✓ Degradation of groundwater or surface water quality such that the existing or potential beneficial uses of the water is reduced;
- ✓ Non-compliance with existing or proposed water quality standards, such as TMDLs, or with other regulatory requirements related to protecting or managing water resources; or
- ✓ Increased potential for flooding or the amount of damage that could result from flooding, including flooding from runoff generated during either large or high-intensity storm events.

3.5.2.2 Proposed Action

The Proposed Action would involve breaching Ku Tree Dam by excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway at the south end of the dam. The hillside would be excavated to match the elevation of the existing streambed. The natural channel would have a bottom width of approximately 50 feet with 1V:1H side slopes, benched every 20 feet to minimize erosion. The upstream inlet to the drain tunnel that currently conveys stream waters under the dam would be blocked, and the valve tower and associated walkways would be demolished. The remainder of the Ku Tree Dam would stay in place. Provisions would be provided to ensure slope stability and establishment of

vegetation along the natural channel. Turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. The upstream dam would be filled with construction debris and approximately 112,000 cubic yards of excavated earth to block off water flow from entering the filled dam passage way.

The Proposed Action would have a less than significant impact on the underlying groundwater aquifer. Impoundment of surface water increases groundwater recharge. However, significant quantities of surface water have not been impounded by the reservoir for a considerable period of time—since 1984, or 30 plus years. Since that time, the flow of the stream feeding the reservoir has been conveyed into an opening at the base of the valve tower, then under the dam via a drain tunnel that emerges about 1,640 feet downstream of the dam. Some unintentional and temporary impoundment does occur during large storm events when the influent streams contribute more water to the abandoned reservoir than the drain tunnel’s rate of discharge downstream. Under the Proposed Action, the dam would be permanently breached and no future impoundment of surface water would occur. Since there would be no unintentional temporary impoundment of water, there may be a slight decrease in groundwater recharge; however, this is expected to be somewhat offset by the stream flows through the natural channel through the spillway, such that a less than significant impact would result.

During large storm events, the maximum volume of surface water leaving the Ku Tree watershed currently is controlled by the capacity of the existing drain tunnel through the dam. Under the Proposed Action, the drain tunnel would no longer regulate discharge, which would lead to a slight change in the shape and magnitude of the peak hydrograph of the stream just below the reservoir during future flood events, but the average volume of surface water runoff leaving the site would not change. Since the drainage area that flows through the dam represents less than 13.7 percent of the total watershed area that contributes water to the South Fork of Kaukonahua Stream and 5 percent of the total watershed area that ultimately supplies water to Wahiawā Reservoir, the overall reduction and delay of peak flow would be minimal at the point where stormwater runoff reaches Wahiawā Reservoir. Given the small size of the watershed controlled by Ku Tree Dam in comparison to the entire watershed that provides water to the Wahiawā Reservoir, the incremental increase from the Proposed Action on total discharge and the resultant water level rise in Wahiawā Reservoir would be not be substantial. Therefore, the Proposed Action would have less than significant impacts on surface water runoff.

With respect to the impact on water quality, erosion and sedimentation during construction may occur, with particular concern during in-stream work. The Proposed Action would have less than significant impacts on water resources in the short-term due to ground disturbance required for construction. The new channel through the existing spillway is the most efficient route as it utilizes the existing hillside slope to reduce the quantity of excavation and earth disturbance to achieve the goal of removing the risk associated with the dam. The upstream dam would be filled with construction debris and approximately 112,000 cubic yards of excavated earth to block off water flow from entering the filled dam passage way. To reduce the potential for sedimentation during excavation and construction in the spillway area, Ku Tree Dam will remain

in its current drawn down state with stream flows continuing to be diverted through the drain tunnel. As a result, only short-term periods of actual in-stream construction would occur. Additionally, under the Proposed Action, because the Ku Tree Dam structure would remain in place the sediment that is impounded behind the dam is expected to remain in its existing location minimizing the potential for deposited material to be transported downstream. By completing the dam breach in this manner, no surge of released loose sediment is expected. BMPs would be followed to prevent sediment and contaminants from impacting surface waters during construction, particularly during any in-stream work. During construction, project activities will be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control. Any area of disturbed ground would be stabilized immediately after construction activities halt to minimize erosion.

Construction activities related to the Proposed Action would result in the disturbance of over an acre of total land area. Therefore, it would be necessary to obtain coverage under a NPDES construction permit from the State of Hawai‘i, Department of Health, Clean Water Branch prior to initiating construction activities. The NPDES permit would require development of a Construction BMP Plan for storm water runoff prior to commencing construction activities. The Construction BMP Plan would identify the most effective erosion, sedimentation, and runoff control measures to prevent soil and sediment transport off-site as a result of construction activities. If ancillary construction activities, such as widening and improving the access road to the dam are required, BMPs and erosion control measures would also need to be implemented for these activities. Section 404, Department of the Army Permit, and Section 401, WQC, may also be needed due to the dam site being located in an impaired water segment. BMPs under Section 404 and Section 401, would also be adhered to.

The proposed alterations to Ku Tree Dam and Reservoir are not expected to contribute to excessive nutrient and sediment loads to the stream. Following construction, the proposed project is expected to improve the long-term water quality of the stream so that the designated and existing uses of waterbodies throughout the Ki‘iki‘i Stream system will be protected and sustained (Tetra Tech, 2009).

A monthly stream water quality monitoring program should be implemented prior to the initiation of construction at a minimum of three stations: one station located above the existing spillway structure, one stream station located just below and downstream of the spillway and existing outlet tunnel, and one stream station at the existing U.S. Geological Survey (USGS) gauging station on the South Fork of Kaukonahua Stream. The collected stream samples should be analyzed for both physical parameters (TSS, pH, DO, turbidity, etc.) and nutrients (total nitrogen, total phosphorous, nitrate/nitrite). The baseline levels of these nutrients and physical parameters determined during this monitoring will be useful for quantifying the effect that the Proposed Action has on water quality standards, such as TMDLs, in this watershed. A Water Quality Monitoring Plan was prepared in 2004 (attached as Appendix A) for the breaching of Ku Tree Dam. This plan should be revisited and revised, as needed, to ensure that it satisfies project requirements and complies with current regulations and accepted protocols. Long-term impacts on water quality are expected to be less than significant.

The USFWS conducted a site visit on February 13, 2020 and found the current native wildlife habitat functions and values along the tributary to Kaukonahua Stream to be extremely limited. In the USFWS March 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* (Attached in Appendix F) the USFWS concluded that the Proposed Action would have minimal impact to aquatic trust resources, and would in fact potentially enhance aquatic habitat values. As recommended by the USFWS in the 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* (Attached in Appendix F) the following BMPs will be applied to all activities pertaining to construction and maintenance activities for this project:

1. The permittee should make every effort to develop and implement a plan for conducting all anticipated work involving stream channels during the summer dry season. Work should be ceased and re-scheduled in the event of an out-of-season heavy rainfall;
2. Avoid conducting construction or subsequent maintenance activities that will lead to mid- and long-term destabilization and exposure of bare sediment along the stream banks or in the stream bed;
3. No debris, petroleum projects, or deleterious materials or wastes shall be allowed to fall, flow, leach, or otherwise enter any waters of the United States;
4. All authorized activities shall be done in a manner to confine and isolate the construction activity and to control and minimize any turbidity that may result from in-water work. Silt curtains or other appropriate and effective silt containment devices approved by the USACE shall be used to minimize turbidity and shall be properly maintained throughout the entire period of any in-water work to prevent the discharge of any material to the downstream aquatic habitat. All sediment control devices installed as BMPs (i.e., fabric sandbags, silt curtains/screens, etc.) downstream or makai of the authorized work shall remain in place until the in-water work is completed and will be removed in their entirety and disposed of at an appropriate upland location once the water quality of the affected area has returned to its pre-construction condition;
5. Return flow or runoff from upland dewatering site(s)/disposal site(s) shall be contained on land and shall not be allowed to discharge and/or re-enter any waters of the United States;
6. No sidecasting or stockpiling of excavated materials in the aquatic environment is authorized. All excavated materials shall be placed above the ordinary high water mark of any designated waters of the United States, or disposed of in an upland location. The permittee shall demonstrate that there is no reasonable expectation that disposal locations adjacent to high tide lines on the ocean, or in floodplains adjacent to other rivers or streams, would result in the material being eroded into the nearby waterbody by high tides and/or flood events;
7. Warning signs shall be properly deployed and maintained until the portion of the in-water work is completed and the affected area water quality has returned to its preconstruction condition and turbidity control devices have been removed from the waterway;
8. Fueling, repair, and other activities with any potential to release pollutants will occur in a location where there is no potential for spills to have an impact on waters of the United States; and
9. When the USACE is notified that an authorized activity is detrimental to fish and wildlife resources, the USACE will issue a suspension order until all pertinent issues have been

satisfactorily resolved. The permittee shall comply with any USACE-directed remedial measures deemed necessary to mitigate or eliminate the adverse effect.

Once completed, the Proposed Action is expected to have beneficial impacts on water resources by improving stream ecological and hydrological functions, such as flood plain water storage and detention, and ground water recharge. The Prosed Action would allow for the reconnection of formerly severed stream channels and floodplains by reconnecting the natural stream channel above and below the dam through the existing spillway. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir. In areas subject to stream flow, turf reinforcement mats would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. This combined with the reconnection of the stream above and below the dam is expected to beneficial impacts on stream health by returning it to its natural, free-flowing state, while minimizing sediment release.

With respect to the impact on future flood hazards, diverting the current stream flow to a natural channel excavated through the spillway hillside would eliminate the existing structure’s ability to reduce and delay flood peaks by eliminating the existing storage availability in the reservoir. As a result, slightly higher flood stages would occur in the small stream located directly down-gradient due to the loss of storage capacity provided by the existing reservoir. The magnitude of the increased flood stage from the existing condition to conditions resulting from the Proposed Action would dramatically decrease further downstream. At the USGS South Fork gauging station, which is located near the point where the South Fork of Kaukonahua Stream enters Wahiawā Reservoir, the increase in flood stage would not be substantial. Hydrologic and hydraulic studies previously performed indicate that the breaching of Ku Tree Dam will be negligible during major flood events on Wahiawa Reservoir, where Wahiawa Reservoir could accommodate the flood surcharge even during typical basin-wide flood events. A DLNR, Commission on Water Resource Management, Stream Channel Alteration Permit may be needed due to the conversion of the spillway to a natural channel and diversion of stream flows from the drainage tunnel to the natural channel.

The Proposed Action would provide 1% ACE 24-hour storm flood protection. The headwater depth at top of breach channel would be approximately 4.3 feet, the upstream depth would be approximately 17.5 feet, and the breach channel velocity would be approximately 14.4 feet per second (note: subject to change based on final design). Breaching the dam with a natural channel through the spillway would meet the 5-foot depth requirement upstream of the natural channel and the depths further upstream would be reasonable for a 1% ACE flood event (100-year, 24-hour storm event) (USACE, 2016). Additionally, since the dam and reservoir would no longer retain any significant storage capacity, the risk of catastrophic failure of the dam and resultant impacts to property and human safety would be averted. This would be a beneficial impact related to flood hazards.

3.5.2.3 Alternative A: No Action

Alternate A is the No Action alternative, which would leave the dam in place without any changes. Under this alternative, the dam would be allowed to slowly deteriorate since no improvements or maintenance to the dam structures would be undertaken. As long as the existing drain tunnel remained open, this alternative would lead to no substantial changes to the existing storm water quality or volume of surface water runoff in the short term. Impacts to surface runoff and water quality would be less than significant. In addition, there would be no impact to the underlying groundwater aquifer, since there would be no change in groundwater recharge. However, if the existing drain tunnel eventually collapsed, became filled with sediment or for some other reason became inoperable, this could lead to refilling of the reservoir, which could eventually lead to failure of the dam structure, resulting in a flood event of up to 900 acre-feet (293 million gallons), if the reservoir is completely filled at the time of failure. If catastrophic dam failure were to occur under a full reservoir, it is expected areas downstream would sustain damage and human safety would be jeopardized. However, previous studies have indicated that further downstream, Wahiawā Reservoir’s 2,940 acre-feet of flood surcharge storage could easily absorb the 900 acre-feet of water released by Ku Tree Dam, even during a typical basin-wide flood event (USACE, 1984c). Due the continued potential for damage and impacts to human safety should Ku Tree Dam catastrophically fail No Action would have less than significant impacts. Additionally, under this alternative, there would be no restoration of connectivity for water, and no habitat or aquatic improvements. Based on this, the impacts of No Action on water resources would be less than significant.

3.5.2.4 Alternative B: Notching the Dam

Alternative B would involve notching the existing dam crest structure to allow water to flow along its original flow path. The notch would be a 50-foot wide trapezoidal-shaped cut with 1V:2H side slopes, benched every 20 feet to minimize erosion. The base of the notch would be constructed at the approximate height of the sediments that have accumulated within the dam over the operational history of the dam. Provisions would be provided to ensure slope stability and establishment of vegetation.

Regarding potential impacts to groundwater, this alternative would have a less than significant impact on the underlying groundwater aquifer. Under this alternative, the dam would be permanently breached and no future impoundment of surface water would occur, including any unintentional impoundment. Since there would be no unintentional temporary impoundment of water, there may be a slight decrease in groundwater recharge; however, this is expected to be somewhat offset by the stream flows through the notched channel, such that a less than significant impact would result.

Like the Proposed Action, under Alternative B the maximum discharge of surface water leaving the Ku Tree watershed during large storm events would no longer be regulated by the existing drain tunnel. This would lead to a slight change in the shape and magnitude of the peak hydrograph of the stream just below the reservoir during future flood events, but the average volume of surface water runoff leaving the site would not change. Notching the existing dam structure to allow water to flow along its original flow path would also eliminate the existing dam structure’s ability to reduce and delay flood peaks by eliminating the existing storage

availability in the reservoir. However, as with the Proposed Action, since the drainage area that flows through the dam represents less than 13.7 percent of the total watershed area that contributes water to the South Fork of Kaukonahua Stream and 5 percent of the total watershed area that ultimately supplies water to Wahiawā Reservoir, the overall reduction and delay of peak flow would be minimal at the point where stormwater runoff reaches Wahiawā Reservoir. Therefore, Alternative B would have less than significant impacts on surface water runoff.

Under this alternative, approximately 356,000 cubic yards of excavated earth would be removed. Construction activities required for Alternative B would likely have a greater effect on short term water quality impacts than the Proposed Action due to larger quantity of sediment to be excavated and more in-stream work. Therefore, adhering to BMPs to address erosion, sedimentation, contaminants, and surface runoff would be critical to preventing impacts on the water resources during construction. During the construction phase of the project, BMPs would be followed to avoid releasing large amounts of sediment during demolition activities and by disturbing the accumulated sediments in the retention area behind the dam structure to restore the stream. Erosion control measures and related BMPs are discussed above and in Section 3.2. If ancillary construction activities, such as widening and improving the access road to the dam are required, BMPs and erosion control measures would also need to be implemented for these activities. Like the Proposed Action, project activities will be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control; a NPDES permit and Construction BMP Plan for storm water runoff would be required; USFWS BMBs would be followed; Section 404, Department of the Army Permit, and Section 401, WQC, would be adhered to; a DLNR, Commission on Water Resource Management, Stream Channel Alteration Permit may be needed; and a monthly stream water quality monitoring program should be implemented at a minimum of three stations (i.e., one station located above the existing dam structure, one stream station located just below and downstream of the dam and existing outlet tunnel, and one stream station at the existing USGS gauging station on the South Fork of Kaukonahua Stream) prior to commencing construction activities. Based on implementation of the above, Alternative B would have less than significant impacts on water resources in the short-term due to ground disturbance required for construction.

Over the long term, Alternative B offers the greatest opportunity to stabilize and restore the natural channel back to the conditions that existed before the dam was constructed (USACE, 2011). Once the notch is installed along the original stream course it is expected that the original grade and meanders of the stream channel would be recreated. The simulated flow velocities for Alternative B are slower than the other breaching alternatives evaluated because the proposed channel slope is more gently sloping and the constructed channel is wider. The slower velocities and the construction of the base of the notch at the height of the accumulated sediments behind the dam would help minimize additional transport of sediment further downstream from the dam site. As a result, the overall quality of the stream water exiting the site would not be much different than the water quality that has existed since 1984, when the reservoir was originally drained. Less than significant impacts would result due to the expectation that there would be a minimal change in water quality. Overall, Alternative B would have beneficial impacts on water resources by reconnecting the stream channel above and below the dam, which would restore the

stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

With respect to the impact on future flood hazards, notching the existing dam structure to allow water to flow along its original flow path would eliminate the existing structure’s ability to reduce and delay flood peaks by eliminating the existing storage availability in the reservoir. Like the Proposed Action, slightly higher flood stages would occur in the small stream located directly down-gradient; however, the magnitude of the increased flood stage would dramatically decrease further downstream and would be negligible on Wahiawa Reservoir during major flood events.

Alternative B would be designed to provide 1% ACE 24-hour storm flood protection with a headwater depth at top of breach channel of 4.2 feet and a maximum upstream depth of 17.4 feet with a breach channel velocity of 5.6 feet per second. Notching the existing dam structure to allow water to flow along its original flow path would also meet the 5-foot depth requirement upstream of the breach channel. Additionally, like the Proposed Action, under Alternative B the dam and reservoir would no longer retain any significant storage capacity, averting the possibility of future catastrophic failure of the dam and resultant impacts to property and human safety. This would have a beneficial impact related to flood hazards.

3.5.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would involve the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions (“natural” conditions). Stream channel restoration would be accomplished by removing the embankment material and the redwood core wall located at the center of the dam. A portion of the concrete cut-off wall would also be removed to allow for natural passage of stream flow. The concrete spillway and drainage tunnels would be abandoned.

Like the Proposed Action, this alternative would have a less than significant impact on the underlying groundwater aquifer. Alternative C would permanently breach the dam and no future impoundment of surface water would occur, including any unintentional impoundment. Since there would be no unintentional temporary impoundment of water, there may be a slight decrease in groundwater recharge; however, this is expected to be somewhat offset by the restored stream flow, such that a less than significant impact would result.

This alternative would completely remove the dam and its appurtenant structures and return the streambed to its natural condition along the original stream course. Removal of the existing dam structure would eliminate the reduction and delay in flood peaks caused by the existing dam structure. However, since the drainage area that flows through the dam represents less than 13.7 percent of the total watershed area that contributes water to the South Fork of Kaukonahua Stream and 5 percent of the total watershed area that ultimately supplies water to Wahiawā Reservoir, the overall reduction and delay of peak flow will be minimal at the point where stormwater runoff reaches Wahiawā Reservoir. The average volume of surface water runoff currently leaving the site will not change as a result of the proposed action. Therefore, Alternative C would have less than significant impacts on surface water runoff.

Under this alternative, approximately 246,000 cubic yards of excavated earth would be removed. Construction activities required for Alternative C would likely have a greater effect on short term water quality impacts than the Proposed Action due to the complete removal of the dam, larger quantity of sediment to be excavated, and more in-stream work. Therefore, adhering to BMPs to address erosion, sedimentation, contaminants and surface runoff would be critical to preventing impacts on the water resources during construction. Due to the large volume of material that will be removed under this alternative, implementation would undoubtedly lead to increased release of sediments to the stream both during direct construction work (removal of the dam structure), associated construction work (potential ancillary construction activities, such as widening and improving the access road), and future exposure of the accumulated reservoir sediments to erosion. The fate of the large quantities or sediment and organic trash currently deposited in the reservoir site when the dam is breached and flows restored is of particular concern. Release of this material downstream may lead to sediment deposition in various unpredictable locations in lower Kaukonahua Stream and perhaps even Wahiawā Reservoir. To minimize the release and downstream transport of sediment, these accumulated sediments would need to be stabilized using various techniques, including laying down vegetative mats and landscaping. Thus, the overall quality of the stream water exiting the project site may be more turbid, resulting in significant impacts. These impacts would be mitigated to less than significant by implementation of appropriate engineering controls to minimize erosion of the accumulated sediments located behind the existing dam structure. Like the Proposed Action, project activities will be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control; a NPDES permit and Construction BMP Plan for storm water runoff would be required; USFWS BMBs would be followed; Section 404, Department of the Army Permit, and Section 401, WQC, would be adhered to; a DLNR, Commission on Water Resource Management, Stream Channel Alteration Permit may be needed; and a monthly stream water quality monitoring program should be implemented prior to construction activities in order to evaluate the impact of the proposed work on overall stream water quality.

Over time, the environment in the vicinity of the restored stream is expected to transition into one that replicates naturally mature, vegetative conditions (Kimura International, 2005). In the long-term, Alternative C would have beneficial impacts on water resources by restoring the site to pre-dam conditions and reconnecting the stream channel above and below the dam, which would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and re-water a currently dry stream reach below the reservoir.

With respect to the impact on future flood hazards, the 10 to 40-foot wide natural channel would be designed to provide 1% ACE 24-hour storm flood protection with a headwater depth at top of breach channel of 12.8 feet and a maximum upstream depth of 21.0 feet with a breach channel velocity of 12.8 feet per second. Under this alternative, the dam breach would not meet the 5-foot depth requirement upstream of the breach channel due to the narrow, 10-foot wide channel based on the pre-dam contour data. This would be the more natural breach case and the computed depths are not unusual for a natural channel passing a 1% ACE event. Additionally,

this alternative would avert the possibility of future catastrophic failure of the deteriorating dam structure. This would have a beneficial impact related to flood hazards.

3.6 Hazardous Materials/Hazardous Waste

3.6.1 Affected Environment

3.6.1.1 Region of Influence

The ROI for analysis of potential impacts related to hazardous materials/hazardous waste is limited to the areas where construction or demolition activities would occur.

3.6.1.2 Existing Conditions

Hazardous materials and waste are substances that could pose a risk to human health or the environment if spilled, released, improperly handled or disposed. Typical hazardous materials at Army training areas include battery fluid; aerosols; petroleum, oils, and lubricants; fluorescent light bulbs; antifreeze and coolants; solvents; fuels (gasoline, diesel, and aviation fuels); chlorine; paint products; pesticides; and munitions. The Army maintains site-specific spill prevention, control, and countermeasure plans and pollution prevention plans that regulate the storage and use of petroleum products and hazardous materials, respectively.

The project site is not a designated Installation Restoration Program (IRP) site and previous studies of hazardous materials and waste, as well as installation records, provide no indication of hazardous materials on or near the project site (Tetra Tech, 2004).

A 1984 baseline water quality and sediment survey was conducted for Ku Tree Reservoir (AECOS, Inc.). Seven sediment samples were taken at various locations upstream from the reservoir site, within the reservoir, and at the natural stream bed immediately downstream of the spillway’s concrete discharge apron. The study found no particularly hazardous properties associated with the sediment samples and suggested that bottom sediments from the reservoir could be used as agricultural top soil or land-fill. The majority of the samples were within the EPA’s screening guideline values. Concentrations of chromium were high, but that is not considered unusual for weathered volcanic soils. Sediment samples taken at bottom of the spillway had higher concentrations of some heavy metals as compared to other sample locations, which suggest the source of these heavy metals, were not from Ku Tree Reservoir.

Regulatory Framework

The Resource Conservation and Recovery Act

The RCRA, Subtitle C, (42 U.S.C § 6901-6939b), establishes standards and procedures for managing hazardous waste. Most construction and demolition debris are nonhazardous and not regulated by the EPA. However, if hazardous waste is generated (e.g., asbestos-containing materials, treated wood, solvents), certain procedures under RCRA for storing, transporting, and disposing of the waste must be followed. RCRA prohibits the land disposal of hazardous wastes unless specific treatment standards and/or methods have first been met. Under RCRA, federal facilities are required to comply with all federal, state, interstate, and local solid and hazardous waste requirements.

3.6.2 Environmental Consequences

3.6.2.1 Impact Methodology

A project action is determined to have a significant environmental impact if it results in the spill or release of hazardous or toxic materials (as defined by 40 CFR part 302 [CERCLA] or 40 CFR parts 110, 112, 116, or 117 [CWA]), particularly if it increases the potential for human exposure; represents an increase or a new source of hazardous waste such that regulatory requirements are increased; adversely effects the progress of an IRP site; or accidentally releases friable (when dry can be crumbled or pulverized by hand) asbestos or lead-based paint.

3.6.2.2 Proposed Action

In the long-term the Proposed Action would not utilize any hazardous material nor generate any hazardous waste. In the short-term, during the construction and demolition phase, some hazardous materials may be utilized. These would include substances such as herbicides or gasoline, diesel fuel, motor oil, and hydraulic fluid, which would be used for construction vehicles and equipment. Accidents potentially could occur which would result in dripping, leaking or spillage of these petroleum-related products. However, adherence to construction site BMPs, including, if warranted, preparation and implementation of a Spill Prevention, Control, and Countermeasure Plan, would minimize the potential for accidental releases to occur. Moreover, typical accidental releases are small with fairly low concentrations and toxicity. Placement of containment devices such as booms, barriers, or skimmers within stream channels prior to construction activities would minimize any impacts should leaking or spilled petroleum-related products reach these waters. Any potentially hazardous materials required for the project (e.g., petroleum or fuel products for construction equipment and vehicles, herbicides for vegetation removal) will be managed in compliance with applicable state and federal regulations, including RCRA if applicable. Therefore, the Proposed Action would have less than significant impacts related to hazardous materials or waste.

3.6.2.3 Alternative A: No Action

Under the No Action alternative, no construction or demolition activities would occur and there would be no need for fueling and maintenance of construction vehicles and equipment at the project site. Thus, there would be no hazardous materials at the site and no potential for accidental releases of hazardous materials associated with construction and demolition activities. Under No Action, there would be no impacts related to hazardous materials or waste.

3.6.2.4 Alternative B: Notching the Dam

Similar to the Proposed Action, Alternative B would have less than significant impacts due to the potential for accidental releases of hazardous material during the construction period. Managing these materials in accordance with applicable federal and state regulations and adherence to BMPs would reduce the potential for accidental releases to occur.

3.6.2.5 Alternative C: Dam Removal and Site Restoration

Like the Proposed Action, Alternative C would have less than significant impacts related to hazardous materials/hazardous waste. Petroleum products or herbicides may be used during the

construction/demolition period and could be accidentally released. Managing these materials in accordance with applicable federal and state regulations and adherence to BMPs would reduce the potential for accidental releases to occur.

3.7 Biological Resources

3.7.1 Affected Environment

3.7.1.1 Region of Influence

Ku Tree Dam and Reservoir are located on an unnamed tributary to the South Fork of Kaukonahua Stream. The South Fork of Kaukonahua Stream merges with the North Fork at the Wahiawā Reservoir. Kaukonahua Stream is part of the larger Ki‘iki‘i Stream system, which ultimately drains into marine waters at Kaiaka Bay, near the towns of Hale‘iwa and Waialua. Due to the positioning of Wahiawā Reservoir, which serves as barrier between the upper and lower potions of the Kaukonahua Stream system, the ROI for analysis of potential impacts on aquatic resources is defined as being from the project site downstream to Wahiawā Reservoir. For faunal resources, the ROI is defined by a 100-foot buffer zone around all construction work areas, including staging and storage areas.

3.7.1.2 Existing Conditions

Flora

According to the USAG-HI’s Integrated Natural Resources Management Plan (INRMP) and the USFWS Environmental Conservation Online System, there are 14 federally listed endangered and one threatened floral species currently documented within the East Range (INRMP, p. 2-46; species status updated using USFWS Environmental Conservation Online System). These federally listed floral species however are found in the upper elevations of the East Range and are not located within or near the project area.

Field studies to assess the botanical resources at the Ku Tree Dam and Reservoir, the area downstream of the dam, and along the access road leading to the dam site were conducted in 2004 as part of the initial EA effort (Char & Associates). The Botanical Resources Assessment Study is attached as Appendix B.

Results of the assessment indicated that the vegetation at the project site consists mainly of introduced species such as ironwood (*Casuarina equisetifolia*), strawberry guava (*Psidium cattleianum*), fiddlewood (*Citharexylum caudatum*), albizia (*Falcataria moluccana*), paperbark (*Melaleuca quinquenervia*), and Koster’s curse (*Clidemia hirta*). Large blocks of forestry plantings, mostly various Eucalyptus species, are located on the slopes above the reservoir. On the steeper slopes and knolls, scattered pockets of native plants were observed, primarily koa trees (*Acacia koa*) and uluhe fern (*Dicranopteris linearis*). The pockets of koa and uluhe were not particularly diverse or species rich. A few other native species were observed. None of the plants found on or in the immediate vicinity of the project site are listed as threatened or endangered, or a species of concern.

In November 2011, February 2012, and April 2012, the Department of the Army Natural Resource Program found incipient populations of Fountain Grass (*Pennisetum setaceum*), a major invasive grass species at the Schofield Barracks East Range. Fountain Grass has the potential to exacerbate the already high threat to endangered species caused by fires. Additionally, in February 2012, the Natural Resource Program found a population of Bush Beard Grass (*Schizachrium condesatum*) at Schofield Barracks East Range. This species is on the state noxious weed list and is a known threat to natural resources. To ensure that vehicles utilized by the project are not carrying seeds or plant material to prevent the spread of noxious or invasive plant species the project will comply with the *USARHAW Washrack Utilization Policy to Control Invasive Species* which requires that vehicles and equipment are cleaned, washed, and inspected prior to movement to/from Schofield Barracks. Additionally, the project will comply with *Policy Memo USAG-HI-63, Landscaping with Native Plants*. Where the use of native Hawaiian plant species cannot be used, the project will comply with base policy and undergo review and approval by the Directorate of Public Works.

In January 2020, in accordance with the FWCA, USAG-HI consulted with the USFWS and State of Hawai‘i’s DLNR for the proposed undertaking. On February 13, 2020, USAG-HI, USFWS biologists, and staff from the State of Hawai‘i’s Division of Forestry and Wildlife, and the State’s Division of Aquatic Resources made a one-day visit to the proposed project site along a tributary to the South Fork of Kaukonahua Stream. Photographs and visual observations were taken of the various stream channels and adjacent riparian areas that might be subject to modification in order to assess the current status of aquatic and terrestrial resources at the proposed project site.

In March 2020, the USFWS provided USAG-HI a *Draft Fish and Wildlife Coordination Act Planning Aid Report* for the proposed breaching of the Ku Tree Dam to evaluate the project impacts in accordance with provisions of the FWCA. The purpose of this report is to document existing fish and wildlife resources at the proposed project sites and to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of conspicuous diurnal fish and wildlife resources at the proposed project sites, an evaluation of potential impacts associated with the proposed alternative actions, and recommendations for fish and wildlife mitigation measures.

The results of the February 13, 2020 site visit and subsequent USFWS March 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* indicate that the headwater reaches of the Kaukonahua catchment are covered in predominantly native upland rain forest, which intergrades downstream into wet and then mesic forests dominated by a progressively larger proportion of non-native plant species. The lower mid-reach of the stream below Wahiawā Dam flows in a deep canyon, bordered by predominantly non-native dry to mesic forests and shrublands on the west, and agricultural fields on the east. In the proposed project area, the dominant vegetation is a tall, non-native forest dominated by various Eucalyptus species. No native plants were seen in this area during the February 13, 2020 site visit except for the native, mat-forming uluhe fern, *Dicranopteris linearis*.

Additionally, during 2020 FWCA consultation, it was noted by the State Division of Forestry and Wildlife that soil and plant material may contain invasive fungal pathogens (e.g. Rapid ‘Ōhi‘a Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts that could harm native species and ecosystems. As stated above, to prevent the spread of noxious or invasive species the project will comply with the *USARHAW Washrack Utilization Policy to Control Invasive Species* which requires that vehicles and equipment are cleaned, washed, and inspected prior to movement to/from Schofield Barracks. Additionally, the project will comply with *Policy Memo USAG-HI-63, Landscaping with Native Plants*. Where the use of native Hawaiian plant species cannot be used, the project will comply with base policy and undergo review and approval by the Directorate of Public Works.

While Rapid 'Ōhi'a Death is not known to occur on O‘ahu, if 'Ōhi'a trees are to be removed, trimmed, or potentially injured BMPs to avoid and prevent spread of the disease would be followed. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution, as necessary, to prevent the spread of Rapid 'Ōhi'a Death and other harmful fungal pathogens. Documentation of consultation with the USFWS and State of Hawai‘i’s DLNR, in accordance with the FWCA, is attached as Appendix F.

Dam and Reservoir

A large stand of ironwood trees is found on the spillway crest and dam crest. In several areas, strawberry guava forms scattered thickets. Other understory shrubs include Koster’s curse and fiddlewood. The fallen “needles” from the ironwood trees form a dense, thick carpet which excludes many smaller ground cover species. Where the ironwood tree cover is sparse or open, clumps of ground cover such as Guinea grass (*Panicum maximum*), Hilo grass (*Paspalum conjugatum*), Spanish clover (*Desmodium incanum*), and vervain (*Stachytarpheta cayennensis*) were observed.

A few small stands of koa are located on the downstream slope of the dam, along with the uluhe fern. Other native species observed include pala‘a (*Sphenomeris chinensis*), and ni‘ani‘au (*Nephrolepis exaltata* ssp. *hawaiiensis*) ferns, some small ‘Ōhi’a trees (*Metrosideros polymorpha*), ‘uki sedge (*Machaerina mariscoides*), and the ‘ie‘ie vine (*Freycinetia arborea*).

A large Chinese banyan tree (*Ficus microcarpa*) along with a few ti plants (*Cordyline fruticosa*), and small ‘Ōhi’a are found at the toe of the dam, along with uluhe fern, Hilo grass, Spanish clover, Koster’s curse, golden beardgrass (*Chrysopogon aciculatus*), broomsedge grass (*Andropogon viginicus*), and carpetgrass (*Axonopus fissifolius*).

The reservoir area is overgrown in most places with dense thickets of strawberry guava and stands of larger emergent trees including paperbark, albizia, and jhalna (*Terminalia myriocarpa*). Shrubs such as Koster’s curse, guava (*Psidium guajava*), and fiddlewood are common. On the slopes of the reservoir, small stands of ironwood and swamp mahogany (*Eucalyptus robusta*) are found.

Groundcover tends to be sparse under the dense tree and shrub cover. In a few places, shade-tolerant species occur, which include palmgrass (*Setaria palmifolia*), blechnum fern (*Blechnum appendiculatum*), thimbleberry (*Robus rosifolius*), and Hilo holly (*Ardisia crenata*).

Open grassy areas on the reservoir bottom are found along the streams and pools of standing water. Observed species of grass include California grass (*Brachiaria mutica*), Guinea grass, Hilo grass, honohono (*Commelina diffusa*), Spanish clover, and a number of weedy, herbaceous species are abundant in sunnier locations.

Access Road

The existing access road leading to the reservoir passes through large blocks of forestry plantings. Swamp mahogany and other Eucalyptus species are the most abundant. Smaller blocks of paperbark and ironwood also are commonly encountered. Under the tree canopy, strawberry guava forms dense thickets, 12 to 15 feet tall. Other plants noted along the access road include rose apple (*Syzgium jambos*), Koster’s curse, uluhe fern, Hilo grass, and woodfern (*Christella parasitica*).

Downstream

Downstream of the dam and reservoir large blocks of forestry plantings occur along the stream and on the slopes above the stream. These include swamp mahogany and other Eucalyptus species, paperbark, and ironwood. Small stands of albizia, silkoak (*Grevillea robusta*), and Java plum (*Suzygium cumini*) are scattered in this area. Thickets of strawberry guava are abundant in most of these forested areas. The understory plants found in the downstream area include most of the plants identified in the reservoir and dam section. Understory plants noted were Spanish clover, vervain, California grass, and Guinea grass.

Terrestrial Fauna

According to the INRMP, within the East Range, there are documented occurrences of faunal species that are threatened and endangered, or a species of concern. Faunal species include one endangered terrestrial mollusk, the O‘ahu tree snail (*Achatinella byronii/decipiens*). Avian species observed within the East Range include three endangered species and one species of concern. One endangered species, the Hawaiian duck (*Anas wyvilliana)* was last observed in 2000, and another species the O‘ahu creeper (‘alauahio or *Paroreomyza maculate*) has not been personally observed by USAG-HI natural resources staff. The O‘ahu ‘Elepaio (*Chasiempis sandwichensis ibidis*) is the only federally listed bird species with Critical Habitat within the East Range. The nearest point of the O‘ahu ‘Elepaio Critical Habitat is located roughly 0.75 miles upslope from Ku Tree Dam. With the exception of the Federally-listed endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or ‘ōpe’ape’a, all terrestrial mammals currently found on O‘ahu are alien species. In Spring 2013 the Department of Army Natural Resource Program discovered the presence of the Hawaiian hoary bat at Schofield Barracks East Range. Bats have also been found by the USGS in numerous locations on O‘ahu spanning from Waikīkī to Ford Island to the Wai’anae Mountains to the North Shore of O‘ahu. For this reason, bats are now considered to be ubiquitous on O‘ahu.

An ornithological and mammalian survey of the Ku Tree Dam and its surrounding area was conducted in February 2004 as part of the initial EA effort (Rana Productions, Ltd.). The primary purpose of the survey was to determine if there were any federally listed endangered, threatened, proposed, or candidate species in the vicinity of the dam and reservoir, including the area immediately downstream of the dam. The survey report concluded that no protected avian or mammalian species were detected, or are likely to be found in the project area. The survey report is attached to this EA as Appendix C.

During the January/February 2020 FWCA consultation for the project, the State Division of Forestry and Wildlife offered the following recommendations pertaining to terrestrial fauna:

- The project work on Kaukonahua Stream could affect endangered native Hawaiian damselflies (*Megalagrion spp*.) that may be present. A survey should be conducted by a qualified entomologist to determine if listed damselflies are present in the project area and to assess any potential impacts to those species[1].

- The State listed Hawaiian Hoary Bat or 'Ope'ape'a *(Lasiurus cinereus semotus)* has the potential to occur in the vicinity of the project area and may roost in nearby trees. If any site clearing is required this should be timed to avoid disturbance during the bat birthing and pup rearing season (June l through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting Division of Forestry and Wildlife.

- We note that artificial lighting can adversely impact seabirds passing through the area at night by causing disorientation. This can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, Division of Forestry and Wildlife recommends that all lights be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea.

- State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) have the potential to occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact Division of Forestry and Wildlife at (808) 973-9778.

[1] The absence of damselflies within the project area was confirmed during the February 2020 site visit by Dan Polhemus, USFWS biologist, and expert on native damselflies.

Following the February 13, 2020 site visit by USAG-HI, USFWS, and DLNR, the USFWS indicated in the subsequent March 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* that although the ESA-listed native damselfly species *Megalagrion nigrohamatum nigrolineatum* has been recorded from the North Fork of Kaukonahua Stream at 1,500 feet elevation as recently as 1996, no sign of this species was detected in the proposed project area along a tributary to the South Fork. Additionally, damselflies are not expected to be present in the project vicinity because the stream is overrun with alien fish that predate them. The absence of damselflies within the project area was confirmed during the February 2020 site visit by Dan Polhemus, USFWS biologist, and expert on native damselflies. Consultation with the USFWS and DLNR, in accordance with the FWCA, is attached as Appendix F.

Avian Survey

Sixteen avian species representing 12 separate families were recorded at the project site during the 2004 survey. All species detected are alien to the Hawaiian Islands. Survey results indicated that avian diversity and densities were low in the project area. All birds recorded during station counts, and while survey personnel were on-site, were alien species. Two species, the Common Waxbill (*Estrilda a. astrild*) and the House Finch (*Carpodacus mexicanus frontalis*) accounted for 39 percent of the total number of birds recorded during station counts. The most common avian species recorded was the Common Waxbill, which accounted for 18 percent of the total number of individual birds recorded. Table 3 below, lists the avian species recorded in the vicinity of the project site during the survey.

Table 3. Avian Species

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Pigeons & Doves - Columbidae		
Spotted Dove	*Streptopelia chinensis*	1.2
Zebra Dove	*Geopelia striata*	2.3
Barn Owls – Tytonidae		
Barn Owl	*Tyto alba*	0.1
Bulbuls – Pycnonotidae		
Red-vented Bulbul	*Pycnonotus cafer*	3.4
Old world Warblers - Sylviidae		
Japanese Bush-Warbler	*Cettia diphone*	1.5
Thrushes – Turdidae		
White-rumped Shama	*Copsychus malabaricus indicus*	2.0
Babblers – Timaliidae		
Hwamei	*Garrulax canorus*	1.8
Red-billed Leiothrix	*Leiothrix lutea*	2.3
Silvereyes – Zosteropidae		
Japanese White-Eye	*Zosterops japonicus*	5.1
Starlings – Sturnidae		
Common Myna	*Acridotheres tristis*	1.5
Emberizids – Emberizidae		
Red-crested Cardinal	*Paroaria coronata*	1.5
Saltators, Cardinals & Allies – Cardinalidae		
Northern Cardinal	*Cardinalis*	1.9

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Carduline Finches & Allies – Fringillidae		
House Finch	*Carpodacus mexicanus frontalis*	5.3
Waxbills & Allies – Estrildidae		
Common Waxbill	*Estrilda a. astrild*	6.9
Chestnut Munia		0.9
Java Sparrow	*Padda oryzivora*	1.0

The relative low diversity and densities of avian species detected during the survey was consistent with at least two other avian surveys conducted in the recent past within Schofield Barracks Military Reservation (SBMR) and the surrounding region (David, 2002 and 2003). The condition is likely indicative of the poor habitat quality present with the general project area. Poor quality habitat coupled with the high density of mosquitoes all but guarantees that few, if any native birds are likely to use the area. Avian malaria, which is transmitted by mosquitoes, is one of the major limiting factors for native Hawaiian birds.

According to the INRMP, the National Audubon Society conducts an annual Christmas Bird Count at USAG-HI sub-installations. From these counts, nine migratory bird species are known to occur within the East Range. Of the nine species, three are native and six are non-native species. Two of the non-native migratory species were observed during the February 2004 survey (Rana Productions, Ltd.) conducted for the initial 2004/2005 EA effort—the Northern Cardinal and the House Finch.

Mammalian Survey

Five mammalian species were detected during conduct of the 2004 survey. No mammals were actually seen; however, tracks and signs of rat (*Rattus* sp.), dog (*Canis f. familiaris*), small Indian mongoose (*Herpestes a. auropunctatus*), cat (*Felis catus*), and pig (*Sus s. scrofa*) were observed throughout the survey area. While no live rodents were seen during the 2004 survey, there was evidence of their presence (discarded Meals Ready to Eat packets with signs of rat gnawing). It is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use resources within the study area. All of the alien mammalian species recorded during the survey are deleterious to the avian and floristic components of the remaining native ecosystems present on O‘ahu. The survey findings are consistent with at least two other mammalian surveys conducted in the recent past within the SBMR (David, 2002 and 2003).

Aquatic Fauna

In 2004, a biological survey (AECOS) of the stream just upstream and downstream from Ku Tree Dam was conducted in conjunction with preparation of the Water Quality Monitoring Plan. The survey is attached as part of Appendix A. During the survey, a few introduced species were observed and possibly one native amphidromus fish. No threatened, endangered, or species otherwise considered rare or special by the state or federal governments were observed. Table 4 below, list the biota observed during the biological survey. Given the presence of significant

physical barriers to upstream migration (Wahiawā Dam and Reservoir, numerous irrigation ditches, and the Ku Tree Dam and Reservoir) in addition to predatory species found in the Wahiawā Reservoir and Ki‘iki‘i Stream, it is not surprising that the presence of native stream organisms are extremely low to non-existent in the Ku Tree Reservoir streams.

Table 4. Observed Aquatic Biota

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
	Invertebrates		
Crustaceans			
American swamp crayfish	*Procambarus clarkii* (Girard)	**N**	**A**
Insects			
forktail damselfly*	*Ischnura posita* (Hagen)	**N**	**U**
	Vertebrates		
Fishes			
‘o‘opu nakea	?*Awaous guamensis* (Valenciennes)	**I**	**R** (possible sighting of 1 individual)
Chinese catfish	?*Clarius fuscus*	**N**	**R** (possible sighting of 1 individual)
rainbowfish, guppy	*Poecilia reticulata*	**N**	**O**
mosquitofish	*Gambusia affins* (Baird & Girard)	**N**	**O**
green swordtail	*Xiphophorus helleri* (Heckel)	**N**	**A**
Frogs & Toads			
bullfrog	*Rana catesbeiana* (Shaw)	**N**	**R** (heard, but not sighted, 1 or 2 individuals)

Notes:
* = The absence of damselflies within the project area was confirmed during the February 2020 site visit by Dan Polhemus, USFWS biologist, and expert on native damselflies.

STATUS
N = Naturalized (introduced or exotic species)
I = Indigenous (native species, also found elsewhere in the Pacific)

ABUNDANCE
R = Rare (only one or two individuals seen)
U = Uncommon (several to a dozen individuals seen)
O = Occasional (regularly encountered, but in small numbers)
A = Abundant (found in large numbers and widely distributed)

On February 13, 2020, USFWS biologists made a one-day visit to the proposed project site along a tributary to the South Fork of Kaukonahua Stream. Documentation of the USFWS findings was provided to USAG-HI via the March 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report*. The report is attached as Appendix F. During the survey two individual sites were evaluated concerning the presence of freshwater fishes, crustaceans, mollusks, and insects. The presence of both native and introduced species breeding in the stream for all or a portion of their life cycle were recorded. Figure 9 shows the locations of the two sites evaluated. The Kaukonahua Stream tributary above the dam was reached by walking along the top of the old spillway, then descending a steep trail down the former inner face of the dam to a point near the valve tower. It was confirmed that the stream waters were being collected at the base of the valve tower and being conveyed into the old drain tunnel. Visual and underwater camera surveys were made upstream from this point along the main flowing stream channel, and along a smaller,

shallower tributary that entered from the right when looking upstream (Station 1; tributary to South Fork Kaukonahua Stream above Ku Tree Dam). The stream reaches examined were slightly turbid due to recent heavy rains, varying from 3–18 inches in depth. A brief visit was also made to the stream reach lying below the dam and the outlet of the drain tunnel, at a point where it is bridged by a road (Station 2; tributary to South Fork Kaukonahua Stream below Ku Tree Dam). The stream had notably higher volume here than above the dam, indicating confluence with another undermined tributary somewhere between the dam and the bridge. Stream channel bottom was natural consisting of boulder, cobble, gravel, and sand and covered with silt.

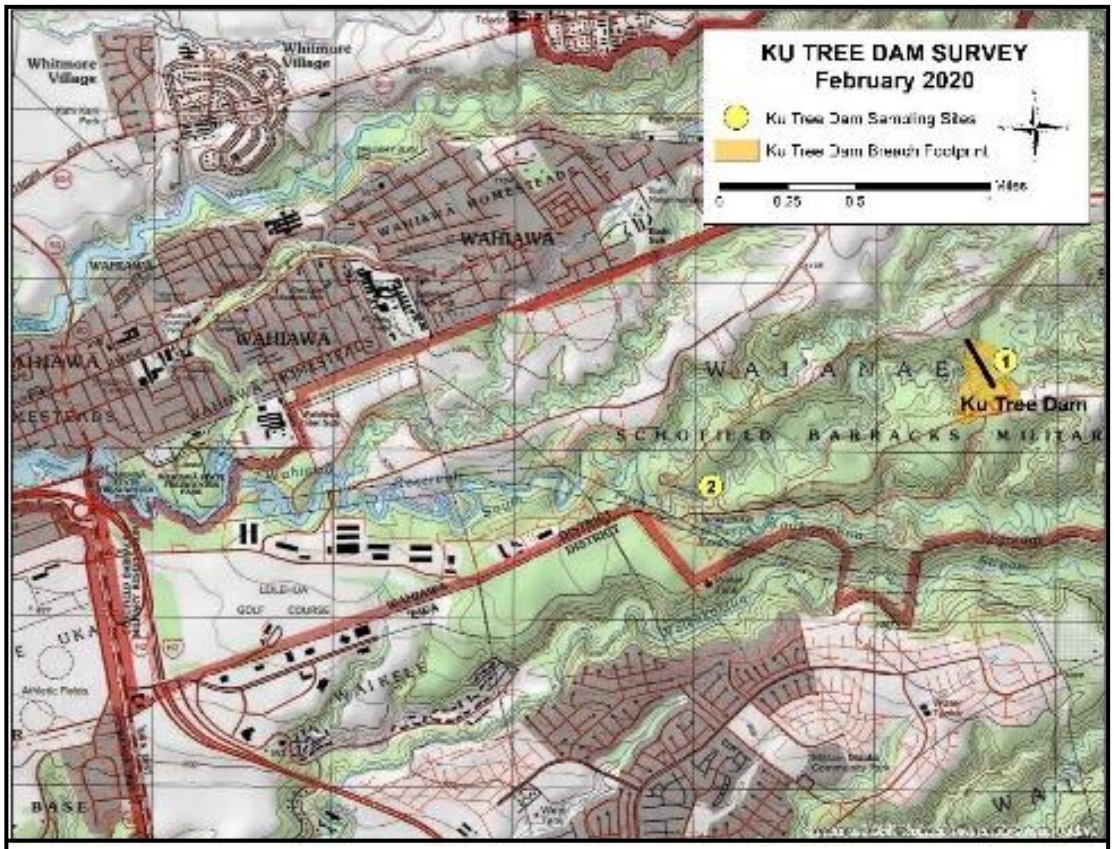

Figure 9. USFWS February 13, 2020 Site Visit Aquatic Survey Locations

No native freshwater fishes, crustaceans, mollusks, or insects were observed along either of stream reach. By contrast, non-native green swordtails (*Xiphophorus helleri*), mosquitofish (*Gambusia affinis*), guppies (*Poecilia reticulata*), and red swamp crayfish (*Procambarus clarkii*) were all observed. In addition, the presence of the Wahiawā Dam and Lake Wilson creates a barrier that prevents native diadromous aquatic species from reaching the upper portion of the Kaukonahua catchment at this time. The results of the February 13, 2020, site visit are summarized in Table 5 below.

The USFWS noted that riffle and pool habitat is currently present in the proposed project footprint. However, based on the disturbed nature of the stream channels examined during the site visit, which formerly lay under the reservoir pool, coupled with the current diversion of the stream waters into the drain tunnel for an extensive distance, and the presence of invasive fishes, the USFWS concluded that the habitat to be impacted in the vicinity of the project is of medium to low value for species of concern.

Table 5. USFWS February 13, 2020 Site Visit Aquatic Survey Results

Site No.	Location	Elev. (ft.)	Latitude and Longitude	Flow	Pools	Native Fish	Native Aquatic Insects	Hydrological Comments	Biological Comments
1	Tributary to South Fork Kaukonahua Stream above Ku Tree Dam	1080	Latitude: 21.497384 Longitude: -157.979475	Y	Y	N	N	Flowing water with riffle and pool habitat present	Non-native fishes and crayfish observed
2	Tributary to South Fork Kaukonahua Stream below Ku Tree Dam	980	Latitude: 21.490692 Longitude: -157.995198	Y	Y	N	N	Flowing water with riffle and pool habitat present	No aquatic species observed

General Watershed Observations and Biological Integrity of Ku Tree Reservoir Streams

General Observations

As part of the initial EA effort in 2004, habitat/bioassessment surveys were conducted in March 2003. The Habitat and Biological Assessment of the Ku Tree Reservoir Streams is attached as Appendix D. In general, the survey found that the natural landscape in and around the site was highly disturbed by massive concrete control structures with large quantities of loose soil and sediment deposited in the stream channels immediately upstream and downstream of the reservoir. The assessment’s findings were based upon four study stream sites—two above the dam and two below the dam.

Riparian zones in the lower stream sites were found to be highly shaded (70 percent closed) by guava and strawberry guava. The upper stream sites were found to be relatively open (2 to 5 percent closed) and dominated by large paper bark trees. Lack of functional understory vegetation in the lower stream sites appeared to be caused by a large biomass of strawberry guava leaves deposited on the forest floor. Exposed soil in riparian zones is likely another contributing factor to chronic soil deposition in stream channels at least in the areas below the reservoir.

In 2004 a biological survey (AECOS) was conducted upstream and downstream from Ku Tree Dam (Appendix A). In general, the survey found that given the significant physical barriers to

upstream migration, coupled with the presence of predatory species, native stream organisms are extremely low to non-existent in the Ku Tree Reservoir streams.

To evaluate the project impacts in accordance with provisions of the FWCA the USFWS conducted a site visit on February 13, 2020. In March 2020, the USFWS provided USAG-HI a *Draft Fish and Wildlife Coordination Act Planning Aid Report* for the proposed breaching of the Ku Tree Dam. In general, the report found that based on the disturbed nature of the stream channels examined during the site visit, which formerly lay under the reservoir pool, coupled with the current diversion of the stream waters into the drain tunnel for an extensive distance, and the presence of invasive fishes that the habitat to be impacted in the vicinity of the project is of medium to low value for species of concern. The *Draft Fish and Wildlife Coordination Act Planning Aid Report* is attached as Appendix F.

Biological Integrity of Ku Tree Reservoir Streams

Utilizing the Hawai‘i Stream Bioassessment Protocol (HSBP) scoring system, the Habitat and Biological Assessment (2004) concluded that the habitat quality and biological integrity of the Ku Tree Reservoir streams are severely “Impaired,” and thus had lost its resilience and natural biophysical ability to support robust populations of native stream animals (Appendix D). An Impaired rating indicates that the stream system has degraded to the point that it has lost natural ecosystem function and resilience.

The primary factors contributing to the loss of biological integrity are the high sediment deposition coupled with the inability of the ecosystem to transport this material. Sediment deposition was most severe in the two small streams feeding the reservoir, where mud layers greater than three feet deep were common. This condition in the stream channels above the reservoir has almost completely eliminated all natural rock habitat, and was thus considered one of the primary factors contributing to the biological impairment of the stream ecosystem. Stream banks at the study sites were found to be relatively stable; therefore, soil inputs into the stream channels were likely chronic and steadily deposited from sources further upstream. Another significant factor contributing is the severe disruption of natural flows to the downstream reaches of the stream below the reservoir, which severely reduces the in-stream habitat except during periods of flooding.

It should be noted that the USFWS, after reviewing the Preliminary Draft of the 2004/2005 EA (the letter is attached in Appendix F), disagreed with the location of the two study sites downstream of the dam. According to the USFWS, this reach of the stream is normally dewatered as it is located below the dam, but upstream of where surface flows are released by the drain tunnel. The more appropriate location for the study sites should be downstream of the drain tunnel, where the stream channel is rewatered. The USFWS also thought that the HSBP was an inappropriate method to evaluate stream fauna, given the circumstances of the stream system.

In 2004 a biological survey (AECOS) was conducted upstream and downstream from Ku Tree Dam (Appendix A). In general, the survey found that given the significant physical barriers to

upstream migration, coupled with the presence of predatory species, native stream organisms are extremely low to non-existent in the Ku Tree Reservoir streams.

To ascertain the current biological integrity of stream the USFWS conducted a site visit on February 13, 2020 and subsequently prepared the March 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* (Attached in Appendix F). Overall, the USFWS found the current native wildlife habitat functions and values along the tributary to Kaukonahua Stream to be extremely limited. As such, the USFWS concluded that breaching the Ku Tree Dam as proposed would have minimal impact to aquatic trust resources, and would in fact potentially enhance aquatic habitat values.

Additionally, given the disturbed nature of the stream channels examined during the site visit, which formerly lay under a reservoir pool; the current diversion of the stream waters into a drain tunnel for an extensive distance under the Ku Tree Dam; the presence of invasive, non-native aquatic biota; the apparent absence of diadromous aquatic macrofauna or ESA-listed native damselfly species in the project footprint; and the overwhelmingly non-native composition of the flora and fauna in at the proposed project construction site, the USFWS concluded that breaching the Ku Tree Dam and restoring a natural channel, would have no significant or deleterious impacts to trust resources, provided management practices as described in Section 3.5.2 are implemented during construction. The USFWS also concluded that the current USFWS *Draft Fish and Wildlife Coordination Act Planning Aid Report* (Attached in Appendix F) is sufficient to cover the current planning phase of the proposed project. In order to avoid or minimize any potential environmental effects, any significant changes to the proposed project plan would be coordinated with the USFWS and State DLNR.

Regulatory Framework

Endangered Species Act

The ESA of 1973 requires that any action authorized by a federal agency not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adversely modify designated habitat critical to that species. The USFWS has jurisdiction over endangered and threatened terrestrial flora, fauna, and birds. The ESA prohibits the harming or killing (also referred to as “taking”) of listed animal species without authorization. Under Section 7 of the Act, the federal agency responsible for the proposed action must consult with the USFWS when a proposed action may impact listed or candidate species under their jurisdiction.

U.S. Fish and Wildlife Coordination Act

The U.S. FWCA of 1934, as amended (16 U.S.C. § 661 et seq.), requires federal agencies to first consult with the USFWS whenever the waters or the channel of a water body are to be modified. The Act further requires that the federal agency also consult with the head of the state agency that administers wildlife resources of the state where the construction is proposed. The goal of the Act is to conserve wildlife by preventing the loss and damage to resources. Section 662 of the Act addresses the impounding, diverting, or controlling of waters and provides for the development and improvement of wildlife resources in connection with water resource development.

The Migratory Bird Treaty Act and Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)
The MBTA of 1918, as amended (16 U.S.C. §703-712) makes it unlawful to, among other things, pursue, hunt, take, capture, kill, transport or import any species listed under the Act. The MBTA implements conventions between the U.S and Great Britain, Mexico, Japan, and the Soviet Union.

EO 13186 was issued to assist federal agencies with their efforts to comply with the MBTA. It should be noted that the EO does not constitute any legal authorization that in any way supersedes the requirements outlined in the MBTA. The EO directs federal agencies undertaking actions that have or are likely to have a measurable adverse impact on migratory bird populations to develop and implement a Memorandum of Agreement with the USFWS addressing the conservation of these populations.

3.7.2 ENVIRONMENTAL CONSEQUENCES

3.7.2.1 Impact Methodology

Project actions are evaluated by their potential to effect biological resources, particularly those listed as endangered or threatened, or as a species of concern, as well as their compliance with federal, state and local regulations applicable to biological resources. Actions would be considered to have a significant impact if any of the following occur:

- ✓ Results in a “take” of a listed species;
- ✓ Adversely affects populations numbers of a listed species;
- ✓ Results in a jeopardy biological opinion by the USFWS;
- ✓ Destroys or adversely modifies designated critical habitat, or other management area designated by federal, state or local authorities;
- ✓ Results in the destruction or long-term degradation of wetland or riparian habitat;
- ✓ Alters or destroys habitat that would prevent biological communities in the area from reestablishing themselves;
- ✓ Interferes with wildlife migratory patterns, including aquatic species;
- ✓ Introduces undesirable or invasive species; or
- ✓ Causes long-term loss or impairment of a substantial portion of local habitat that species depends upon.

3.7.2.2 Proposed Action

The Proposed Action would have less than significant impacts on floral resources in the ROI. Vegetation removal would be necessary to implement the Proposed Action; however, vegetation in the ROI is dominated by introduced or alien species. None of the plants observed within the ROI during previous studies are listed as threatened or endangered, or a species of concern. To prevent the spread of noxious or invasive species the project will comply with the *USARHAW Washrack Utilization Policy to Control Invasive Species* which requires that vehicles and equipment are cleaned, washed, and inspected prior to movement to/from Schofield Barracks. Additionally, the project will comply with *Policy Memo USAG-HI-63, Landscaping with Native*

Plants. Where the use of native Hawaiian plant species cannot be used, the project will comply with base policy and undergo review and approval by the Directorate of Public Works.

While Rapid 'Ōhi'a Death is not known to occur on O‘ahu, if 'Ōhi'a trees are to be removed, trimmed, or potentially injured BMPs to avoid and prevent spread of the disease would be followed. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution, as necessary, to prevent the spread of Rapid 'Ōhi'a Death and other harmful fungal pathogens. Over time, the environment in the vicinity of the natural channel though the existing spillway is expected to transition into one that replicates naturally mature, vegetative conditions.

No avian, mammalian, or vertebrate species listed as endangered, threatened, proposed, or candidate species by the USFWS under the ESA would be affected by the Proposed Action. No protected avian species were detected within the ROI. Therefore, the Proposed Action is not expected to result in a “take” or otherwise adversely affect a listed species or species of concern, or their habitat.

While seabirds were not detected during surveys of the project site, artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, all lights should be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15, if possible. This is the period when young seabirds take their maiden voyage to the open sea.

While State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) were not detected during surveys of the project site, they have the potential to occur in the vicinity of the proposed project. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point the USFWS and Division of Forestry and Wildlife should be contacted immediately.

The Hawaiian hoary bat, while not detected during the mammalian survey, is known to be present at Schofield Barracks West Range. The following measures will be followed to minimize the potential for impacts to the Hawaiian hoary bat from the Proposed Action:

(1) During the bat pupping season, 1 June to 15 September, there shall be no cutting or trimming of any tree over 15 feet tall.
(2) If a tree falls on its own that is over 15 feet tall, the Army may remove the tree.

No other listed mammalian species are known to be present at the proposed site or within the ROI, nor is the existing habitat likely to support listed vertebrate species. During the demolition and construction phases of the Proposed Action, it is likely that individual alien bird and

mammal activity in the area may be temporarily disturbed. However, it is expected that post-completion of all construction work associated with the project that any displaced individuals will again resume use of the area after some time. Therefore, the Proposed Action would have less than significant impacts on terrestrial and avian faunal species in the short-term. No other listed terrestrial species are known to be present at the proposed site or within the ROI.

Although the ESA-listed native damselfly species (*Megalagrion nigrohamatum nigrolineatum*) has been recorded from the North Fork of Kaukonahua Stream at 1,500 feet elevation as recently as 1996, no sign of this species was detected in the proposed project area along a tributary to the South Fork of the Kaukonahua. Additionally, damselflies are not expected to be present in the project vicinity because the stream is overrun with alien fish that predate them. The absence of damselflies within the project area was confirmed during the February 2020 site visit by Dan Polhemus, USFWS biologist, and expert on native damselflies.

No listed aquatic species are known to be present at the proposed site or within the ROI. During the February 13, 2020 site visit the USFWS found the current native wildlife habitat functions and values along the tributary to Kaukonahua Stream to be extremely limited. As such, the 2020 USFWS *Draft Fish and Wildlife Coordination Act Planning Aid Report* (Attached in Appendix F) concluded that the Proposed Action would have minimal impact to aquatic trust resources, and would in fact potentially enhance aquatic habitat values. In accordance with the FWCA, the USFWS also provided their concurrence that the Proposed Action and *Draft Fish and Wildlife Coordination Act Planning Aid Report*, provided management practices are implemented during construction, is sufficient to cover the current planning phase of the proposed project.

In accordance with Section 7 of the ESA, USAG-HI notified the USFWS that a no effect determination was made for the Proposed Action (Kawelo, March 4, 2020). The USFWS indicated to USAG-HI that they received the determination of no effect. Determination of no effect is at the discretion of the action agency; however, if any new information or project alterations change this determination and trigger consultation under the ESA the USFWS will be contacted immediately (Donmoyer, March 4, 2020). Correspondence with the USFWS regarding ESA is attached as Appendix G.

The Proposed Action would have less than significant impacts on aquatic resources in the short-term due to ground disturbance required for construction. The new channel through the existing spillway is the most efficient route as it utilizes the existing hillside slope to reduce the quantity of excavation and earth disturbance to achieve the goal of removing the risk associated with the dam. The upstream dam would be filled with construction debris and approximately 112,000 cubic yards of excavated earth to block off water flow from entering the filled dam passage way. BMPs would be followed to prevent sediment and contaminants from impacting surface waters during construction, particularly during any in-stream work. In addition, Ku Tree Dam is currently in a drawn down state and would remain that way throughout construction. There would not be a surge of loose sediment released once the breach is complete.

Once completed, the Proposed Action is expected to have beneficial impacts on aquatic resources by improving stream ecological and hydrological functions, such as flood plain water

storage and detention, and ground water recharge. The Prosed Action would allow for the reconnection of formerly severed stream channels and floodplains by reconnecting the natural stream channel above and below the dam through the existing spillway. This would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients. In areas subject to stream flow, turf reinforcement mats would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel. This combined with the reconnection of the stream above and below the dam is expected to beneficial impacts on stream health by returning it to its natural, free-flowing state, while minimizing sediment release.

While breaching the dam may increase the ability of native amphidromous and diadromous aquatic species to migrate up and down the stream, the presence of the Wahiawā Dam and Lake Wilson creates a barrier that prevents aquatic species from reaching the upper portion of the Kaukonahua catchment at this time. While this barrier is expected to limit native aquatic movement following the dam breach, it is also expected to prevent the migration of introduced/invasive species from moving upstream. Overall, breaching the dam with a natural channel through the existing spillway would have beneficial impacts on aquatic resources throughout the stream by allowing restoration of natural seasonal flow variations, eliminating siltation, allowing nutrients to pass downstream, and eliminating unnatural temperature variations.

3.7.2.3 Alternative A: No Action

Under the No Action alternative, the dam and its appurtenant structures would remain and no construction or demolition activities would occur. Disruption of habitat or avian or mammalian activity would not occur. Short-term water quality impacts would not occur as there would be no potential for construction-related erosion or sedimentation to affect aquatic habitats. While well-designed and properly managed dams can provide many benefits, they drastically alter natural communities. The natural flow of water and sediment is impeded, and populations of native species are damaged. Under the No Action alternative, there would be no restoration of connectivity for water, and no habitat or aquatic improvements. Based on this, the impacts of No Action on biological resources would be less than significant.

3.7.2.4 Alternative B: Notching the Dam

Like the Proposed Action, Alternative B would have less than significant impacts on biological resources in the short-term. Construction and demolition activities may temporarily disturb terrestrial or avian species in the ROI; however, it is expected that any displaced species would return once the project is completed. No impacts on avian and terrestrial species would occur over the long-term. It is expected that there would be no impacts on any listed species or species of concern. Similar to the Proposed Action, BMPs would be followed to prevent the spread of noxious or invasive species and to minimize the potential for impacts to state listed seabirds, waterbirds, and the Hawaiian hoary bat. No other listed species are known to occur in the ROI.

Like the Proposed Action, over time, the environment in the vicinity of the natural channel through the dam crest is also expected to transition into one that replicates naturally mature,

vegetative conditions. Under this alternative, approximately 356,000 cubic yards of excavated earth would be removed. Construction activities required for Alternative C would likely have a greater effect on short term water quality impacts than the Proposed Action due to the complete removal of the dam, larger quantity of sediment to be excavated, and more in-stream work. Therefore, adhering to BMPs to address erosion, sedimentation, contaminants and surface runoff would be critical to preventing impacts on the aquatic environment during construction. Once completed, Alternative B would have beneficial impacts on biological resources by reconnecting the stream channel above and below the dam, which would restore aquatic and riparian habitat and re-water a currently dry stream reach below the reservoir.

3.7.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would have less than significant impacts on biological resources in the short-term. Construction and demolition activities may result in the temporary disturbance of habitat and activities; however, avian and mammalian species would return to the site after work is completed. Similar to the Proposed Action, BMPs would be followed to prevent the spread of noxious or invasive species and to minimize the potential for impacts to state listed seabirds, waterbirds, and the Hawaiian hoary bat. No other listed species are known to occur in the ROI.

Under this alternative, approximately 246,000 cubic yards of excavated earth would be removed. Impacts related to construction activities would likely have a greater effect on the aquatic environment than the Proposed Action due to the complete removal of the dam and more in-stream work. Therefore, adhering to BMPs to address erosion, sedimentation, contaminants and surface runoff would be critical to preventing impacts on the aquatic environment during construction. Over time, the environment in the vicinity of the restored stream is expected to transition into one that replicates naturally mature, vegetative conditions (Kimura International, 2005). Over the long-term, Alternative C would have beneficial impacts on biological resources by restoring the site to pre-dam conditions and reconnecting the stream channel above and below the dam, which would restore aquatic and riparian habitat and re-water a currently dry stream reach below the reservoir.

3.8 Socio-Economic Environment

3.8.1 Affected Environment

3.8.1.1 Region of Influence

The ROI for the purposes of analyzing potential impacts to the socio-economic environment is the island of O‘ahu. The socioeconomic indicators used for this analysis include population, employment, and housing.

3.8.1.2 Existing Conditions

Population

Table 6 presents population trends for the State of Hawai‘i and County of Honolulu. The population at both the state and county level grew less rapidly between 2000 and 2010 than in the previous decade. The population at both the state and county level grew less rapidly between 2010 and 2018 than between 2000 and 2010. Between 2000 and 2010 the state population grew at an average annual rate of 0.7% while the average annual population growth of the County of Honolulu was 0.4%. Between 2010 and 2018 the state population grew at an average annual rate of 0.5%, with two years of negative growth in 2017 and 2018. The statewide negative population growths in 2017 and 2018 attributed to the negative growth in the County of Honolulu due to out-migration of people leaving for the U.S. mainland. Between 2010 and 2018 the average annual population growth of the County of Honolulu was 0.3%.

Table 6. State of Hawai‘i and County of Honolulu Population Trends[a]

	2000 Total Population	2010 Total Population	2018 Total Population	% Change 2000-2010	% Change 2010-2018
State of Hawai‘i	1,211,537	1,360,301	1,420,491	+7.3	+4.4
Honolulu County (O‘ahu)	876,156	953,206	980,080	+3.8	+2.8

Source: DBEDT, 2019
a. Total population data is based on tabulation from the U.S. Census Bureau.

Employment

Table 7 shows employment information for County of Honolulu by industrial sector. As Table 7 demonstrates, the largest economic sectors within County of Honolulu are (1) educational services, health care, and social assistance—accounting for approximately 21.7 percent of total employment; and, each accounting for 10 percent or more of total employment are (2) arts, entertainment, recreation, accommodation, and foodservices; (3) retail trade; and, (4) public administration. The construction field accounted for 7 percent of employment.

Table 7. Employment by Sector for County of Honolulu

Sector	Number of Persons, 2017	% of Total, 2017
Total Employment	467,165	100.0
Educational services, health care, and social assistance	101,334	21.7
Arts, entertainment, recreation, accommodation, and food services	67,587	14.5
Retail trade	53,667	11.5
Professional, scientific, management, and administrative and waste management	46,998	10.0
Public administration	45,703	9.8
Construction	32,721	7.0
Finance, insurance, and real estate	32,541	7.0
Transportation, warehousing, and utilities	28,595	6.1
Other services, except public administration	20,015	4.3

Sector	Number of Persons, 2017	% of Total, 2017
Manufacturing	15,395	3.3
Wholesale trade	11,466	2.5
Information	8,139	1.7
Agriculture, forestry, fishing, and hunting	3,004	0.6

Source: U.S. Census Bureau 2017

Housing

Table 8 presents housing occupancy rates for County of Honolulu. Within the ten-year period encompassed by Table 8, there was a 3.5 percent increase in total available housing units, and a 15.6 percent increase in the housing vacancy rate.

Table 8. Housing Occupancy Trends for the County of Honolulu

	2007	2017	% Change
Total Units	334,799	346,374	+3.5
Occupied Units	304,611	311,451	+2.2
Vacant Units	30,188	34,923	+15.6

Source: U.S. Census Bureau 2017

3.8.2 Environmental Consequences

For the purposes of impact analysis, each alternative was reviewed and evaluated for potential impacts to each of the socioeconomic indicators identified for this VEC. Project actions for the Proposed Action or alternatives would be determined to have a significant impact if implementation of the action would result in:

- ✓ A sudden and substantial change to population, such that it would produce measurable indirect effects on the County of Honolulu’s economy, or demand on public services and facilities,
- ✓ A sudden change in employment that would impact the economic vitality of the County of Honolulu, or
- ✓ A sudden and substantial change to housing demands or availability.

3.8.2.1 Proposed Action

The Proposed Action has no population-related or housing-related components; therefore, there would be no impact on population or housing for the County of Honolulu. The Proposed Action would create short-term, beneficial impacts on the economy in the form of temporary construction jobs. Other economic benefits that would result are the purchase of local goods and services and increased tax revenue. Economic benefits would accrue throughout the ROI due to the regional labor market. Once construction is completed, the Proposed Action would have no impacts on the economic environment.

3.8.2.2 Alternative A: No Action

Under the No Action alternative, no construction or demolition activities would take place and there would be no impact on employment nor would there be other economic benefits from expenditures for the purchase of local goods and services or increased tax revenue. No Action would also have no impact on population or housing.

3.8.2.3 Alternative B: Notching the Dam

Similar to the Proposed Action, Alternative B has no population-related or housing-related component, and would have no impact on the ROI’s population or housing. However, implementation of this alternative would have beneficial impacts on employment in the form of temporary construction jobs. Other economic benefits that would result from Alternative B are the purchase of local goods and services and increased tax revenue. Economic benefits would accrue throughout the ROI due to the regional labor market. Once construction is completed, the Alternative B would have no impacts on the economic environment.

3.8.2.4 Alternative C: Dam Removal and Site Restoration

Similar to the Proposed Action and Alternative B, Alternative C has no population- or housing-related components, and would have no impact on the ROI’s population or housing. Alternative C would provide beneficial impacts on employment in the form of temporary construction jobs and economic benefits through the purchase of local goods and services and increased tax revenue. Economic benefits would accrue throughout the ROI due to the regional labor market. Alternative C would have no long-term impacts on employment.

3.9 Environmental Justice

3.9.1 Affected Environment

3.9.1.1 Region of Influence

For the purposes of this EA, the census block groups comprising the nearby population centers of Wahiawā, Mililani, and Wheeler Airfield/Schofield Barracks were used as the ROI for Environmental Justice analysis. Wahiawā and Mililani are the nearest civilian communities to the project site.

3.9.1.2 Existing Conditions

EO 12898 Environmental Justice

Environmental Justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. On 11 February 1994, President Clinton issued EO 12898 entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. EO 12898 requires federal agencies to identify and address disproportionately high and adverse human health and environmental effects of federal programs, policies, and activities may have on minority and low-income populations.

A Presidential memorandum that accompanied EO 12898 specified that federal agencies “shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities, when such analysis is required by the National Environmental Policy Act of 1969, 42 U.S.C. Section § 4321 et seq.” The memorandum further stated that federal agencies “shall provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents, and notices.”

The demographic profile for the ROI and State of Hawai‘i is unusual among U.S. communities because the population has no racial majority. Table 9 provides racial data at the U.S., State of Hawai‘i, and ROI level for the purpose of EJ analysis. As Table 9 demonstrates, both the State of Hawai‘i and the ROI have very different racial profiles than the U.S. Populations considered minorities at the national level comprise approximately 75 percent of Hawaii’s population and 37 percent of the population of the ROI. The racial profile of the ROI is similar to the State of Hawai‘i except with reference to White/Caucasian, African American and Asian racial/ethnic categories. The differences between these two populations at the state are influenced by the military population of Schofield Barracks. The average number of families living below the poverty level in the ROI is lower than at the State of Hawai‘i and U.S. levels.

Table 9. Race, Ethnicity, and Poverty Status in the U.S., State of Hawai‘i, and Region of Influence for Environmental Justice Analysis

	Percentage of the Population		
	United States	**State of Hawai‘i**	**ROI**
White/Caucasian	73.0	25.1	25.9
African American	12.7	1.8	5.0
American Indian/Native Alaskan	0.8	0.2	0.2
Asian	5.4	38.0	34.8
Native Hawaiian or Other Pacific Islander	0.2	10.0	5.0
Other	4.8	1.0	1.2
Two or More Races	3.1	23.8	27.9
Living in Poverty	14.6	10.3	6.9

Source: American Community Survey, 2017, Table B02001, 5-yr estimates. U.S. Census Bureau 2000

A comparison of demographic data between the ROI and the County of Honolulu is presented in Table 10. As of the 2017 American Community Survey,[2] the ROI had a population of 91,922 persons or roughly 9 percent of the population of the County of Honolulu, which encompasses the entire island of O‘ahu. The median age group in the ROI was 35.2 years, a few years younger than the median age for the County of Honolulu of 37.6 years. Asians made up the largest portion of the population, accounting for approximately 34.8 percent of the ROI, as

[2] Full data from the 2018 ACS is not yet available.

compared to 42.9 percent for O‘ahu. Caucasians and those who identified themselves as Two or More Races comprised the next two highest racial identities, 25.9 and 27.9 percent for the ROI, respectively. This compares to 21.1 and 23.2 percent for O‘ahu. Native Hawaiians and Other Pacific Islanders comprised 5.0 percent of the ROI population, compared to 9.4 for O‘ahu.

Table 10. Demographic Profile of the Region of Influence and County of Honolulu for Environmental Justice Analysis

	ROI		County of Honolulu (O‘ahu)	
	Total	***Percentage***	***Total***	***Percentage***
Basic Demographic				
Total Population	91,922	100.0	990,060	100.0
Median Household Income	$80078	--	$83065	--
Median Age	35.2	--	37.6	--
Education				
Total Population (over age 25) with a Bachelors Degree or higher	15,041	33.7	184,115	35.6
Unemployment				
Total Unemployment (over age 16)	2,143	4.3	20,705	3.9
Race				
Caucasian alone	23,825	25.9	209,222	21.1
African American alone	4,640	5.0	23,248	2.3
American Indian / Native Alaskan alone	162	0.2	1,391	0.1
Asian alone	32,021	34.8	424,558	42.9
Native Hawaiian or Other Pacific Islander	4,621	5.0	92,743	9.4
Other (1 race)	1,071	1.2	9,539	1.0
2 or more races	25,612	27.9	229,359	23.2
Poverty				
Individuals below poverty level	6,016	6.9	86,868	8.8

Source: ACS 2017, age Table B01002, income Table B19013, education Table B23006, race Table B02001, unemployment Table S2301.

The median household income for the ROI was slightly lower than the County of Honolulu. The median household income for the County of Honolulu (O‘ahu) was $83,065. By comparison, the ROI had a median household income of $80,078. Consistent with that finding, slightly more individuals were identified as living below the poverty level. Within the ROI 6.9 percent of individuals were counted as living below the poverty level, as compared to 8.8 percent for the County of Honolulu.

The total number of unemployed persons over 16 years old residing in the ROI was 2,143, which accounts for 4.3 percent of area’s population, slightly lower than the same statistic for the County of Honolulu. The ROI also had less people between ages 25 and 64 who had earned a bachelor’s degree or higher. The comparative figures were 33.7 percent for the ROI, versus 35.6 percent for the County of Honolulu, respectively.

Within the ROI, seven census block groups were identified as areas for EJ consideration because of their minority populations. Two census block groups were identified as areas for EJ consideration because of their low-income populations. Two areas, Wahiawa Makai 94001 and Schofield Barracks 95019, were classified as having both high percentages of minority groups and relatively high percentages of persons living below the poverty line. Table 11 presents the block groups classified as EJ areas and the basis for their classification. As the EJ populations are defined by income and ethnicity, the designation of Schofield and the Schofield Barracks block groups as an EJ population is misleading, as the ethnic makeup of these areas are skewed due to the high number of African Americans and Hispanics in the military. These block groups are located within military installations and their populations are mostly military personnel.

Table 11. Environmental Justice Populations by Block Group in the Region of Influence

Location	Block Group	Low-Income	Minority
Mililani-Kīpapa	89079		x
Waipio Acres	89151		x
Mililani Mauka	89169		x
Mililani – Nob Hill	89181		x
Schofield	90009		x
Wahiawā – Mauka	92001		x
Wahiawā – Makai	94001	x	x
Schofield Barracks	95019	x	x
Schofield Barracks	95029		x
Schofield Barracks	95039		x
Schofield Barracks	95059		x

Source: ACS 2017, See also Table 10.

Executive Order 13045 – Environmental Health Risks and Safety Risks to Children

On April 20, 1997, EO 13045 entitled *Protection of Children from Environmental Health Risks and Safety Risks* was issued. EO 13045 requires that federal agencies make it a priority to identify and assess environmental health and safety risks that may disproportionately affect children. It also requires that agencies ensure that their policies, programs, activities, and standards address such risks.

3.9.2 Environmental Consequences

3.9.2.1 Impact Methodology

For the purpose of EJ impact analysis, EJ populations were first identified, then the Proposed Action and alternatives were reviewed for potential impacts to these low-income or minority populations. An impact would be considered significant if it posed disproportionate economic, environmental, or health risks on low-income or minority populations.

3.9.2.2 Proposed Action

The Proposed Action would have no impact related to EJ or environmental health risks and safety to children. The project site is located in an isolated location within a military training

range, which is generally off-limits to the civilian population. There are no children or EJ populations in the vicinity of the project site. The nearest civilian communities where there would be measurable populations of children are Wahiawā and Mililani Mauka, both of which are over 4,000 feet from the project site. The nearest EJ populations are Wahiawa Makai 94001 and Schofield Barracks 95019, the nearest point off which is located about 4,000 feet from the project site. The Proposed Action would benefit the area’s population, regardless of race, ethnicity or socioeconomic status by eliminating the risk of potential dam failure. In addition, the Proposed Action was not biased by race or income, but is the result of an objective evaluation that indicates the need for the project to address health and safety requirements. All of the potential impacts resulting from the Proposed Action would be temporary and limited in severity (i.e., less than significant) and most would be limited to the immediate vicinity of the project. Therefore, the Proposed Action would have no environmental or safety risks to children or affect EJ populations, much less have any disproportionate effects on these special groups.

3.9.2.3 Alternative A: No Action

Under the No Action alternative the dam and appurtenant structures would remain and there would be no construction or demolition activities. No maintenance would take place and the dam would continue to deteriorate. The potential for dam failure and associated impacts downstream would remain. EJ populations have been identified downstream of the project site, which include the Schofield Barracks block groups and Wahiawā – Makai. No Action would not create a new safety hazard, but would maintain current conditions. Due to the continued potential safety hazards, No Action would have less than significant impacts on the EJ populations located downstream.

3.9.2.4 Alternative B: Notching the Dam

The project site for Alternative B is the same as the Proposed Action, but accomplishes the purpose and need for the project through different means. Potential impacts resulting from Alternative B are expected to be similar to the Proposed Action. As such, Alternative B also would have no impacts related EJ or environmental health risks and safety to children.

3.9.2.5 Alternative C: Dam Removal and Site Restoration

The project site for Alternative C is the same as the Proposed Action, but accomplishes the purpose and need for the project through different means. Potential impacts resulting from dam removal and site restoration are expected to be similar to the Proposed Action. As such, Alternative C would have no impacts related EJ or environmental health risks and safety to children.

3.10 Land Use

3.10.1 Affected Environment

3.10.1.1 Region of Influence

Due to the isolated location of the project site on a military-controlled land with very limited public access, the ROI for analyzing potential impacts to land use is the Schofield Barrack’s East Range, where the project site is located.

3.10.1.2 Existing Conditions

The Schofield Barrack’s East Range consists of 5,154 ac (2,086 ha). According to the installation master plan, land uses in the East Range consist of Training, Conservation/Buffer, Supply/Storage, Outdoor Recreation, and Maintenance. Facilities within the East Range include education facilities, the light infantry training command, a golf course, the U.S. Army Non-Commissioned Officers Academy, warehouses, and a maintenance facility. Training is the largest land use designation in the East Range, with 2,223 ac (900 ha) designated for training and maneuvers. Infantry training and maneuvers, including air assault and airborne training occur within this area; however, no live-fire training is conducted. The project site is located in the Schofield Barrack’s East Range within the Training-designated land use area.

Regulatory Framework

Coastal Zone Management Act

The CZMA of 1972, as amended (16 U.S.C. § 1451 et seq.), is administered in Hawai‘i by the Department of Business Economic Development and Tourism’s (DBEDT) Office of Planning. The Coastal Zone Management (CZM) program objectives and policies are to provide coastal recreational opportunities; preserve and protect historic, scenic and coastal ecosystem resources; provide economic uses; reduce coastal hazards; improve public awareness in coastal zone management; and manage development within the coastal zone. The CZMA requires federal agencies to conduct their planning, management, development, and regulatory activities in a manner consistent, to the maximum extent practicable, with the federally-approved state coastal zone management program.

3.10.2 Environmental Consequences

3.10.2.1 Impact Methodology

Project actions are evaluated against the existing land use and its supported activities within the ROI. Actions are determined to have a significant impact if it causes a long-term or permanent disruption or conflicts with an existing land use, or conflicts with the base master/development plan.

3.10.2.2 Proposed Action

The Proposed Action would have less than significant impacts on land use, although these impacts would be temporary. The project site is located amidst land designated for troop training and is currently used for training exercise. Construction and demolition activities may temporarily disrupt training activities, but once completed would not interfere with training activities in the long-term. To minimize disruption to training exercises, construction and demolition activities would be closely coordinated with the range scheduling office.

The Proposed Action is not expected to have any spillover effects into the coastal zone (i.e., would not affect land, water use, or natural resources of the "coastal zone" subject to management under CZMA). All construction and demolition activities would take place within Schofield Barrack’s East Range and no off-base construction-related activities or impacts are anticipated.

3.10.2.3 Alternative A: No Action

Under the No Action alternative, the dam and appurtenant structures would remain and no construction or demolition would occur. No Action would not change the current land use of the area nor would it disrupt or conflict with surrounding lands use, which is used for training exercises. No Action would have no impact on Land Use.

3.10.2.4 Alternative B: Notching the Dam

Similar to the Proposed Action, there would be less than significant impacts on land uses with implementation of Alternative B due to the potential to disrupt training exercised in the East Range. No long-term impacts on land use are expected.

3.10.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C also would have less than significant impacts on land use due to the potential to temporarily disrupt training exercised within the East Range. No impacts to land use are expected in the long-term.

3.11 Visual and Aesthetic Resources

3.11.1 Affected Environment

3.11.1.1 Region of Influence

The project area is located entirely within a military installation and is not readily accessible or visible to the general population. Therefore, the ROI for analysis of potential impacts on visual and aesthetic resources is limited to the areas where construction or demolition activities would occur.

3.11.1.2 Existing Conditions

The character of the project site is typical of forested areas in Hawai‘i, consisting of a variety of large trees and an understory of shrubs and grasses. Views of the dam and the former reservoir are obscured by tall trees and heavy vegetation. The project site is also in an isolated area that is heavily forested and cannot be seen from any public area (e.g., public road, scenic corridor, or vantage point). Likewise, due to the heavy vegetation, there are no scenic vistas or vantage points from the dam and reservoir site.

3.11.2 Environmental Consequences

3.11.2.1 Impact Methodology

Impacts to this VEC are evaluated on the basis of the amount or severity of change to the aesthetic and visual resources of the affected environment, as well as the resulting extent of diminished viewing opportunities or enjoyment. Aesthetic/visual impacts would be considered significant if project actions would substantially degrade the visual and aesthetic character of the area, degrade existing viewsheds or scenic vistas, alter the character of the viewshed by the introduction of anomalous structures or elements, or create a new and substantial source of light

or glare. Significant impacts would also occur if project actions substantially damage scenic resources, including, but not limited to, trees, rock outcroppings or natural formations.

3.11.2.2 Proposed Action

The Proposed Action would have beneficial impacts on visual and aesthetic resources by demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir and allowing the project site to return to a more natural looking environment. No new facilities would be constructed; thus, there would be no new anomalous structures or sources of light or glare.

3.11.2.3 Alternative A: No Action

Under the No Action alternative, current conditions would remain unchanged and no construction or demolition would occur. The existing concrete structures would continue to deteriorate degrading the aesthetic and visual resources of the East Range. However, since the project site is isolated and not publicly viewable, the impacts of No Action would be less than significant.

3.11.2.4 Alternative B: Notching the Dam

Like the Proposed Action, Alternative B would have beneficial impacts on visual and aesthetic resources by demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir and allowing the project site to return to a more natural looking environment. No new facilities would be constructed; thus, there would be no new anomalous structures or sources of light or glare.

3.11.2.5 Alternative C: Dam Removal and Site Restoration

Like the Proposed Action, Alternative C would have beneficial impacts by not only demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir, but also by removing the dam itself and restoring the project site to pre-dam conditions.

3.12 Cultural Resources

3.12.1 Affected Environment

3.12.1.1 Region of Influence

The ROI for analyzing impacts on cultural resources is defined as the areas where construction or demolition activities would occur, including any temporary staging and storage areas.

3.12.1.2 Existing Conditions

The East Range is part of the ancient land-locked ahupua‘a of Wai‘anae Uka that extends over central O‘ahu between the Ko‘olau and Wai‘anae mountains. Wai‘anae Uka is relatively narrow and bounded by the central summits of the Wai‘anae Range to the west and the Ko‘olau Range to the east. The ahupua‘a of Wai‘anae Uka and Wahiawā are within the moku of Wai‘anae.

History of the Project Area

Settlement and land use in Wai‘anae Uka can be classified into three time periods: 1) traditional Hawaiian use during the prehistoric and early historic period; 2) ranching during the middle to late 19th century; and 3) U.S. military occupation during the 20th century.

Of these three time periods, the era most relevant to the project vicinity is the period of military occupation. Military use of Wai‘anae Uka began in 1899 when Wai‘anae Uka was set aside as a U.S. military reservation by Executive Order G.O. 147 (Alvarez, 1982). The initial intent of the reserve was to provide a place for soldiers to recuperate after fighting in the Philippines. The location of Wai‘anae Uka was also considered to be advantageous as the base for O‘ahu’s mobile defense troops because of its strategic central location on the island.

A 1919 Water Supply System map prepared by the Office of Constructing Quartermaster indicates that water sources from both the Ko‘olau and Wai‘anae mountain slopes were exploited during Schofield Barrack’s early days to support its growing population. Monumental water procurement structures were established in the “Ko‘olau Watershed,” which included an intake dam (Canon Dam) on upper Kaukonahua Stream and connecting tunnels and flumes to transport water down slope to the Ko‘olau and the lower East Pump Station reservoirs.

Although construction paused during World War I, following the declaration of war in 1917, most of the major building projects initially planned for Schofield were completed in the early 1920s. In 1925, a larger reservoir (Ku Tree Reservoir) and connecting tunnel-flume system was constructed in the Ko‘olaus, in the Kalakoa Stream just north of Kaukonahua Stream. The Ku Tree Reservoir tapped into the pre-existing Canon Dam and its ditch and tunnel system; however, it was known to dry up during times of drought.

By the end of World War II, the population at Schofield Barracks decreased to just 5,000 individuals. In the early 1920s, a 600-foot deep well with an “inexhaustible source of pure water” was drilled at Schofield (Honolulu Advertiser, quoted in Robins and Spear, 2002, p. 34). This technology improvement probably was the impetus to abandon the Canon and Ku Tree Dams and their respective storage reservoirs. The reservoir continued to provide irrigation water though the 1970s until it was emptied in 1983 to conduct a safety inspection. The components were found to be severely deteriorated; the dam was determined to be unsafe, and the reservoir was never refilled. Subsequent safety inspections by the State of Hawaii in 2014 and the U.S. Army in 2017 identified the potential hazards of catastrophic dam failure.

Steps Taken to Identify Historic Properties per 36 CFR § 800.11(d)(2)

The proposed project to breach Ku Tree Dam will be funded and carried out by the U.S. Army on federal land and is a federal undertaking that has the potential to cause effects on historic properties as defined in 36 CFR § 800.3(a).

The USAG-HI has taken several steps to identify historic properties in the project Area of Potential Effect (APE), including, intensive survey, field reconnaissance, consultation, archival research, and architectural analysis.

The APE for the undertaking is 28.5 acres and is illustrated in Figure 10. The APE includes the footprint of all demolition and construction activities, the access route from the East Range road, and sufficient space for storing equipment and material during the project.

In 1997, USAG-HI contracted with Scientific Consulting Services (SCS) to conduct an intensive cultural resources inventory survey in a large portion of Schofield Barracks East Range (Robins and Spear 2002). That inventory survey covered more than half of the APE for the current undertaking. SCS identified Ku Tree Dam and its associated components as a *potential* historic property and assigned it State Inventory of Historic Places number 50-80-05-5509. SCS did not identify any other buildings, structures, sites, districts, or objects within the current APE for the dam breach project.

The SCS report documented four components of the historic-period structure: an earthen dam, a concrete control tower, a concrete foot bridge, and a concrete spillway. SCS inaccurately identified those four constructed components as “historic archaeological features” (Robins and Spear 2002:83). As part of the designed and engineered structure, they are actually architectural and engineering features. SCS recommended to USAG-HI that Ku Tree Dam could be considered eligible to the National Register of Historic Places (NRHP) under Criterion D because of the information potential of the engineered structure, and suggested that it be preserved as an example of an architectural type. It is very uncommon for historic period buildings and structures to be considered eligible for the NRHP because of their information potential. SCS did not provide any rationale for their recommendation and USAG-HI did not request any clarification. After receiving the report from SCS, USAG-HI did not formally evaluate the significance and integrity of the structure against the NRHP criteria to make official determination of NRHP eligibility. USAG-HI instead chose to simply treat the dam as eligible based solely on the recommendation from the archaeological contractor, which was standard practice for the USAG-HI cultural resources program at the time.

In 2004, USAG-HI proposed an undertaking to breach Ku Tree Dam. That proposal was nearly identical to the currently proposed undertaking, the only difference being a slightly shorter, narrower, and concrete-lined channel in the 2004 proposal. In accordance with the NHPA, USAG-HI initiated consultation with the Hawai‘i State Historic Preservation Division (SHPD), OHA, Hui Mālama I Na Kupuna O Hawai‘i Nei, Association of Hawaiian Civic Clubs, and Historic Hawai‘i Foundation about the proposed undertaking and the potential effects to historic properties in the area.

The USACE hosted an on-site inspection of the Ku Tree Dam project area with SHPD staff and Mr. Tom Lenchanko of the Hawaiian Civic Club of Wahiawa on June 9, 2004. During the visit, SHPD staff recommended that the Army complete Historic American Engineering Record (HAER) documentation of the dam components. None of the consulting parties expressed concerns about other historic properties or cultural resources in the area, although Mr. Lenchanko and the Wahiawa Civic Club expressed concerns about the impacts to natural resources resulting from the proposed concrete-lined stream channel and the burial of demolished concrete behind the dam.

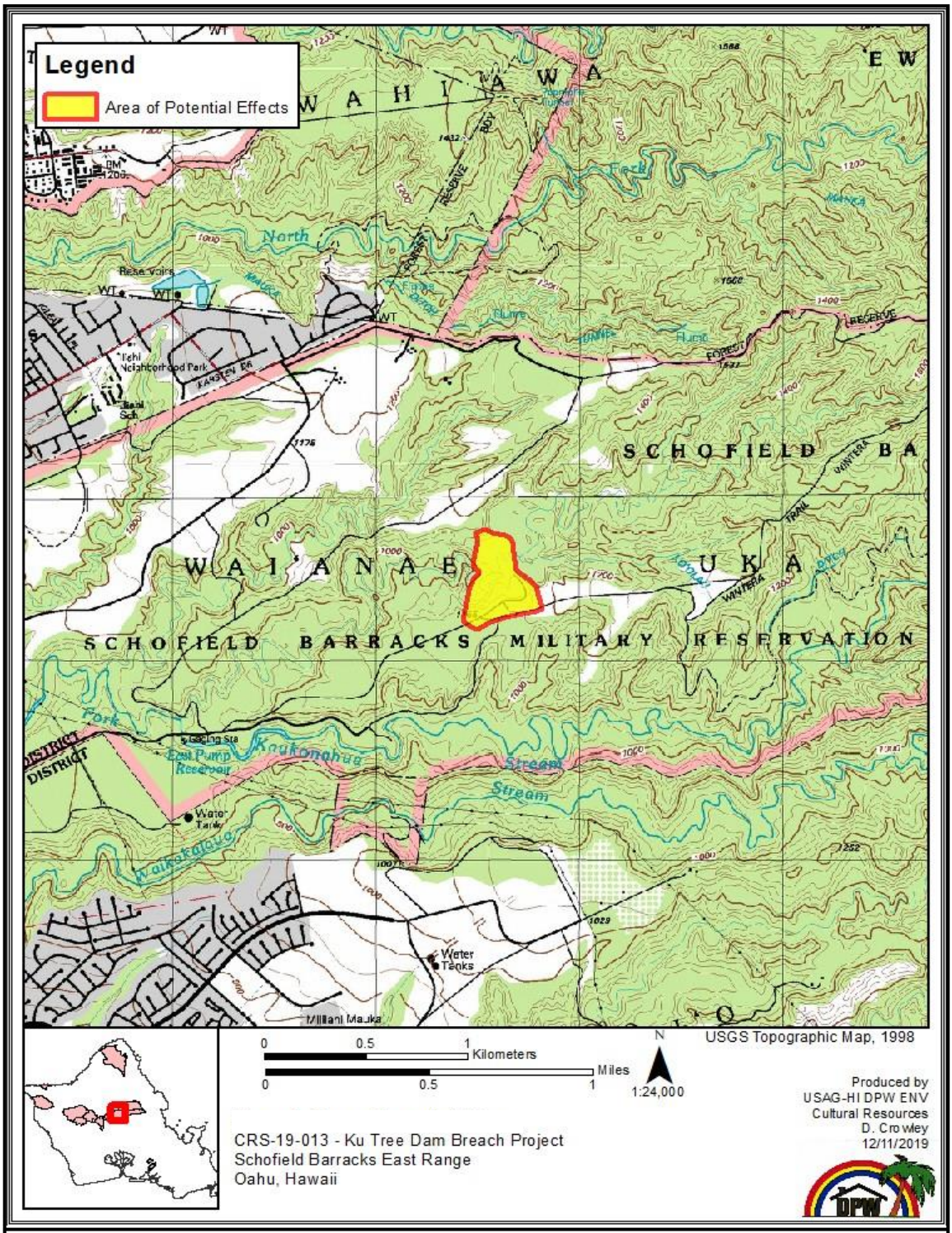

Figure 10. Area of Potential Effect

After the site visit, on June 30, 2004, USAG-HI sent a letter to the consulting parties acknowledging the NRHP eligibility recommendation by SCS, but did not formally accept it. The letter recognized that the proposed project could result in adverse effects, offered the HAER documentation of the architectural elements as mitigation for proposed impact of the dam breach, and made a finding of “no adverse effect on historic properties.”

The OHA, echoing the concerns of Mr. Lenchanko and Hawaiian Civic Club of Wahiawā, responded by mail on September 2, 2004. They expressed concerns about water quality, asked if there was a way to avoid lining the channel with concrete to support reintroduction of native species, and inquired if there was a better place to dispose of the demolition debris rather than burying it beneath the excess fill on the upstream side of the dam.

USAG-HI received a consultation response letter from the SHPD in May of 2008, almost four years later (Appendix E). The SHPD response letter concluded that Ku Tree Dam components have lost their historic integrity and expressed the opinion that the determination of effect for architectural concerns is “no adverse effect.” The letter also acknowledged that USAG-HI staff agreed to SHPD’s request for HAER documentation for their records. Regarding potential archaeological concerns, the SHPD letter stated that “the area has been previously disturbed and a great deal of fill was introduced to construct the earthen dam and therefore is unlikely to retain cultural deposits.”

After receiving the letter from the SHPD in May of 2008, USAG-HI contracted with Mason Architects to complete the HAER documentation requested by the SHPD. The resulting HAER report (Appendix E) was submitted to the SHPD and the National Park Service on December 11, 2008 and subsequently filed with the Library of Congress (HAER Call Number HI-81). USAG-HI also worked to redesign the project to address the concerns about water quality and the concrete-lined stream channel expressed by the Hawaiian Civic Club of Wahiawā and the OHA. For unknown reasons, the breach project was put on hold in 2009 and was not revived until the most recent safety inspections were conducted.

Upon resuming the project, it was noted that the NRHP eligibility recommendation by SCS was not conducted in accordance with the NRHP criteria for evaluation found at 36 CFR § 60.4 and USAG-HI did not make a formal determination of eligibility. Subsequent correspondence between USAG-HI and SHPD did not clarify the NRHP status of Ku Tree Dam. A formal application of the NRHP criteria for evaluation is appropriate at this point as a basis for determining that no historic properties are present or affected.

Ku Tree Dam is an engineered structure consisting of four associated components: an earthen dam, a concrete tower, a concrete spillway, and a concrete footbridge. Constructed in 1925 with the intent of providing potable water to Schofield Barracks, Ku Tree Dam is associated with the context of U.S. Military development on O‘ahu during the inter-war years of the early 20th Century. The dam did not function well and persistent water shortages forced the Army to develop other sources of potable water. In 1933, the Army started developing plans to drill deep wells and by 1938, after less than 13 years, the Army abandoned Ku Tree Dam as a source of potable water. While the dam continued to hold water and was used for golf course irrigation

from the 1940s into the 1970s, it was inconsequential to the development of the U.S. Military on O‘ahu.

Considering its limited utility and lack of association with a specific important event or events that made a significant contribution to the broad patters of our history in the context of U.S. Military Development on O‘ahu, Ku Tree Dam is not eligible for listing in the NRHP under Criterion A.

Ku Tree Dam is not associated with the lives of any known individuals whose specific contributions to history can be identified and documented. Accordingly, Ku Tree Dam is not eligible for listing in the NRHP under Criterion B.

According to the HAER documentation, the design and construction of the earthen dam and its reinforced concrete components was typical for its time in Hawai‘i and throughout the Nation. Ku Tree Dam is an average example of earthen dams built in Hawai‘i in the early 20th Century. It is one of 125 similar earthen dams in Hawai‘i, the majority of which were constructed between 1885 and 1940. The Ku Tree Dam components are common features found at other dams and there are no specific characteristics that distinguish it from other similar dams in Hawai‘i or the United States as a whole. It does not embody a distinctive type, period, or method of construction, represent the work of a master, or possess high artistic value and it is not eligible for listing in the NRHP under Criterion C.

Ku Tree Dam and its components do not have the potential to provide important information or answer research question about human history. As a designed and engineered structure, the important information about Ku Tree Dam is found in the engineering records and photographs. That information has already been assembled by USAG-HI in the HAER documentation (Appendix E). There is no additional information or data in the physical remnants of the dam that could support eligibility for listing in the NRHP under Criterion D.

Ku Tree Dam still exists where it was constructed and most of the original construction materials remain. Accordingly, it retains integrity of location and material. The absence of working valves and controls and the inability to function as designed indicates the dam lacks integrity of design and workmanship. Overgrown and obscured by dense vegetation, lacking the characteristic reservoir of water, and far removed from the associated historic districts of Schofield Barracks and Wheeler Field, the dam does not retain integrity of setting or feeling.

Finally, with no direct link between an important historic event or person, Ku Tree Dam does not have integrity of association. Retaining only the integrities of location and material and lacking the other five aspects of integrity specified in 36 CFR § 60.4, Ku Tree Dam lacks sufficient integrity to convey historical significance and cannot be considered eligible for the NRHP.

On November 7, 2019, the USAG-HI Cultural Resources Manager Richard Davis, Architectural Historian Ken Hayes, and Archaeologist David Crowley met with the SHPD Architectural Historians Tanya Gumapac-McGuire and Julia Flauaus to discuss the Ku Tree Dam breach project. The group reviewed the NRHP eligibility recommendation by SCS and the consultation

letters from 2004 and 2008, discussed the condition and integrity of the dam components, and recognized that the Army has already completed the HAER documentation of the dam components as requested by SHPD.

At the meeting, the group reached a consensus on two points. First, findings reached as a result of the previous consultation, including the eligibility recommendation, the HAER mitigation, and the finding of no adverse effect, would not be acceptable under current standards. Second, there is no potential for Ku Tree Dam to yield significant information that would qualify it for eligibility to the NRHP under Criterion D and the dam lacks historical integrity because of its dilapidated condition, which began to deteriorate in the mid-1900s and was exacerbated when the reservoir was emptied in 1983.

On December 10, 2019, USAG-HI archaeologists inspected the downstream portion of the project area to document current conditions and look for any cultural resources and potential historic properties that might be present. The team found the area to be a narrow, deeply incised stream channel that was heavily scoured by water, bounded by dangerously steep mud and clay walls and cliffs, and covered with dense, often impassible, vegetation. No cultural resources were identified and no areas of reasonably flat ground were found along the streambank that could potentially contain intact buried archaeological resources. The team also attempted to reach the top of a hill adjacent to the stream channel to find any area with the potential to contain historic properties, but the effort was thwarted by the precipitous slopes and impassible vegetation, which created a significant safety hazard. Considering the adjacent archaeological survey in nearby similar areas and the extremely steep nature of the APE, the probability that historic properties are present in the area is very low.

Employing a combination of intensive survey, field reconnaissance, consultation, archival research, and architectural analysis, USAG-HI has made a reasonable and good faith effort to identify historic properties in the APE for the Ku Tree Dam breach project.

In conclusion, USAG-HI has determined that Ku Tree Dam, does not meet any of the NRHP criteria, lacks a majority of the aspects of integrity, and is not a historic property for the purposes of Section 106 of the NHPA. Accordingly, there are no historic properties present in the project APE, and no historic properties will be affected by this project.

Regulatory Framework

The National Historic Preservation Act

Section 106 of the NHPA of 1966, as amended, and its implementing regulations (36 CFR 800), requires federal agencies to identify and consider the potential effects of their proposed actions on historic properties. Under Section 106, a historic property is any property that is included in, or eligible for inclusion in, the NRHP.

3.12.2 Environmental Consequences

3.12.2.1 Impact Methodology

Project Actions are evaluated against their potential to affect the integrity of a historic property. Actions would have a significant impact if it adversely affects a historic property by altering any of the characteristics that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting materials, workmanship, feeling or association. If a historic property were present, adverse effects would include any of the following:

- ✓ Physical destruction, damage, or alteration of all or part of the property;
- ✓ Introduction of visual, audible, or atmospheric elements that are out of character with the property, or changes that may alter its setting; and
- ✓ Neglect of a property, resulting in its deterioration or destruction.

3.12.2.2 Proposed Action

Under the Proposed Action the dam structure would remain, but the appurtenant structures would be demolished. As a result of archival research and consultation with the SHPD in 2004 and 2020, USAG-HI has determined that Ku Tree Dam lacks historic integrity and therefore is not eligible for nomination to the NRHP. Accordingly, Ku Tree Dam is not considered to be a historic property for the purposes of Section 106 of the NHPA. In compliance with Section 106, the SHPO, Native Hawaiian Organizations and interested parties were notified of the USAG-HI’s finding of no historic properties affected for this undertaking in a letter dated April 9, 2020.

Due to Ku Tree Dam is not being considered a historic property for the purposes of Section 106 of the NHPA and the low probability of encountering any previously undocumented cultural resources, the Proposed Action would have no impacts on cultural resources.

The Proposed Action is in compliance with the NHPA. In accordance with Section 106 of the NHPA, the USAG-HI Directorate of Public Works has consulted with the SHPO and other organizations regarding the Proposed Action. Documentation of Section 106 consultation is attached as Appendix E.

3.12.2.3 Alternative A: No Action

Under the No Action alternative, no construction or demolition activities would occur, the dam and its appurtenant structures would be left in place and there would be no impacts on cultural resources.

3.12.2.4 Alternative B: Notching the Dam

Under Alternative B the dam structure would be notched and the appurtenant structures demolished. As with the Proposed Action, given that Ku Tree Dam is not considered a historic property and the low probability of encountering any previously undocumented cultural resources, Alternative B would have no impacts on cultural resources.

3.12.2.5 Alternative C: Dam Removal and Site Restoration

Under Alternative C the dam structure would be removed and its appurtenant structures demolished. As with the Proposed Action, given that Ku Tree Dam is not considered a historic property and the low probability of encountering any previously undocumented cultural resources, Alternative C would have no impacts on cultural resources.

3.13 Traffic and Transportation System

3.13.1 Affected Environment

3.13.1.1 Region of Influence

The ROI for analyzing potential impacts to traffic is limited to the Schofield Barrack’s East Range and public roadways that provide access to the East Range, primarily the Kamehameha Highway and H-2 Freeway approaches to Schofield Barracks.

3.13.1.2 Existing Conditions

The main vehicular access to the project site is via Higgins Road, which is under the jurisdiction of the U.S. Army. Higgins Road, also known as East Range Road, intersects with Kamehameha Highway approximately 0.5 miles south of Wahiawā Town. From Kamehameha Highway, Higgins Road is paved for approximately 2 miles until it reaches a locked gate (Pineapple Junction Gate). Beyond the gate, the road is unimproved and requires travel by four-wheel drive vehicles. Gate control is managed by the Range Scheduler.

Within the gated area, the unimproved main road follows along the top of the ridge line with several spur roads branching to the north and south. One of the branch roads leads to the Ku Tree Reservoir.

3.13.2 Environmental Consequences

3.13.2.1 Impact Methodology

Project Actions are evaluated against the existing volume of traffic on affected roadways, parking, circulation patterns, demand for services and consistency with local and installation traffic/transportation plans. Actions are determined to have a significant impact if the project results in an increase in traffic volume such that existing levels-of-service are degraded to a point requiring substantial road improvements to increase the capacity of affected street systems; causes long-term disruption or alteration of circulation patterns; increases demand for parking or public transportation beyond existing or planned capacities; increases traffic safety hazards; or conflicts with approved traffic/transportation plans.

3.13.2.2 Proposed Action

The Proposed Action would have short-term impacts on regional traffic and circulation; however, impacts would be less than significant. During demolition and construction, movement of vehicles and equipment to and from the site would minimally add to the existing volume of traffic along the region’s public roadways. Given the existing traffic volume, the number of added vehicles would not be significant enough to affect existing levels-of-service. Also,

because the project site is located entirely within a military installation and in an isolated, non-developed area, there would be no need to detour traffic around the project site nor would entry/egress of construction vehicles create any safety hazards on public roadways. Construction vehicles tend to move slower than the normal flow of traffic and could cause some minor inconvenience to other motorists, although this interference is expected to be minimal given the context of existing traffic flow and volumes. Although traffic-related impacts are not expected to be significant, construction vehicles and the transport of equipment to and from the project site would be scheduled to avoid conflicts with the morning and afternoon rush hours in order to minimize any inconvenience on regional traffic.

Once the demolition and construction phase is complete, the Proposed Action would not generate any traffic and would have no long-term impacts on parking, traffic or transportation systems nor would it conflict with any traffic/transportation plans.

3.13.2.3 Alternative A: No Action

Under the No Action alternative, there would be no construction or demolition activities and thus no need for construction vehicles and equipment to access the site. Therefore, there would be no impacts on traffic and transportation systems.

3.13.2.4 Alternative B: Notching the Dam

Similar to the Proposed Action, Alternative B would have less than significant impacts on traffic and transportation systems due to the short-term impacts during the construction and demolition phase of the project. Alternative B would have no long-term impacts on traffic and transportation systems.

3.13.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would also have less than significant impacts on traffic and transportation systems due to the short-term impacts generated during the construction and demolition phase of the project. Alternative C would have no long-term impacts on traffic and transportation systems.

3.14 Recreational Facilities

3.14.1 Affected Environment

3.14.1.1 Region of Influence

The ROI for analysis of potential impacts on recreational facilities includes the East Range and areas downstream from the Ku Tree Dam and Reservoir. This includes the South Fork of Kaukonahua Stream down to the Wahiawā Freshwater State Recreation Area and Wahiawā Reservoir (also known as Lake Wilson or Wilson Reservoir).

3.14.1.2 Existing Conditions

Recreational opportunities located within the East Range include golfing and hiking. Leilehua Golf Course is located at the far western end of the Range. The Schofield-Waikāne trail is owned and managed by the state and the Army. This 3.5-mile long trail extends along most of the northern boundary of the East Range and ends at the Ko‘olau Mountain Ridge. To access

this trail, written permission is required from Range Control, as well as a permit from Army Support Command. Both these recreational facilities are well outside the project area.

There are no hunting or fishing areas within the East Range. However, approximately 3 miles downstream from the project site is the Wahiawā Freshwater State Recreation Area. Lake Wilson is the central feature of the park. With 330 acres of surface water, it is one of the largest freshwater bodies in the state. The park includes a boat ramp, parking, restroom facilities, a jogging/biking path, and a caretaker’s residence. Park usage is estimated at 70,000 annual visitors.

The community has expressed an interest in expanding and improving the Wahiawā Freshwater State Recreation Area. Existing problems associated with park include the steep slopes around the reservoir and rising water levels, both of which discourage fishing from the banks; the effluent discharge (2 mgd) from the Wahiawā Wastewater Treatment Plant that is rich in nutrients and contributes to periodic fish kills and overgrowth of the aquatic weed *Salvinia molesta*; and the limited fish population (resulting in “catch and release” rules).

3.14.2 Environmental Consequences

3.14.2.1 Impact Methodology

Project actions are evaluated for their effects on the availability, accessibility, existing usage and carrying capacity of recreational facilities. Actions are determined to have a significant impact if it results in a loss of recreational facilities, decreases accessibility, or the increases usage beyond the facility’s carrying capacity.

3.14.2.2 Proposed Action

The Proposed Action would have less than significant impacts on recreational facilities. Excavating the natural channel through the natural hillside that supports the existing spillway and demolishing the appurtenant structures would not result in the direct loss of any recreational facilities, including the Leilehua Golf Course and the Schofield-Waikane Trail, both of which are located within Schofield’s East Range, but are of sufficient distance away from the project site that any construction or demolition activity would not affect these areas. The Proposed Action also would not affect accessibility to any recreational facility within the ROI.

It is expected that after the dam is breached with a natural channel through the spillway, that the water quality exiting the site would not be much different than the water quality that has existed since 1984 when the reservoir was drawn down, and therefore would not substantially affect water quality downstream. The Proposed Action would also result in slightly higher flood stages downstream; however, where the South Fork of Kaukonahua Stream enters Wahiawā Reservoir, the increase in flood stage would not be substantial. Further, given the small size of the watershed controlled by Ku Tree Dam in comparison to the entire watershed that provides water to the Wahiawā Reservoir, the incremental increase from the Proposed Action on total discharge and the resultant water level rise in Wahiawā Reservoir would be minimal. Since the Proposed Action would not substantially affect water quality downstream nor substantially increase

discharge and water levels at the Wahiawā Reservoir, the Proposed Action would have less than significant impacts on the Wahiawā Reservoir and Wahiawā Freshwater State Recreation Area.

3.14.2.3 Alternative A: No Action

Under the No Action alternative, the dam and its appurtenant structures would remain in place. No maintenance would be undertaken and these facilities would continue to deteriorate. The potential for dam failure would continue to exist, which if occurs, would result in a large uncontrolled release of water, thus affecting downstream waters. Therefore, the No Action would have less than significant impacts on recreational facilities due to the continued potential for dam failure and downstream impacts.

3.14.2.4 Alternative B: Notching the Dam

Similar to the Proposed Action, Alternative B would have less than significant impacts on recreational facilities. This alternative would not result in the direct loss nor affect accessibility of recreational facilities within the ROI. It would however have slight effects on downstream water quality and water discharge and levels at Wahiawā Reservoir; therefore, this alternative would have less than significant impacts on recreational facilities.

3.14.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would have a less than significant impact on recreational facilities. Like the Proposed Action, removing the dam would have slight effects on downstream water quality and water levels. Alternative C would not result in the direct loss nor affect accessibility of recreational facilities within the ROI; therefore, this alternative would have less than significant impacts on recreational facilities.

3.15 Utilities and Public Services

3.15.1 Affected Environment

3.15.1.1 Region of Influence

Utilities and public services would include potable water, wastewater, solid waste disposal, electrical, and telecommunication systems; and fire and medical services. The ROI for analyzing potential impacts on utilities and public services includes the main post of Schofield Barracks and the East Range.

3.15.1.2 Existing Conditions

Utilities

The project site is located in a remote area within Schofield Barrack’s East Range and is not serviced by electrical, potable water, wastewater, solid waste disposal or land-line telecommunication systems.

Public Services

The Federal Fire Department provides fire protection to Army installations on O‘ahu. A one-company fire station is located at the Schofield Barracks main post and a two-company fire station is located at Wheeler Army Airfield. Two commercial pumpers and two military field

firefighting vehicles are based at Schofield Barracks and a crash fire rescue and commercial pumper is based at Wheeler Army Airfield. The Army also has Cooperative and Mutual Aid Agreements for firefighting assistance during major wildfire incidents with various federal, state, and local fire agencies.

The East Range is a potentially high fire-danger area because the rugged terrain limits accessibility for fire suppression. Also, flammable dry grassland areas border much of the native habitat. Several wildfires have occurred at the East Range, even though live-fire training is not conducted there. The East Range depends upon the closest responding forces (such as the City and County of Honolulu Fire Department) for first response and immediate Federal Fire Department/Range Control response.

Medical services available to personnel at Schofield Barracks include access to Tripler Army Medical Center in Honolulu, which provides a full complement of medical facilities, including medical evacuation by helicopter from outlying training areas and ranges. Medical services at Schofield Barracks include an outpatient clinic and an acute care clinic. The nearest civilian offering 24-hour emergency services are St. Francis Medical Center West and Kapi‘olani Medical Center at Pali Momi. The state’s only Level II trauma center is located at Queen’s Medical Center in Honolulu.

3.15.2 Environmental Consequences

3.15.2.1 Impact Methodology

Project actions are evaluated against existing demand and system/service capacity. Actions would have a significant impact if it caused demand for public services or utilities to exceed the capacity of existing services and systems (inclusive of any planned system upgrades or expansion of services) the results of which would require additional facilities or staff, or it if resulted in a long-term or permanent disruption of utilities or services.

3.15.2.2 Proposed Action

The Proposed Action would have no impacts on utilities during either the short-term (construction/demolition phase) or the long-term, once alteration of the dam and demolition of its appurtenant structures are complete. Because there are no utilities at the project site, it is anticipated that portable generators and fuel tanks would be used at the project site to power construction equipment and construction activities would cause no disruption of service. Once construction and demolition are completed, the Proposed Action would generate no demand for any utility. Ku Tree Dam and the abandoned reservoir were once part of Schofield Barrack’s potable water system; however, its use for this purpose was discontinued decades ago. Thus, the Proposed Action would not result in any disruption or degradation of utility service.

Once complete, the Proposed Action also would not require the use of any public services. During the construction and demolition phase of the project, there is the potential for accidents to occur, which may require emergency services. However, these incidences are rare and observance of construction site safety protocols would minimize the potential for accidents to occur. Therefore, the Proposed Action would have no impact on this VEC.

3.15.2.3 Alternative A: No Action

Currently, the existing dam and abandoned reservoir require no utilities and no public services. Under the No Action alternative, these conditions would not change and there would be no impacts on utilities and public services.

3.15.2.4 Alternative B: Breach the Dam with a Natural Channel Through the Spillway

Similar to the Proposed Action, Alternative B would require no utilities either in the short- or long-term and would cause no disruption of service; therefore, it would have no impacts on this VEC.

3.15.2.5 Alternative C: Dam Removal and Site Restoration

Alternative C would also have no impact on utilities and public services. Like the Proposed Action, it has no requirement for utilities either in the short- or long-term, and any need for emergency services is expected to be negligible in the short-term and non-existent in the long-term.

4.0 Consistency with Federal, State, and Local Plans, Policies, and Approvals

The approach of this project is consistent with the objectives of many entities. It is in accord with USFWS policy for the management of natural communities using an “ecosystem approach” and with the Hawai‘i Natural Area Reserve Law, which states a system of reserves be established to “…preserve in perpetuity specific land and water areas with support communities, as unmodified as possible, of the natural flora and fauna…” (Chapter 195D, Hawai‘i Revised Statutes). Protection and enhancement of endangered species is also mandated by both Federal and state Endangered Species Acts (16 U.S.C. 1531-1543, as amended; Chapter 195, Hawai‘i Revised Statutes). It is also in alliance with the State of Hawai‘i’s long-term environmental policies, goals and guidelines outlined in Hawai‘i Revised Statutes, Chapter 344. This project is consistent with a designated land use of the “R or Resource” subzone: “to ensure, with proper management, the sustainable use of the natural resources of those areas” (HAR, 13-5-13).

The Proposed Action is consistent with the CZMA and the Hawai‘i CZM Program to the maximum extent practicable. The treatment area is located in central O‘ahu far from the coastline. The project would have no effect on coastal ecosystems or the marine environment.

The project also strives toward the provisions of the City and County of Honolulu General Plan Objectives and Policies, Chapter III, Objective A, Policies 1-11, by “protect[ing] and preserv[ing] the natural environment (Objective A)” as well as the “plants, birds, and other animals that are unique to the State of Hawai‘i and the Island of O‘ahu (Policy 8).”

5.0 Cumulative Impacts

The CEQ regulations for implementing the NEPA define cumulative effects as:

> "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR part 1508.7)

Cumulative impacts are two or more individual effects, which, when considered together, compound or increase the overall impact. Cumulative impacts can arise from the individual effects of a single action or from the combined effects of past, present or reasonably foreseeable future actions. Cumulative impacts can result from individually minor actions, but collectively they can amount to significant actions over a period of time. Effects can include both direct effects, which are caused by an action and occur at the same time and place as the action, and indirect effects, which are caused by an action and occur later in time and are farther removed in distance, but can still be considered to be reasonably foreseeable.

The following projects and programs were considered in conducting the cumulative impacts analysis.

Table 12. List of Cumulative Projects

Project	Location	Sponsor	Description	Start Date	Completion Date
Army Military Munitions Response Program	SBMR	USAG-HI	The compliance, restoration, and closeout activities for Schofield Barracks munitions ranges	1985	Ongoing
USAG-HI Real Property Master Plan	SBMR/WAAF	USAG-HI	Installation-wide facilities construction and associated infrastructure improvements.	2009	Ongoing
Integrated Training Area Management (ITAM)	All O‘ahu ranges	US Army	The intent of the ITAM program is to systematically provide uniform training land management capability across USAG-HI and to ensure that the carrying capacity of the training lands is maintained over time.	Ongoing	Ongoing
Implementation of Proposed Range and Training Land Program Development Plan actions	O‘ahu	US Army	A planning document for managing range facilities and training areas, based on Army training doctrine and resource guidance.	Ongoing	Ongoing
Implementation of the Integrated Natural Resources Management Plan (INRMP)	O‘ahu	US Army	The INRMP “preserves, protects, and enhances natural and cultural resources and complies with all applicable laws and regulations, while improving the Army’s capability to conduct training and maintain military readiness.”	Ongoing	Ongoing

Table 12. List of Cumulative Projects (cont.)

Project	Location	Sponsor	Description	Start Date	Completion Date
Army 2020 Force Structure Realignment	Army-wide including SBMR and WAAF	USAG-HI	Army wide force and realignment including reductions up to 8,000 Soldiers and Army civilians at Schofield Barracks.	2013	Ongoing
Division Headquarters Facilities, Phase I	SBMR	USAG-HI	Construct Division Headquarters operational complex, including general purpose administrative area, battalion headquarters, company operations facility, band facility, tactical equipment maintenance facility, organization parking, parking structure, unit storage, and related site work. Renovate Building 580 on Schofield Barracks.	Unknown	Unknown
Unit Facilities (52582), Phase I	SBMR	USAG-HI	Construct standard design unit facilities, including company operation facility, tactical equipment maintenance facility, unit storage, organizational parking, and related facilities and site work, including road and utility connections. Current facilities are inadequate to support the modular force structure.	2014	2018
Unit Facilities (67176), Phase II	SBMR	USAG-HI	Construct standard design unit facilities to accommodate the modular force structure on a previously developed area used for motor pools. Includes brigade headquarters, battalion headquarters, 600-space parking structure, company operations facility, tactical equipment maintenance facility, unit storage, and related site work.	2014	2018
Unit Facilities (67114), Phase II	SBMR	USAG-HI	Construct standard design unit facilities, including tactical equipment maintenance facility, unit storage, organization parking, and related facilities and site work, including road and utility connections.	2014	2018
JOTC Facilities Repair	SBER	USAG-HI	Facilities repair.	2015	Ongoing
Use of Short-Range Ammunition	SBER	USAG-HI	Use of Short-Range Ammunition.	2016	2017
Renovate Lightning Academy HQ	SBER	USAG-HI	Lightning Academy improvements.	2017	2017
Repair Bridge ERBR05	SBER	USAG-HI	Bridge repairs.	2018	Ongoing
Repair Bridge ERBR09	SBER	USAG-HI	Bridge repairs.	2018	Ongoing
HING Land Acquisition and Future Construction	SBER	USAG-HI	Acquisition of 10-acre parcel adjacent to Wahiawa Park and Ride. Proposed action to include construction of parking lot and maintenance shed.	Unknown	Unknown
NCOA Parking Lot Extension	SBER	USAG-HI	Site Approval Board concurrence granted. Proposed new gravel parking lot to be built at NCOA. No plans or designs have been provided.	Unknown	Unknown

A summary of the cumulative impacts potentially resulting from the Proposed Action, is provided below in Table 13. followed by a brief discussion of the anticipated impacts. As is presented in Table 13, there would be no cumulative impacts to most VEC under the Proposed Action.

Table 13. Summary of Anticipated Cumulative Impacts

Valued Environmental Component	Cumulative Impacts
Geology, Soils and Seismicity	⊙
Air Quality	○
Noise Effects	○
Water Resources	⊙
Hazardous Materials/Hazardous Waste	○
Biological Resources	○
Socio-Economic Environment	+
Environmental Justice	○
Land Use	○
Visual and Aesthetic Resources	○
Cultural Resources	○
Traffic and Transportation Systems	○
Recreational Resources	⊙
Utilities and Public Services	○

⊗ Significant Impact
⦸ Significant impact but mitigable to less than significant
⊙ Less than significant impact
○ No impact
\+ Beneficial Impact

Cumulative Impacts

Based on the findings of the cumulative impacts analysis, the Proposed Action would not cumulatively impact 10 of the 14 VECs, and would contribute to less than significant cumulative impacts to 3 of the 14 VECs. Impacts to the Socio-Economic Environment would be considered beneficial through the provision of construction jobs, the procurement of local goods and services and increased tax revenue.

A more detailed discussion of the VECs anticipated cumulative impacts resulting from implementation of the Proposed Action is provided below:

Geology, Soils and Seismicity

The Proposed Action is expected to have less than significant impacts due to the potential for erosion and sedimentation. BMPs would be implemented to minimize any potential impacts and would include any number of measures, such as berms, silt fences, cut-off ditches, and application of water and/or soil stabilization materials. It is expected that all other construction projects would similarly employ standard construction site BMPs, such that none of the projects would have significant impacts on this VEC. With implementation of

BMPs and other appropriate protective measures, these projects would have less than significant cumulative impacts. Due to its potential for erosion and sedimentation, the Proposed Action would contribute to these less than significant cumulative impacts.

Air Quality

Implementing the Proposed Action would have temporary impacts on air quality during construction and demolition due to emissions from construction vehicles and equipment, and dust from ground disturbing activities. Impacts would be limited to the immediate vicinity of the project site and would be minimized by adhering to standard construction site BMPs. Other planned construction projects would similarly affect air quality in the vicinity of each respective project site. However, each project would be expected to employ BMPs to minimize impacts in compliance with applicable regulations and standards. Thus, no cumulative impacts on air quality are expected.

Noise Effects

Implementing the Proposed Action would have temporary impacts on the noise environment during construction and demolition. Impacts would be limited to the immediate vicinity of the project site and would be minimized by adhering to standard construction site BMPs. Other planned construction projects would similarly affect the noise environment in the vicinity of each respective project site. However, each project would be expected to employ BMPs to minimize impacts in compliance with applicable regulations and standards. Once complete, the Proposed Action would generate no noise. Thus, no cumulative impacts on the noise environment are expected.

Water Resources

The Proposed Action would have less than significant impacts on water resources, with beneficial impacts related to hydrology (movement of water), aquatic and riparian habitat, transport of sediment and nutrients, and flood hazards. Impacts to water resources relate largely to the potential for increased sedimentation, particularly during the construction and demolition phase of the project when ground disturbing activities would expose soils. Standard construction site BMPs and other engineering controls, as needed, would be implemented to keep impacts from reaching a level of significance. It is expected that all construction projects listed in Table 12 would also adhere to BMPs and utilize other protective measures to minimize any impacts to water resources. Also, in compliance with the Army’s low-impact development mandate, many of these future projects would be required to incorporate site design strategies and design features that substantially limit runoff from project sites. Therefore, cumulatively, all foreseeable projects would be expected to have less than significant impacts. Viewed collectively with the other projects, the Proposed Action would contribute to these less than significant cumulative impacts.

Hazardous Materials/Hazardous Waste

The Proposed Action would have no long-term impacts related to hazardous materials/hazardous waste, but would have potential impacts during the construction and demolition phase of the project. The use of petroleum-related products (fuel, lubricants, hydraulic fluid, etc.) or herbicides would be used at the project site. Accidents may occur

which would result in leaking or spillage of these items. However, adherence to construction site BMPs would reduce the potential for accidents to occur, and if they did occur, proper protocols would be followed to minimize impacts. It is expected that other planned projects would similarly follow BMPs and established protocols, such that any there would be no cumulative impacts.

Biological Resources

The Proposed Action would have temporary impacts on biological resources due to the expected disruptions to habitat and activities during the construction and demolition phase. The project site is not located in or near to any critical habitat and no “takes” or other impacts to threatened, endangered or other species of concern are expected. No long-term impacts are anticipated to result from the Proposed Action. Other planned projects are expected to be carried out in compliance with the INRMP and all applicable laws and regulations to protect these species. Therefore, the Proposed Action would have no cumulative impacts on biological resources.

Socio-Economic Environment

The Proposed Action has no population or housing component and would have no impacts on those items. It would however have limited beneficial impacts on the economy through the provision of construction jobs, the procurement of local goods and services and increased tax revenue. Each of the planned construction jobs listed in Table 12 would have similar beneficial impacts. Thus, the Proposed Action would contribute to those beneficial impacts on the local economy.

Environmental Justice

The Proposed Action would have no impact related to EJ populations or environmental health risks and safety to children. As federal agencies are mandated to evaluate the potential their policies, programs and activities would have on these special populations, it is expected that the programs and construction projects listed in Table 12 would each avoid any disproportionate impacts on EJ populations or children. As such, cumulative impacts, if any, would be expected to be less than significant. Since the Proposed Action would have no impact related to EJ populations or environmental health risks and safety to children, it would not contribute to any cumulative impacts.

Land Use

The Proposed Action would have less than significant short-term impacts on land use due to the temporary disruption it could cause to training exercises conducted in the East Range. Breaching the dam would not change the long-term land use of the project site or surrounding area, which would continue to be designated and used for troop training. Thus, the Proposed Action would not contribute to cumulative impacts related to land use.

Visual and Aesthetic Resources

The Proposed Action would have beneficial impacts on visual and aesthetic resources by demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir and allowing the project site to return to a more natural looking environment. The

construction projects listed in Table 12 would cumulatively affect visual and aesthetic resources by changing the visual character of the areas in which they are built, creating additional lighting and glare, and adding to the loss of open space by developing on previously undeveloped sites. Cumulative impacts would be less than significant as each project would be expected to minimize any impacts on the aesthetic environment. Since the Proposed Action would have beneficial impacts, it would not contribute to the minor degradation to the visual and aesthetic environment cumulatively caused by other development projects.

Cultural Resources

The Proposed Action would have no impacts on cultural resources because no historic properties are present in the project area. Ku Tree Dam lacks historic integrity and therefore is not eligible for nomination to the NRHP. Accordingly, Ku Tree Dam is not considered to be a historic property for the purposes of Section 106 of the NHPA. In compliance with Section 106, the SHPO, Native Hawaiian Organizations and interested parties were notified of the USAG-HI’s finding of no historic properties affected for this undertaking in a letter dated April 9, 2020. All projects listed in Table 12 are expected to comply with the NHPA, including Section 106 consultation, and the protocols and management actions contained in the ICRMP. Taken collectively, while impacts to cultural resources may occur from any of these projects in the long-term, cumulatively, impacts are expected to be less than significant due to compliance with applicable regulations and the ICRMP, which purpose is to protect these resources. However, as the Proposed Action would have no impact related to cultural resources, it would not contribute to any cumulative impacts.

Traffic and Transportation Systems

The Proposed Action would have less than significant impacts on regional traffic and circulation due to the movement of vehicles and equipment to and from the project site. Impacts would be minimized by scheduling the movement of vehicles and equipment to avoid conflicts with morning and afternoon rush hours. In the long-term, the Proposed Project would not generate any traffic, increase demand for parking, or conflict with any traffic/transportation plans. It is expected that each of the planned projects listed in Table 12 would individually assess their impact on traffic and transportation systems, and if needed, implement roadway or other improvements to address those impacts such that any impacts would not be significant. Taken collectively, all of the listed projects would have less than significant impacts on traffic in the long-term. However, as the Proposed Action has no traffic component, it would not contribute to those cumulative impacts.

Recreational Facilities

The Proposed Action is expected to have less than significant impacts on recreational facilities due to minor changes to water quality and water levels downstream from the project site where the Wahiawā Reservoir and Wahiawā Freshwater State Recreation Area are located. It would not however restrict access, availability, usage or carrying capacity of recreational facilities. Some of the projects listed in Table 12 involve an increase of personnel at Schofield Barracks. This increase would cumulatively impact recreational facilities by increasing usage and affecting carrying capacity. Thus, the Proposed Action

when evaluated collective with other foreseeable projects, would have a less than significant cumulative impacts on recreational facilities.

Utilities and Public Services

The Proposed Action would have no short- or long-term impacts on utilities and public services. Implementation of the planned projects listed in Table 12 above would cumulatively affect demand on utilities and public services, as some of these projects are to accommodate increase population at Army Garrison installations. However, as federally-mandated, new construction projects would incorporate sustainable design to minimize demand on utilities and the Army would ensure through proper planning that infrastructure is capable of supporting these new facilities. Once construction and demolition work are complete, the Proposed Action would not generate any demand for utilities and public services and would not contribute to cumulative impacts on utilities and public services.

6.0 Summary of Environmental Consequences

A summary of the environmental consequences potentially resulting from the Proposed Action and the other alternatives considered, including the No Action alternative, is provided below in Table 14. followed by a brief discussion of the anticipated impacts. As is presented in Table 14, there would be less than significant impacts to most VEC under the Proposed Action and each alternative action.

Table 14. Summary of Anticipated Impacts

Valued Environmental Component	**Proposed Action** Natural Channel through Spillway	**Alt. A:** No Action	**Alt. B:** Notch through Dam	**Alt. C:** Dam Removal and Site Restoration
Geology, Soils and Seismicity	⊙	⊙	⊙	⊙
Air Quality	⊙	○	⊙	⊙
Noise Effects	⊙	○	⊙	⊙
Water Resources	⊙/+	⊙	⊙/+	⊘/+
Hazardous Materials/Hazardous Waste	⊙	○	⊙	⊙
Biological Resources	⊙/+	⊙	⊙/+	⊙/+
Socio-Economic Environment	+	○	+	+
Environmental Justice	○	⊙	○	○
Land Use	⊙	○	⊙	⊙
Visual and Aesthetic Resources	+	⊙	+	+
Cultural Resources	○	○	○	○
Traffic and Transportation Systems	⊙	○	⊙	⊙
Recreational Facilities	⊙	⊙	⊙	⊙
Utilities and Public Services	○	○	○	○

⊗ Significant Impact
⊘ Significant impact but mitigable to less than significant
⊙ Less than significant impact
○ No impact
\+ Beneficial Impact

The following provides a discussion of the anticipated impacts resulting from implementation of the Proposed Action and each alternative action.

Proposed Action: Breaching the Dam with a Natural Channel Through the Spillway

Under the Proposed Action, impacts to 7 of the 14 VECs would be considered less than significant. There would be no impacts related to Environmental Justice; Cultural Resources; or on Utilities and Public Services. Impacts to Water Resources and Biological Resources

would be considered both less than significant and beneficial. Impacts to Water Resources and Biological Resources would result in less than significant impacts during construction; however, engineering controls and BMPs would be implemented to mitigate construction related impacts. Long-term beneficial impacts to Water Resources and Biological Resources would result since the natural stream channel above and below the dam would be reconnected restoring the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and removing the potential risk of catastrophic dam failure. Impacts to the Socio-Economic Environment would be considered beneficial through the provision of construction jobs, the procurement of local goods and services and increased tax revenue. Impacts to Visual and Aesthetic Resources would be considered beneficial due to demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir and allowing the project site to return to a more natural looking environment.

Alternative A: No Action

Under the No Action alternative, there would be no impact to 8 of the 14 VECs, and impacts to the remaining 6 VECs would be considered less than significant. No significant impacts are anticipated.

Alternative B: Notching the Dam

Under Alternative B, impacts to 7 of the 14 VECs would be considered less than significant. There would be no impacts related to Environmental Justice; Cultural Resources; or on Utilities and Public Services. Beneficial impacts would result on the Socio-Economic Environment, and Visual and Aesthetic resources. Impacts to Water Resources and Biological Resources would be considered both less than significant and beneficial. As with the Proposed Action, impacts to Water Resources and Biological Resources would result in less than significant impacts for during construction; however, engineering controls and BMPs would be implemented to mitigate construction related impacts. Long-term beneficial impacts to Water Resources and Biological Resources would result since the natural stream channel above and below the dam would be reconnected restoring the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and removing the potential risk of catastrophic dam failure.

Alternative C: Dam Removal and Site Restoration

Alternative C, like the other actions reviewed, would have no impact related to Environmental Justice; Cultural Resources; or on Utilities and Public Services. Impacts to 7 of the 14 VECs would be considered less than significant. Impacts on the Socio-Economic Environment and Visual and Aesthetic Resources would be beneficial. Impacts to Water Resources would be both beneficial and significant but mitigable to less than significant. Impacts to Biological Resources would be considered both less than significant and beneficial. Due to the large volume of material that will be removed under this alternative, implementation would undoubtedly lead to increased release of sediments to the stream during construction. The fate of the large quantities or sediment and organic trash currently deposited in the reservoir site when the dam is breached and flows restored is of particular concern. Release of this material downstream may lead to sediment deposition in various

unpredictable locations in lower Kaukonahua Stream and perhaps even Wahiawā Reservoir. These impacts would be mitigated to less than significant by implementation of appropriate engineering controls to minimize erosion of the accumulated sediments located behind the existing dam structure. Long-term beneficial impacts to Water Resources and Biological Resources would result by restoring the site to pre-dam conditions and reconnecting the stream channel above and below the dam, which would restore the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and remove the potential risk of catastrophic dam failure.

A more detailed discussion of the environmental consequences potentially resulting from the implementation of the Proposed Action is provided below:

Geology, Soils and Seismicity

Impacts to geology, soils and seismicity would be less than significant. To ensure slope stability and enable the natural channel to withstand the erosion forces from the high energy flows created by the steep, straight nature of the channel, design provisions would be provided including benching the 1V:1H side slopes every 20 feet. In areas subject to stream flow, turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel.

Short-term impacts to soils during construction and demolition activities would be minimized by adhering to standard construction site BMPs. BMPs would include the use of appropriate temporary and permanent erosion and sedimentation control measures to minimize soil loss, particularly during any in-stream work. Typical erosion control measures that may be applied include the use of berms, silt fences, cut-off ditches, ground cover vegetation, and the application of water and/or soil stabilization and protection materials. Additionally, during construction, all project activities will be conducted in compliance with HAR 11-54 Water Quality Standards and HAR 11-55 Water Pollution Control. Any area of disturbed ground would be stabilized immediately after construction activities halt to minimize erosion.

The Proposed Action would not increase exposure to geologic or seismic hazards.

Air Quality

Impacts to air quality would be short-term, occurring in the construction and demolition phase of the project. Implementation of BMPs would control emissions and dust. BMPs would include dust control measures such as the erection of dust screens around the construction site, wet suppression (e.g., wetting of exposed soils), or chemical stabilization. Dust can be further minimized by landscaping bare earth areas as soon as practicable. Vehicles and construction equipment would be properly maintained to minimize exhaust emissions. If warranted, a dust control plan would be prepared to guide activities during demolition and construction. There would be no long-term impacts on air quality.

Noise Effects

Impacts related to noise would be short-term, occurring in the construction and demolition phase of the project. Implementation of BMPs would minimize noise impacts. Noise effects would be reduced by the use of newer and quieter equipment (or modifying older equipment with dampeners), the use of properly muffled construction equipment, properly maintaining construction equipment and vehicles, shutting off equipment when not in use and, if practical, the use of construction noise barriers. In accordance with the Noise Control Act, project activities would adhere to all applicable federal, state, and local noise regulations. There would be no long-term impacts related to noise.

Water Resources

Impacts on water resources include slight changes to water quality, surface water runoff, and groundwater recharge. Impacts to water resources would be both beneficial and less than significant. Engineering controls and BMPs would be implemented to mitigate construction related impacts. Long-term beneficial impacts to water resources would result since the natural stream channel above and below the dam would be reconnected restoring the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients, and removing the potential risk of catastrophic dam failure and flood hazards.

To reduce the potential for sedimentation during excavation and construction in the spillway area, Ku Tree Dam will remain in its current drawn down state with stream flows continuing to be diverted through the drain tunnel. As a result, only short-term periods of actual in-stream construction would occur. BMPs would be followed to prevent sediment and contaminants from impacting surface waters during construction. In areas that will be subject to stream flow, turf reinforcement mats would be anchored to the soil to provide erosion control while allowing for mature plant growth at the up- and down-stream ends of the newly excavated natural channel.

As recommended by the USFWS in the 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* (Attached in Appendix F) the following BMPs will be applied to all activities pertaining to construction and maintenance activities for this project:

1. The permittee should make every effort to develop and implement a plan for conducting all anticipated work involving stream channels during the summer dry season. Work should be ceased and re-scheduled in the event of an out-of-season heavy rainfall;
2. Avoid conducting construction or subsequent maintenance activities that will lead to mid- and long-term destabilization and exposure of bare sediment along the stream banks or in the stream bed;
3. No debris, petroleum projects, or deleterious materials or wastes shall be allowed to fall, flow, leach, or otherwise enter any waters of the United States;
4. All authorized activities shall be done in a manner to confine and isolate the construction activity and to control and minimize any turbidity that may result from in-water work. Silt curtains or other appropriate and effective silt containment devices

approved by the USACE shall be used to minimize turbidity and shall be properly maintained throughout the entire period of any in-water work to prevent the discharge of any material to the downstream aquatic habitat. All sediment control devices installed as BMPs (i.e., fabric sandbags, silt curtains/screens, etc.) downstream or makai of the authorized work shall remain in place until the in-water work is completed and will be removed in their entirety and disposed of at an appropriate upland location once the water quality of the affected area has returned to its pre-construction condition;

5. Return flow or runoff from upland dewatering site(s)/disposal site(s) shall be contained on land and shall not be allowed to discharge and/or re-enter any waters of the United States;
6. No sidecasting or stockpiling of excavated materials in the aquatic environment is authorized. All excavated materials shall be placed above the ordinary high water mark of any designated waters of the United States, or disposed of in an upland location. The permittee shall demonstrate that there is no reasonable expectation that disposal locations adjacent to high tide lines on the ocean, or in floodplains adjacent to other rivers or streams, would result in the material being eroded into the nearby waterbody by high tides and/or flood events;
7. Warning signs shall be properly deployed and maintained until the portion of the in-water work is completed and the affected area water quality has returned to its preconstruction condition and turbidity control devices have been removed from the waterway;
8. Fueling, repair, and other activities with any potential to release pollutants will occur in a location where there is no potential for spills to have an impact on waters of the United States; and
9. When the USACE is notified that an authorized activity is detrimental to fish and wildlife resources, the USACE will issue a suspension order until all pertinent issues have been satisfactorily resolved. The permittee shall comply with any USACE-directed remedial measures deemed necessary to mitigate or eliminate the adverse effect.

All project activities will be conducted in compliance with HAR 11-54 Water Quality Standards, HAR 11-55 Water Pollution Control. Any area of disturbed ground would be stabilized immediately after construction activities halt to minimize erosion. In addition, a NPDES permit would be required for the project and would require development of a Construction BMP Plan for storm water runoff prior to commencing construction activities. BMPs under the Section 404, Department of the Army Permit, and Section 401, WQC, would also be adhered to. A monthly stream water quality monitoring program will be implemented to quantify the effect that the Proposed Action has on water quality standards, such as TMDLs, within this watershed. A Water Quality Monitoring Plan was prepared in 2004 (attached as Appendix A) for the breaching of Ku Tree Dam. This plan should be revisited and revised, as needed, to ensure that it satisfies project requirements and complies with current regulations and accepted protocols. In addition, a DLNR, Commission on Water Resource Management, Stream Channel Alteration Permit may be needed due to the conversion of the spillway to a natural channel.

Hazardous Materials/Hazardous Waste

Potential impacts related to hazardous materials and waste would occur during the construction and demolition phase of the project, when some hazardous materials may be used, including petroleum-related products and herbicides. BMPs and preparation and implementation of a Spill Prevention, Control, and Countermeasure Plan would minimize the potential for accidental releases to occur. Placement of containment devices such as booms, barriers, or skimmers within stream channels prior to construction activities would minimize any impacts should leaking or spilled petroleum-related products reach these waters. Any potentially hazardous materials required for the project (e.g., petroleum or fuel products for construction equipment and vehicles, herbicides for vegetation removal) will be managed in compliance with applicable state and federal regulations, including RCRA if applicable.

Biological Resources

Impacts to biological resources would be short-term, occurring in the construction and demolition phase of the project. Construction activities would temporarily disrupt avian and terrestrial habitat and activity. Displaced individuals would be expected to return post-construction.

To ensure that vehicles utilized by the project are not carrying seeds or plant material to prevent the spread of noxious or invasive plant species the project will comply with the *USARHAW Washrack Utilization Policy to Control Invasive Species* which requires that vehicles and equipment are cleaned, washed, and inspected prior to movement to/from Schofield Barracks. Additionally, the project will comply with *Policy Memo USAG-HI-63, Landscaping with Native Plants*. Where the use of native Hawaiian plant species cannot be used, the project will comply with base policy and undergo review and approval by the Directorate of Public Works.

While Rapid 'Ōhi'a Death is not known to occur on O‘ahu, if 'Ōhi'a trees are to be removed, trimmed, or potentially injured BMPs to avoid and prevent spread of the disease would be followed. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution, as necessary, to prevent the spread of Rapid 'Ōhi'a Death and other harmful fungal pathogens.

The Hawaiian hoary bat, while not detected during the mammalian survey, is known to be present at Schofield Barracks West Range. The following measures will be followed to minimize the potential for impacts to the Hawaiian hoary bat from the Proposed Action:

(1) During the bat pupping season, 1 June to 15 September, there shall be no cutting or trimming of any tree over 15 feet tall.
(2) If a tree falls on its own that is over 15 feet tall, the Army may remove the tree.

While seabirds were not detected during surveys of the project site, artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, all lights should be fully shielded to minimize

impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15, if possible. This is the period when young seabirds take their maiden voyage to the open sea.

While State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) were not detected during surveys of the project site, the State Division of Forestry and Wildlife identified that they have the potential to occur in the vicinity of the proposed project. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point the USFWS and Division of Forestry and Wildlife should be contacted immediately.

No other listed species are known to occur in the ROI. Impacts to the aquatic environment would be controlled by BMPs during the construction and demolition. In the long-term, reconnecting the natural stream channel above and below the dam through the existing spillway would enhance aquatic habitat values by restoring the stream’s natural hydrology (movement of water), aquatic and riparian habitat, and transport of sediment and nutrients.

Socio-economic Environment

Beneficial impacts would incur to the socio-economic environment due to the provision of construction jobs, the procurement of local goods and services, and increased tax revenues.

Environmental Justice

The Proposed Action would have no impacts related to environmental justice.

Land Use

Impacts to land use would be temporary and are limited to the disruption of training activities in the East Range during construction and demolition work. To minimize disruption to training exercises, construction and demolition activities would be closely coordinated with the range scheduling office.

Visual and Aesthetic Resources

The Proposed Action would have beneficial impacts on visual and aesthetic resources by demolishing the deteriorated concrete structures associated with the dam and abandoned reservoir and allowing the project site to return to a more natural looking environment. No new facilities would be constructed; thus, there would be no new anomalous structures or sources of light or glare.

Cultural Resources

The Proposed Action would have no impacts on cultural resources. Ku Tree Dam lacks historic integrity and therefore is not eligible for nomination to the NRHP. Accordingly, Ku Tree Dam is not considered to be a historic property for the purposes of Section 106 of the NHPA. In compliance with Section 106, the SHPO, Native Hawaiian Organizations and

interested parties were notified of the USAG-HI’s finding of no historic properties affected for this undertaking in a letter dated April 9, 2020. Documentation of Section 106 consultation is attached as Appendix E.

Traffic and Transportation Systems

Impacts to traffic would be temporary, occurring during the construction and demolition phase of the project due to the movement of construction vehicles and equipment to and from the project site. To minimize traffic inconvenience, movement would be scheduled to avoid the morning and afternoon rush hours.

Recreational Facilities

Impacts to recreational facilities would result from slight changes in water quality and water levels downstream from the dam site, at the Wahiawā Freshwater State Recreation Area; however, this would not be significant and would be addressed by adhering to standard construction site BMPs.

Utilities and Public Services

The Proposed Action would have no impacts on utilities and public services.

6.1 Short-term Uses versus Long-term Productivity

In the short-term, the Proposed Action would result in some less than significant impacts on selected VECs. Most of these impacts are temporary and would occur only during the construction and demolition phase of the project (e.g. noise and air quality). There would be some long-term impacts, but these are minor, such as the changes to water resources. These less than significant impacts would be offset by the long-term benefits of removing the deteriorated dam and associated structures and allowing the site to return to a more natural condition.

6.2 Irreversible and Irretrievable Commitment of Resources

The Proposed Action would result in the irretrievable commitment of resources expended for construction and demolition activities. Financial resources and fuels used to power construction equipment and vehicles would be an irreversible and irretrievable commitment of resources. Labor required for planning, design, and construction would be irretrievable, once used.

6.3 Summary

Based on the analysis of the environmental consequences of the Proposed Action and Alternatives A, B and C, this EA provides that no significant environmental impacts are expected as a result of implementing the Proposed Action.

7.0 Consultation and Coordination

7.1 Public and Agency Scoping

The following agencies, organizations and individuals were consulted thus far as part of the EA preparation process.

Initial consultation consisted of letters sent in January 2004 requesting pre-assessment comments. Response letters were received from 15 agencies. Copies of the pre-assessment correspondence are attached as Appendix J.

Consultation for the proposed undertaking and potential effects to historic properties in the area was initiated in accordance with Section 106 of the NHPA. Consultation was initiated with the SHPO, Native Hawaiian Organizations and interested parties in 2004, which continued to 2008, and in 2019, which continued into 2020. As a result, USAG-HI has determined that Ku Tree Dam lacks historic integrity and therefore is not eligible for nomination to the NRHP. In compliance with Section 106, the SHPO, Native Hawaiian Organizations and interested parties were notified of the USAG-HI’s finding of no historic properties affected for this undertaking in a letter dated April 9, 2020. Documentation of Section 106 consultation is attached as Appendix E.

In 2004 and 2020, in accordance with the FWCA, USAG-HI consulted with the USFWS and State of Hawaii’s DLNR for the proposed undertaking. To assess the current status of aquatic and terrestrial resources at the proposed project site, a site visit was conducted in February 2020. Participants in the visit included USAG-HI, USFWS biologists, and the State of Hawaii’s Division of Forestry and Wildlife, and the State’s Division of Aquatic Resources. In March 2020, the USFWS provided USAG-HI a *Draft Fish and Wildlife Coordination Act Planning Aid Report* for the proposed breaching of the Ku Tree Dam to evaluate the project impacts in accordance with provisions of the FWCA. The USFWS 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* concluded that breaching the Ku Tree Dam as proposed would have minimal impact to aquatic trust resources, and would in fact potentially enhance aquatic habitat values. The USFWS also provided their concurrence the Preferred Alternative and current *Draft Fish and Wildlife Coordination Act Planning Aid Report*, provided management practices are implemented during construction, is sufficient to cover the current planning phase of the proposed project. Documentation of FWCA consultation is attached as Appendix F.

In March 2020, in accordance with Section 7 of the ESA, USAG-HI notified the USFWS that a Preferred Alternative had been selected and that a no effect determination was made internally as the project would avoid tree felling during bat pupping season (Kawelo, March 4, 2020). Correspondence regarding ESA is attached as Appendix G.

In 2004, brief presentations on the project were also made to two neighborhood boards in the Central O‘ahu region. Presentations were given to the Wahiawā Neighborhood Board on March

15, 2004 and to the Mililani Mauka Neighborhood Board on March 16, 2004. The neighborhood board meeting minutes for these two dates are attached as Appendix I. In addition, a site visit to the project site was conducted by the USACE on June 18, 2004 for interested neighborhood board members and representatives from DOH and OHA.

Responding agencies are noted by an asterisk (*) in the list below.

Federal

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service*

State

Department of Accounting and General Services, Public Works Division
Department of Business, Economic Development and Tourism, Office of Planning
Department of Hawaiian Home Lands
Department of Health, Environmental Planning Office*
Department of Health, Office of Environmental Quality Control*
Department of Land and Natural Resources, Commission on Water Resource Management*
Department of Land and Natural Resources, Division of Aquatic Resources*
Department of Land and Natural Resources, Division of Forestry and Wildlife*
Department of Land and Natural Resources, Division of State Parks*
Department of Land and Natural Resources, Engineering Division*
Department of Land and Natural Resources, Land Division – O‘ahu District*
Department of Land and Natural Resources, State Historic Preservation Division*
Office of Hawaiian Affairs*

City and County of Honolulu

Board of Water Supply*
Department of Design and Construction*
Fire Department
Department of Planning and Permitting (DPP)*
Department of Facility Maintenance*

Utilities

Hawaiian Electric Company*
Verizon Hawai‘i*

Community Organizations

Wahiawā Neighborhood Board No. 26
Mililani Mauka/Launani Valley Neighborhood Board No. 35

Elected Officials

Senator Donovan M. Dela Cruz (note: Senator Robert Bunda previously consulted), State 22nd Senatorial District
Representative Henry J.C. Aquino (note: Representative Marilyn B. Lee previously consulted), 38th Representative District
Representative Amy A. Perruso (note: Representative Michael Y. Magaoay, 46th Representative District previously consulted)
Representative Ty J.K. Cullen (note: Representative Marcus Oshiro previously consulted), 39th Representative District
Councilmember Heidi Tsuneyoshi (note: Councilmember Donavan Dela Cruz previously consulted), City Council District 2

7.2 Summary of Issues Raised

Agency	Letter Date	Comments
State Dept. of Health		
1) Environmental Planning Office	2-24-2004	1) The project is located in the drainage basin of Ki‘iki‘i Stream and Waialua/Kaiaka Bays which are listed as impaired waters under Section 303(d) of the CWA. Impaired status requires establishment of TMDLs. Suggest the EA quantify pre- and post-project pollutant loading for the affected drainage basin and that the Army plan additional pollutant load-reduction practices for future watershed management.
2) Solid Waste Program		2) Waste materials resulting from demolition of the tower and other waste fill should meet the definition of “inert fill” as defined in Hawai‘i Revised Statutes 342H-1. If waste materials do not meet this definition, the EA should include information on proper waste management.
State Dept. of Health Standard Comments		
1) Environmental Planning Office	3-8-2004	1) To facilitate TMDL development and planning, environmental review documents should include information related to: a) water body type and class b) existing water quality management actions c) pending water quality management actions d) proposed action and alternatives considered
2) Solid and Hazardous Waste Branch		2) Recommends development of a solid waste management plan for all phases of the project

Agency	Letter Date	Comments
3) Noise, Radiation and Indoor Air Quality Branch		3) Cites potentially relevant Administrative Rules
4) Clean Water Branch		4) Refers to the NPDES program
5) Waste Water Branch		5) Cites Administrative Rules on wastewater systems
6) Clean Air Branch		6) Recommends development of a dust control management plan
7) Hazard Evaluation and Emergency Response Office		7) Recommends a Phase I Environmental Site Assessment for development or redevelopment of a No Further Action letter for land with a history of contaminants or hazardous substance releases.
State Dept. of Health, Office of Environmental Quality Control	3-2-2004	No comments at this time.
State Dept. of Land and Natural Resources		
1) Commission on Water Resource Management	2-13-2004 & 2-10-2020	1) A stream channel alteration permit (SCAP) may be required for the project.
2) Division of Aquatic Resources	2-28-2020	2) (a) Complete dam removal may contribute to an increase in sediment load to the Wahiawa Reservoir and therefore is not recommended. Would prefer breaching the dam by notching; (b) Recommends maintaining the spillway structure to prevent the migration of introduced/invasive species from moving upstream, but is not a barrier to native stream species; (c) Recommends mapping stream channel habitat areas above and below the dam to provide a model for determining the impacts of the proposed project.
3) Division of Forestry and Wildlife	1-30-2004 & 2-27-2020	3) 2004 – No comment at this time. Would like to review the draft EA. 2020 – (a) Recommends a survey be conducted to determine if listed damselflies are present in the project area[3]. (b) Avoid disturbance during bat birthing/pup rearing season (June l through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. (c) Recommends all lights be fully shielded to minimize impacts to seabirds. Nighttime work that requires outdoor lighting should be avoided during seabird fledging season from September 15 through December 15. (d) If any of State listed waterbirds are present during construction activities, all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves on its own accord.

[3] The absence of damselflies within the project area was confirmed during the February 2020 site visit by Dan Polhemus, USFWS biologist, and expert on native damselflies.

Agency	Letter Date	Comments
		(e) Recommends minimizing the movement of plant or soil material between worksites, such as in fill to minimize the risk of spreading invasive species.
4) State Parks Division	2-4-2004	4) No comments.
5) Engineering Division	1-30-2004 & 2-13-2020	5) The EA should address hydrologic requirements, hydraulic capabilities, and anticipated flooding impacts of the proposed breach. A Dam Construction/Alternation/Removal permit will be required prior to actual work.
6) Land Division – O‘ahu District	1-30-2004 & 1-28-2020	6) No comments.
7) State Historic Preservation Division	2-10-2020	7) 2020 – (a) Should the proposed project require state lands, funding, approval, or permitting historic preservation review under State of Hawai'i Administrative Rules Chapter 6E-8 is required.
Office of Hawaiian Affairs	9-2-2004	Concerned about impacts of the proposed action on the area's water quality. Recommend avoiding lining the channel with cement, which does not support the reintroduction of native species into the stream. Also concerned about the proposal to bury the demolished remains of the tower beneath waste fill.
City and County of Honolulu Dept. of Design and Construction	2-26-2004	Given the flooding history of Kaukonahua Stream and Waialua Town, recommend consideration of impacts to downstream drainageways.
City and County of Honolulu Dept. of Facility Maintenance	2-4-2004	No comments at this time. Would like to review draft EA.
City and County of Honolulu Dept. of Planning and Permitting	2-12-2004	Referral to the State Department of Land and Natural Resources.
Board of Water Supply	2-13-2004	No objections to the project.
Hawaiian Electric Company	3-10-2004	No comments at this time. Would like to review the draft EA.
Verizon Hawai‘i Inc.	2-6-2004	No facilities in the area. No comments.

7.3 CONSULTATION

7.3.1 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the NHPA of 1966, as amended, and its implementing regulations (36 CFR 800), requires federal agencies to identify and consider the potential effects of their proposed actions on historic properties.

During the 1997 archaeological survey, SCS documented the Ku Tree Dam components. SCS did not find any other structures, buildings, districts, objects, or sites within or adjacent to the APE for the current project. In the 2002 project report of the 1997 survey, SCS recommended that Ku Tree Dam be considered eligible to the NRHP under Criterion D because of the

information potential of the historic structure. It is very uncommon for historic period buildings and structures to be considered eligible for the NRHP because of their information potential. SCS did not provide any rationale for their recommendation and USAG-HI did not request any clarification. After receiving the report from SCS, USAG-HI did not formally evaluate the significance and integrity of the structure against the NRHP criteria to make official determination of NRHP eligibility. USAG-HI instead chose to simply treat the dam as eligible based solely on the recommendation from the archaeological contractor, which was standard practice for the USAG-HI cultural resources program at the time.

A June 2004 consultation letter from USAG-HI to the SHPD and the other consulting parties acknowledged the NRHP eligibility recommendation by SCS, but did not formally accept it. The letter recognized that the proposed project could result in adverse effects, offered the HAER documentation of the architectural elements as mitigation for proposed impact of the dam breach, and made a finding of “no adverse effect on historic properties.”

USAG-HI received a consultation response letter from the SHPD in May of 2008, almost four years later (Appendix E). The SHPD response letter concluded that Ku Tree Dam components have lost their historic integrity and expressed the opinion that the determination of effect for architectural concerns is “no adverse effect.” The letter also acknowledged that USAG-HI staff agreed to SHPD’s request for HAER documentation for their records. Regarding potential archaeological concerns, the SHPD letter stated that “the area has been previously disturbed and a great deal of fill was introduced to construct the earthen dam and therefore is unlikely to retain cultural deposits.”

The NRHP eligibility recommendation by SCS was not conducted in accordance with the NRHP criteria for evaluation found at 36 CFR § 60.4 and USAG-HI did not make a formal determination of eligibility. Subsequent correspondence between USAG-HI and SHPD did not clarify the NRHP status of Ku Tree Dam. A formal application of the NRHP criteria for evaluation is appropriate at this point as a basis for determining that no historic properties are present or affected.

Ku Tree Dam is an engineered structure consisting of four associated components: an earthen dam, a concrete tower, a concrete spillway, and a concrete footbridge. Constructed in 1925 with the intent of providing potable water to Schofield Barracks, Ku Tree Dam is associated with the context of U.S. Military development on O‘ahu during the inter-war years of the early 20th Century. The dam did not function well and persistent water shortages forced the Army to develop other sources of potable water. In 1933, the Army started developing plans to drill deep wells and by 1938, after less than 13 years, the Army abandoned Ku Tree Dam as a source of potable water. While the dam continued to hold water and was used for golf course irrigation from the 1940s into the 1970s, it was inconsequential to the development of the U.S. Military on O‘ahu.

Considering its limited utility and lack of association with a specific important event or events that made a significant contribution to the broad patters of our history in the context of U.S.

Military Development on O‘ahu, Ku Tree Dam is not eligible for listing in the NRHP under Criterion A.

Ku Tree Dam is not associated with the lives of any known individuals whose specific contributions to history can be identified and documented. Accordingly, Ku Tree Dam is not eligible for listing in the NRHP under Criterion B.

According to the HAER documentation, the design and construction of the earthen dam and its reinforced concrete components was typical for its time in Hawai‘i and throughout the Nation. Ku Tree Dam is an average example of earthen dams built in Hawai‘i in the early 20th Century. It is one of 125 similar earthen dams in Hawai‘i, the majority of which were constructed between 1885 and 1940. The Ku Tree Dam components are common features found at other dams and there are no specific characteristics that distinguish it from other similar dams in Hawai‘i or the United States as a whole. It does not embody a distinctive type, period, or method of construction, represent the work of a master, or possess high artistic value and it is not eligible for listing in the NRHP under Criterion C.

Ku Tree Dam and its components do not have the potential to provide important information or answer research question about human history. As a designed and engineered structure, the important information about Ku Tree Dam is found in the engineering records and photographs. That information has already been assembled by USAG-HI in the HAER documentation (Appendix E). There is no additional information or data in the physical remnants of the dam that could support eligibility for listing in the NRHP under Criterion D.

Ku Tree Dam still exists where it was constructed and most of the original construction materials remain. Accordingly, it retains integrity of location and material. The absence of working valves and controls and the inability to function as designed indicates the dam lacks integrity of design and workmanship. Overgrown and obscured by dense vegetation, lacking the characteristic reservoir of water, and far removed from the associated historic districts of Schofield Barracks and Wheeler Field, the dam does not retain integrity of setting or feeling.

Finally, with no direct link between an important historic event or person, Ku Tree Dam does not have integrity of association. Retaining only the integrities of location and material and lacking the other five aspects of integrity specified in 36 CFR § 60.4, Ku Tree Dam lacks sufficient integrity to convey historical significance and cannot be considered eligible for the NRHP.

On November 7, 2019, the USAG-HI Cultural Resources Manager Richard Davis, Architectural Historian Ken Hayes, and Archaeologist David Crowley met with the SHPD Architectural Historians Tanya Gumapac-McGuire and Julia Flauaus to discuss the Ku Tree Dam breach project. The group reviewed the NRHP eligibility recommendation by SCS and the consultation letters from 2004 and 2008, discussed the condition and integrity of the dam components, and recognized that the Army has already completed the HAER documentation of the dam components as requested by SHPD.

At the meeting, the group reached a consensus on two points. First, findings reached as a result of the previous consultation, including the eligibility recommendation, the HAER mitigation, and the finding of no adverse effect, would not be acceptable under current standards. Second, there is no potential for Ku Tree Dam to yield significant information that would qualify it for eligibility to the NRHP under Criterion D and the dam lacks historical integrity because of its dilapidated condition, which began to deteriorate in the mid-1900s and was exacerbated when the reservoir was emptied in 1983.

The information presented above is the basis for the USAG-HI’s determination that no historic properties are present or affected by this undertaking. In conclusion, USAG-HI has determined that Ku Tree Dam, does not meet any of the NRHP criteria, lacks a majority of the aspects of integrity, and is not a historic property for the purposes of Section 106 of the NHPA. Accordingly, there are no historic properties present in the project APE, and no historic properties will be affected by this undertaking. The SHPD, Native Hawaiian Organizations and interested parties were notified of the USAG-HI’s finding of no historic properties affected for this undertaking in a letter dated April 9, 2020. Documentation of Section 106 consultation is attached as Appendix E.

7.3.2 Fish and Wildlife Coordination Act

The USAG-HI originally initiated a draft EA for a proposed breach of the Ku Tree Dam in 2004. The 2004 document proposed two alternatives, both of which involved routing the stream into concrete channels with differing alignments. The USFWS reviewed the EA under the authority of FWCA and issued a letter of response indicating concerns with the loss of the natural stream channel that would result from implementation of either alternative. The USFWS suggested that additional alternatives be considered, including full or partial dam removal and more natural channel restoration. This EA document builds upon and carries forward the EA process and addresses the concerns raised by the USFWS starting from 2004. Revisions to the EA include a new preferred alternative with a natural channel and consideration of a dam removal and site restoration alternative.

In January 2020, USAG-HI indicated to the USFWS and DLNR that a Preferred Alternative had been selected. In February 2020, the DLNR Division of Aquatic Resources and Division of Forestry and Wildlife issued a letter of response indicating concerns with the preferred alternative in regard to impacts to soils, threatened and endangered species, introduced/invasive species, and also with the habitat survey methodology.

To assess the current status of aquatic and terrestrial resources at the proposed project site, a site visit was conducted in February 2020. Participants in the visit included USFWS biologists, as well as staff from both USAG-HI and the State of Hawaii’s Division of Forestry and Wildlife, and the State’s Division of Aquatic Resources.

In March 2020 the USFWS provided USAG-HI a *Draft Fish and Wildlife Coordination Act Planning Aid Report* for the proposed breaching of the Ku Tree Dam to evaluate the project impacts in accordance with provisions of the FWCA, the Federal CWA of 1977 [33 U.S.C. 1251 et seq.; 62 stat. 1155], as amended, and the ESA [16 U.S.C 1531 et seq.], as amended (ESA).

The report was prepared by the USFWS in coordination with the State of Hawaii's DLNR. Comments were solicited from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, EPA, and State of Hawai‘i DAR.

The USFWS 2020 *Draft Fish and Wildlife Coordination Act Planning Aid Report* concluded that breaching the Ku Tree Dam as proposed would have minimal impact to aquatic trust resources, and would in fact potentially enhance aquatic habitat values. The USFWS also provided their concurrence the Preferred Alternative and current *Draft Fish and Wildlife Coordination Act Planning Aid Report*, provided management practices are implemented during construction, is sufficient to cover the current planning phase of the proposed project.

Documentation of consultation with the USFWS and State of Hawaii's DLNR, in accordance with the FWCA, is attached as Appendix F.

7.3.3 Section 7 of the Endangered Species Act

The ESA of 1973 requires that any action authorized by a federal agency not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adversely modify designated habitat critical to that species. The USFWS has jurisdiction over endangered and threatened terrestrial flora, fauna, and birds. The ESA prohibits the harming or killing (also referred to as "taking") of listed animal species without authorization. Under Section 7 of the Act, the federal agency responsible for the proposed action must consult with the USFWS when a proposed action may impact listed or candidate species under their jurisdiction.

No plant or animal species listed as endangered, threatened, proposed, or candidate species by the USFWS under the ESA would be affected by the Proposed Action. In March 2020, in accordance with Section 7 of the ESA, USAG-HI notified the USFWS that a Preferred Alternative had been selected and that a no effect determination was made internally as the project would avoid tree felling during bat pupping season (Kawelo, March 4, 2020). In March 2020, USFWS indicated to USAG-HI that they had received the determination of no effect regarding the Ku Tree Dam breaching project. Determination of no effect is at the discretion of the action agency; however, if any new information or project alterations change this determination and trigger consultation under the ESA the USFWS will be contacted immediately (Donmoyer, March 4, 2020). Correspondence with the USFWS regarding ESA is attached as Appendix G.

7.3.4 Sections 401 and 404 of the Clean Water Act

A multi-agency scoping meeting was held on March 9, 2004 to discuss issues related to water quality (Appendix H). Meeting participants included representatives of the USACE, DOH, DLNR and the project consultants. Issues and concerns raised during the meeting were as follows:

- Construction-related issues
  - Soil erosion and sedimentation
  - Duration of construction activities

- Need to secure a Stream Channel Alteration Permit (SCAP) from the Commission on Water Resource Management, DLNR

➢ Long-term operation issues
- Since stream water had been constricted by the dam, there was de facto sediment detention behind the dam. This function would be lost with the breach.
- The project is proposing a flood control channel, not a flood control basin. Therefore, debris will pass through faster and quicker.
- If a sediment pod is provided, who would maintain it?
- What is the anticipated post-project pollutant loadings?
- Is there a phasing plan? One outlet will be closed while another is being opened.
- What are the impacts to stream biology? Can fish migrate up the existing drain tunnel?

➢ Section 303(d) List of Impaired Waters
- Under provision of Section 303(d) of the CWA, the DOH prepares a list of waters that are either threatened or impaired based on nonattainment of water quality standards. Although Kaukonahua Stream itself is not on the 303(d) list, Ki‘iki‘i Stream and Wailua/Kaiaka Bays, waterbodies downstream of the project site, are on the current EPA-approved list (DOH, 2018). During the 2004 meeting, representatives from DOH expressed concern that Lake Wilson and Kaiaka Bay appear muddier than usual and, although located miles away, there is potential that activities at Ku Tree might compound worsening conditions. Background studies are currently underway to establish the TMDLs for the watershed.
- Note: Since the meeting in 2004 TMDLs have been established for the watershed in which Ku Tree Reservoir is located. This analysis found that existing pollutant concentrations in the South Fork of Kaukonahua Stream exceeded wet and dry season water quality standards for turbidity and total nitrogen (Tetra Tech, 2009). The proposed alterations to Ku Tree Dam and Reservoir are not expected to contribute to excessive nutrient and sediment loads to the stream. Following construction, the proposed project is expected to improve the long-term water quality of the stream so that the designated and existing uses of waterbodies throughout the Ki‘iki‘i Stream system will be protected and sustained (Tetra Tech, 2009).

During the meeting the following permits were identified as being needed for the project:

<u>Section 401 (33 U.S.C. § 1341) – Water Quality Certification</u>. Section 401 requires federal agencies to obtain certification from the State before issuing permits to ensure that the project subject to said permits, would not cause or contribute to a violation of relevant State water quality standards. Section 401 certification is needed to acquire the Section 402 and 404 permits.

<u>Section 402 (33 U.S.C. § 1342) – NPDES Permit</u>. Section 402 authorizes the NPDES permitting program. An NPDES permit is required for the discharge of storm water (non-

point sources of water pollution), which includes construction activities such as clearing, grading, excavation, and dewatering that result in the disturbance of at least one (1) acre.

Section 404 (33 U.S.C. § 1344) – U.S. Army Corps of Engineer Permit. Section 404 entails the regulation and permitting for the placement of dredged or fill material into water of the U.S. Typically, the USACE does not regulate excavation and fill in a freshwater, non-tidally influenced stream; however, a Section 404 permit will be required for this project because of the channel’s length, the type of lining material proposed, and its location in an impaired water segment.

8.0 List of Preparers

This Environmental Assessment was prepared for the USAG-HI Directorate of Public Works, Hawai‘i, the project’s owner and proponent, by the USACE, Honolulu Engineer District, with technical assistance from R.M. Towill Corporation pursuant to USACE, Honolulu Engineer District, Contract No. W9128A-18-F-0064.

R.M. Towill Corporation - Planning & Environmental

Brian Takeda	Project Manager
Kelly Staples	Planner

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Appendix A:

Water Quality Monitoring Plan & Water Quality and Biological Survey

WATER QUALITY MONITORING PLAN
BREACH KU TREE DAM

EAST RANGE, SCHOFIELD BARRACKS
ISLAND OF O`AHU, HAWAII

PREPARED FOR:

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU

MARCH 2004

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1 INTRODUCTION

1.1 Regulatory Background

The Federal Water Pollution Control Act (FWPCA) amendment of 1977, commonly referred to as the Clean Water Act (CWA), prohibits discharges of pollutants to the waters of the United States unless authorized by a National Pollutant Discharge Elimination System (NPDES) permit. In 1987, the NPDES program was expanded to include storm water discharges.

The Environmental Protection Agency (EPA) established sampling requirements for the storm water discharges in 1990 (55 Fed. Reg. 47990). These requirements are enforced by both the EPA and state governments. In the State of Hawaii, the enforcement agency for the NPDES program is the Department of Health.

1.2 Purpose of This Plan

This plan establishes specific storm water runoff sampling and monitoring requirements for the proposed project to breach Ku Tree Dam and reservoir located in the east range of Schofield Barracks (Figure 1 and Figure 2). The Department of the Army is proposing this project as a long term solution to eliminate the possibility of a major storm event breaching the dam (Figure 3) and endangering life and property downstream.

1.3 Project Location and General Description

Ku Tree Dam, constructed in 1925, is located in rough, heavily vegetated area within the east range of Schofield Barracks Military Reservation, approximately 3 kilometers (km) (2 miles) east of the town of Wahiawa, 12 km (7.5 miles) upstream of Wahiawa Reservoir and 12 km (7.5 miles) north of Pearl Harbor, and south of the Ewa Forest Reserve. The dam sits on an unnamed tributary to the south fork of Kaukonahua Stream.

The Ku Tree Dam and Reservoir originally provided water for the U.S. Army at Schofield Barracks. In 1938, a deep well pumping station was constructed and became the potable water supply source for the Army. Since that time this dam and reservoir site has been used as a troop training facility.

In 1978, the dam was determined to be unsafe following inspection under the National Dam Safety Program. The Corps of Engineers indicated that failure was possible given the poor structural integrity of the dam and its associated structures.

In 1983, the water level of Ku Tree Reservoir was lowered to facilitate engineering studies of the dam structures. Numerous reports and studies from

1978 to today are the basis of design for the breaching of Ku Tree Dam. This is the recommended course of action to provide a long term solution to the dam safety problem.

The dam is approximately 168 meters long, 27 meters high with a crest width of 9 meters. Both upstream and downstream slopes are sloped 1:3 (1 vertical to 3 horizontal). The upstream slope is lined with riprap and the crest and downstream slope are grassed. The dam is an embankment with a timber diaphragm core wall. A reinforced concrete spillway is located on the left end (facing upstream slope) of dam crest and consists of a 49 meter ogee weir and drop section into a stilling basin. An existing intake tower located upgradient of the dam contains gate valves to control the discharge to either a discharge tunnel (1.2 meter wide x 1.8 meter high x 762 meter long) or to the drainage tunnel 162 meters long. The dam crest is at elevation 330.7 meters above MSL and the floor of the concrete lined spillway stilling basin is at elevation 300.2.

The proposed breaching will be accomplished by excavating a rectangular channel approximately 122 meters long through the natural hillside, which supports the existing concrete spillway. The new channel will be concrete lined and measure 9.1 meters wide. The invert elevations for the channel will range from 307.8 meters at the upstream end to elevation 301.1 meters at the connection to the existing channel. The wall heights for the new channel will be approximately 3.2 meters high and will extend above the design water surface profile by not less than 0.61 meters. The proposed channel will tie in to the existing discharge end of the spillway and stilling basin. Where the spillway channel can be retained, riprap extending 1.2 meters above the existing walls will be required for protection against overtopping flow during design flood conditions.

Material from the excavation shall be placed along the upstream face of the existing dam. The existing intake tower shall be demolished and buried beneath the waste fill.

The drain tunnel will be permanently plugged at the inlet and outlet ends and a small diameter drain will be installed to permit relief of seepage water from the blocked tunnel. A section of the discharge tunnel located beneath the new channel will be plugged to preclude any hazard of collapse. Appurtenant improvements will be two access roads.

The estimated total construction period is 12 months, with work within water estimated at 6 – 7 months.

In January 2004, AECOS biologists conducted an environmental reconnaissance survey of the immediate vicinity of the Ku Tree Dam site (Appendix A). Their work included observations characterizing the existing aquatic environment, taking water samples and performing water quality analysis of several parameters. The survey states in regards to aquatic biota, "None of the species

observed is listed as threatened or endangered, or otherwise would be considered rare or special by the State or Federal governments." The survey states in regards to existing water quality, "The water in the area of the dam is of similar quality to other mountain streams on O`ahu and breaching the dam should not alter the quality significantly." For discussion of other impacts, please refer to Appendix A.

1.4 Organization of This Plan

This plan is divided into the following sections:

Section 1: Introduction
Section 2: Sampling Preparation
Section 3: Sampling Requirement
Section 4: Sample Documentation
Section 5: Health and Safety Considerations

2 SAMPLING PREPARATION

2.1 Description of Drainage System

The existing drainage system consists of a drainage tunnel connecting an un-named stream at the Intake Tower inlet on the upstream side of Ku Tree Dam through the dam and discharging at the unnamed stream flowing to the south fork of Kaukonahua Stream.

2.2 Sample Point Selection

Two sampling locations are recommended for the project area. Sampling Point #1 will be located at least 30-ft upstream of the construction limits and Sampling Point #2 will be located at 3-ft downstream of the construction limits.

2.3 Sampling Frequency

Five grab samples will be collected from the unnamed stream discharge location prior to construction. The pre-construction monitoring results will be submitted to DOH Clean Water Branch within two weeks after availability of the results.

During construction, samples will be collected twice a week upstream and downstream of the discharge location. Monitoring frequency may decrease depending on storm activity. Sample results will be faxed and mailed to DOH Clean Water Branch on a weekly basis.

Five post-construction samples shall be collected after the completion of construction, unless a waiver for the post-construction monitoring is granted by DOH based on the during-construction monitoring results and upon the request

of the Contractor. The post-construction monitoring results will be submitted to DOH Clean Water Branch within two weeks after availability of the results.

2.4 Sampling Parameters

Samples will be analyzed for dissolved oxygen, temperature, pH, total suspended solids, oil & grease, electrical conductivity and turbidity.

2.5 Sampling Methods

All sampling methods, for each parameter to be monitored, will be performed in accordance with Title 40, Code of Federal Regulations (CFR), Chapter I, Subchapter D, Part 136. Dissolved oxygen, temperature, pH, and electrical conductivity will be measured onsite.

3 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) PROTOCOL

3.1 Sampling Device Decontamination

All devices that will directly or indirectly contact samples will be decontaminated:

- Scrub the devices with a solution of potable water and Alconox, or equivalent laboratory grade detergent. Rinse devices with copious quantities of potable water followed by deionized water. High-pressure liquid chromatograph-grade water and distilled water purchased in stores will not be used to substitute for the deionized water.

- Decontaminate and air dry devices on a clean surface or rack, such as Teflon, stainless steel, or oil-free aluminum elevated at least two feet above ground. If the sampling devices will not be immediately used, it will be wrapped in aluminum foil, or placed in a closed stainless steel, glass, or Teflon container.

In addition, samples will be prevented from coming into contact with potentially contaminating substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

3.2 Field Sampling

Samples will be collected so as not to cause cross-contamination. The locations where samples are collected will be marked and detailed on the project map. The sample collection sequence will be as follows:

- Sampling will start at the downstream point and proceed upstream.

- If the sample can be taken without disturbing the stream bottom, any background sample will be obtained first, then the downstream sample and upstream sample.

- If the stream bottom must be disturbed, start at the downstream and proceed upstream.

Representative concentrations of the contaminants of interest in water samples will be assured by taking the following precautions in obtaining field samples:

- Prior to the initial sampling, decontamination procedures will be followed on all devices to be used to prevent the introduction of contaminants by outside sources.

- Samples from shallow depths will be readily collected by merely submerging the sample container with the container's mouth positioned in the upstream direction with the sampler positioned downstream to prevent contamination.

- To avoid aeration of the sample, the sample container will be held at an angle so that the stream of water gently flows down the side of the container. Inverting the container and carefully tapping on the cap will ensure zero headspace in the sample container. If air bubbles appear, the cap will be removed and additional sample water will be added to produce a meniscus. This will be repeated as often as necessary until no headspace remains in the container.

- A representative sample should be collected from a relatively large body of stream water.

- Sampling for oil & grease will use two 40-ml. volatile organic analysis bottles (screw-top vials with Teflon-lined silicone septa) provided by the analytical laboratory. These sample bottles will not be rinsed prior to sampling, but will be placed in a 4°C environment immediately after labeling in accordance with Section 3.6 of this WQM Plan. A vial of water named "Temperature Blank" will be placed together with water samples to permit the laboratory to determine sample temperature upon arrival.

- Duplicate samples, when collected, will be taken immediately after the field sample. Decontamination procedures will not be necessary between sampling for the field samples and the duplicate. Field samples, field duplicates, and trip blanks will be labeled in sequence and individually placed in plastic bags to prevent cross-contamination.

Thermometers, pH meters, dissolved oxygen, and EC meters will be calibrated in accordance with Section 3.3. The following records will be maintained in addition to the requirements of laboratory QA/QC program:

- Stream water conditions (i.e., floating oil or debris, gassing)
- Instrument calibration

3.3 Equipment Calibration

Analytical instruments used in the field will be calibrated before and after use in accordance with the manufacturer's recommendations and instruction. The instruments will be zeroed and challenged with a span gas to provide verification of function. All calibration records will be maintained on the field log. Selected field checks will also be performed to insure equipment integrity.

The pH meter will be calibrated immediately before the final value is measured. At least two buffer solutions that bracket the sample pH will be used (i.e. 4.0 and 9.0). EC meters will be calibrated daily. At least two solutions that bracket the expected range of sample EC's will be used. Dissolved oxygen meters will be calibrated daily against temperature-compensated, air-saturated water. The electronic calibration will be checked before each use. Thermometers will be calibrated before initializing the monitoring program. The expected range of sample temperatures will be bracketed.

3.4 Equipment Maintenance

Equipment will be maintained in accordance with manufacturer's recommendations. Particular attention will be given in avoiding high humidity and dusty conditions.

3.5 Field Measurements

Dissolved oxygen, temperature, pH, and electrical conductivity will be measured on-site. Field personnel will familiarize themselves with the manufacturer's instructions for use of the pH, temperature, and EC meters before going to the field and collecting samples.

3.5.1 Temperature

- Rinse the thermometer or temperature probe with distilled water.
- Immerse the thermometer or probe into the sample. The thermometer or probe will not be placed in sample containers containing groundwater samples for laboratory analysis.
- Wait for the temperature reading to stabilize (this may take about a minute).
- Read and record the temperature to the nearest 0.5°C. Read the thermometer while it is immersed in the sample.

- Rinse the thermometer or probe with distilled water.

3.5.2 pH

- Set up and calibrate the pH meter with the proper buffer solution according to the manufacturer's instructions.
- Rinse the electrode thoroughly with distilled water. Coating of oily material or particulate matter can impair electrode response. These coatings can usually be removed by gentle wiping or detergent washing, followed by rinsing with distilled water. An additional treatment with hydrochloric acid (1:9) may be necessary to remove any remaining film.
- Immerse the electrode into the sample and gently swirl, if possible.
- Wait for the reading to stabilize.
- Read and record the pH to the nearest 0.1 unit.
- Remove the electrode from the sample and rinse the electrode with distilled water.
- Store the electrode.

3.5.3 Electrical Conductivity

- Set up and calibrate the conductivity meter according to the manufacturer's instructions.
- The specific conductance cell can become coated with oil and other materials. It is essential that the cell be thoroughly rinsed and, if necessary, cleaned between samples.
- Set the range selector to the desired range for measurement.
- Measure the temperature for the sample with a thermometer (as above) and set the temperature selector on the conductivity meter to the measured temperature (if required). Whenever possible, samples should be analyzed at 25°C.
- Rinse the probe with distilled water.
- Place the probe into the sample and move it up and down several times to remove the air bubbles inside the cell casing. Rotate the cell slowly in the sample until the reading stabilizes (some meters requires different procedures).

- Read and record the conductivity measurement. Remember to multiply the reading by the range the dial is set to.
- Rinse the probe with distilled water.
- If necessary, correct the measurement to the standardized 25°C.

3.5.4 Floating Petroleum Products

A mechanical containment device such as booms, barriers, and skimmers, as well as natural and synthetic sorbent materials will be installed across the stream downstream of construction limits prior to construction activities commencing to capture and store possible petroleum products until it can be disposed of properly. When detected, the presence of floating hydrocarbons will be confirmed by withdrawing a sample with a clear, bottom-filled Teflon bailer. All equipment will be constructed of inert materials and will be decontaminated prior to subsequent use to avoid cross-contamination.

3.6 Sample Handling

Sample handling will be in accordance with SW-846 Methods for Chemical Analysis of Water and Wastes. The Sample Analysis Request Form of Table 1 will be used and completed by the field sampling technician. Samples will be identified, preserved, contained, and delivered from the primary site monitoring personnel through an unbroken chain of custody process to the analytical laboratory manager and the analytical chemist.

3.6.1 Sample Identification

Each sample collected in the field should be identified with a sample identification tag as shown in Table 2. The tags will be completed with waterproof or indelible ink and affixed to the sample containers prior to collection of the sample. The following information will be included on each sample tag:

- Serial Tag Number: The tag will have a unique stamped serial number. This number will be recorded in the field notebook.
- Event code: The event code is unique number assigned by the primary site monitoring personnel for sampling event.
- Date: The date the sample was collected will be recorded. All dates will be expressed in the YYMMDD format.
- Time: The time the sample was collected will be entered on the sample identification tag as four-digit numbers indicating the time of collection using 24-hour clock notation in Hawaiian Standard Time (HST).

- Station Number: The sampling station location as identified in the sampling plan at which the sample was procured will be noted on the sample tag.
- Preservative: If a chemical preservative was used, the type and quantity of preservative added to the sample will be written on the sample tag.
- Grab/Composite Sample: If a grab and/or a composite sample is collected, this will be indicated on the tag.
- Analysis Requested: The type of chemical analysis requested will be indicated.
- Sampling Personnel: The printed name and signature or each person who collected the sample will be included on the sample tag.
- Field Sample ID Number: The field sample ID number, which is a unique number identifying the sample in sequence of collection at the station location, will be included on the tag.
- Laboratory Sample ID Number: A space on the sample tag will be reserved for laboratory use to record the laboratory sample number.
- Remarks: Any pertinent information such as identification of split samples or special procedures will be included on the sample tag.

3.6.2 Sample Containers

Sample containers will be used in the sample collection for analysis. The quantity of sample bottles provided for a sampling event will always exceed the required number of sample bottles by 50 percent, in case of accidents or so that additional samples can be taken if desired.

Plastic bags, packing cans, etc. will be used to protect the sample container from damage and to eliminate the possibility of cross-contamination. These bags and cans will be filled with an appropriate packing material and secured with a custody seal. Samples to be shipped to the analytical laboratory will be placed in coolers, delivering containers, etc. These containers will be padlocked or sealed with custody seals. If custody seals are used, a minimum of two custody seals will be placed on each delivering container with at least one at the front and one at the back and located in such a manner as to indicate container tampering. Wide, clear tape will be placed over the seals to ensure that the seals are not broken during transit.

3.6.3 Sample Preservation

After samples have been contained, if necessary, appreciate preservation techniques will be used to ensure no physical/chemical changes to the sample

occur prior to workup, extraction and/or analysis at the laboratory. A vial of water named "Temperature Blank" will be placed together with samples to permit the laboratory to determine sample temperature upon arrival.

3.6.4 Sample Delivery

After being properly contained, preserved, and documented, samples will be delivered to the analytical laboratory in accordance with Federal and State statutes and regulations. The analytical laboratory will be contacted before the sampling event so that delivery of the samples will be coordinated and delivered to the laboratory manager. All samples sent by mail will be registered with a return receipt.

3.7 Sample Custody

The Chain-of-Custody (COC) form of Table 3 will be used to document that control of the samples is successively relinquished from one authorized person's custody and received by another authorized person's custody. This COC document will be maintained from procurement through final analysis and disposition for each sample. Field samplers will be responsible for the care and custody of all samples collected by their teams until the samples are properly transferred or dispatched. As few people as possible will handle the samples. When samples are packaged for shipment to the laboratory for analysis, a separate COC will accompany each shipment. The sampler will retain a copy of the COC. Once received by the laboratory, the laboratory custody procedures will apply. It will be the laboratory's responsibility to maintain custody records throughout sample preparation and analysis.

3.8 Quality Control Samples

Two (2) types of field QC samples will be collected during the entire monitoring effort. The number, type, and composition of these samples will comply with the following requirements. The distribution of field QC samples by site, sampling round, etc. will be specified in the work plan.

Trip Blanks: Trip blanks are collected for chemical analysis of volatile organic. The analytical results serve as a baseline measurement of volatile organic contamination that sample containers may be exposed to during transport and laboratory storage prior to analysis.

Trip blanks originate in the laboratory. They are comprised of organic-free reagent water, which is place in sample containers by the laboratory, transported to the site location, handled along with the samples, and returned to the laboratory along with samples of water and/or soil collected for volatile organic analysis. The trip blank containers are not to be opened in the field.

For the samplings in this project, one (1) trip blank will be analyzed at a frequency of one per delivery to the laboratory. The Trip blanks will be stored in the laboratory with the samples, and analyzed by the laboratory (for volatile organic only).

Field Duplicates: Field duplicates are defined as two samples collected independently of each other at the same sampling location during a single sampling episode. Duplicate analysis provides statistical information relating to sample variability and serves as check on the precision of any sample collection method.

For the samplings in this project, ten percent of all samples submitted for laboratory analysis will be collected in duplicate. Field duplicates will be labeled similar to field samples so that persons performing laboratory analyses are not able to distinguish duplicates from other collected samples. Field duplicates are recorded in the field logbooks for future reference.

3.9 Record Keeping

Field records sufficient to recreate all sampling and measurement activities will be maintained. The information will be recorded in indelible ink in a permanently bound notebook with sequentially numbered pages. These records will be archived in an easily accessible form and made available up request.

- The following information will be recorded for all activities:

  1. Location
  2. Data and time
  3. Identity of people performing activity
  4. Weather conditions

- The following additional information will be recorded for all field measurements:

  5. The numerical value and units of each measurement
  6. The identity of and calibration results for each field instrument

- The following additional information will be recorded for all sampling activities:

  7. Sample type and sampling method
  8. The identity of each sample and depth(s), where applicable, from which it was collected.

9. The amount of each sample
10. Sample description (e.g. color, odor, clarity)
11. Identification of sampling devices
12. Identification of conditions that might affect the representatives of a sample (e.g. refueling operations)

3.10 Sample Analysis Level

The sample analysis level to be used for this project will be Analytical Level II.

4 SITE PHOTOGRAPHING

Photographs will be taken to show the pre-construction condition at the project site. Weekly photographing will be conducted during the construction. The erosion and discharge control system for in-stream work and the stream flow diversion structure shall be evident on the photos. After the completion of the construction, photos will be taken to show the new site conditions, including the new channel and roadway.

Pre-construction, during construction, and post-construction photographs shall be submitted on the same time-table as sampling results.

5 REFERENCES

1. Mitsunaga and Associates, Inc., "Draft Design Analysis, FY04 OMA PKG A-130, Breach Ku Tree Dam, East Range, Schofield Barracks, Island of Oahu, Hawaii, Pre-Final Submittal," Feb. 2004
2. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 54, Water Quality Standards
3. Code of Federal Regulations (CFR), Title 40, Chapter 1 (EPA), Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants.
4. American Public Health Association, Standard Methods for the Examination of Water and Wastewater, 20th Edition, 1989
5. State of Hawaii, Department of Health, General Monitoring Guideline for Section 401 Water Quality Certification Projects, April 7, 2000

6 TABLES

Table 1. Example Sample Analysis Request Form

PART 1: FIELD SAMPLER SECTION

SAMPLE COLLECTION INFORMATION:

Date: Time: Number of Samples Included:
Site Name:
Site Location:
Sampling Personnel: Phone Number:
Organization:

LAB SAMPLE NO.	FIELD SAMPLE NO.	SAMPLE LOCAITON	TYPE OF SAMPLE	ANALYSIS REQUESTED	NOTES (Preservatives)

SPECIAL STORAGE AND/OR HANDLING INSTRUCTIONS:

PART 2: LABOARATORY SECTION

Received By: Title: Date:
Comments (sample integrity, cooler temp, etc.):

Table 2. Sample Identification Tag

SAMPLE ID TAG		SERIAL TAG #						
EVENT CODE:	DATE (YYMMDD):							TIME:
STATION #:	STATION LOCATION:							
PRESERVATIVE:	____ GRAB ____ COMPOSITE							
ANALYSIS REQUESTED:								
SAMPLING PERSONNEL:								
FIELD SAMPLED ID #:	LABORATORY SAMPLE ID #:							
REMARKS:								

Table 3. Chain of Custody / Analysis Request Form (Sample Only)

BASIC LABORATORY CHAIN OF CUSTODY RECORD
2218 Railroad Ave., Redding, CA 96001 (530) 243-7234 FAX (530) 243-7494

LAB #:

CLIENT NAME:

PROJECT NAME:

PROJECT #:

SAMPLE TYPE:

ADDRESS:

REQUESTED COMP. DATE:

STATE FORMS? ☐

OF SAMPLES:

TURN AROUND TIME: STD ☐ RUSH ☐

PAGE _____ OF _____

PROJECT MANAGER:

PHONE: FAX: E-MAIL:

INVOICE TO: PO#:

SPECIAL MAIL ☐ E-MAIL ☐ FAX ☐ EDT ☐

REP:

ID#:

SYSTEM:

GLOBAL ID #:

LAB ID

QC=1 2 3 4

REMARKS

DATE	TIME	WATER	COMP	SOIL	SAMPLE DESCRIPTION DESCRIPTION	# OF BOTTLES	ANALYSIS REQUESTED										LAB ID	REMARKS

PRESERVED WITH: ☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ ZnAce/NaOH ☐ HCL ☐ Thio ☐ OTHER _____

SAMPLED BY:	DATE/TIME:	RELINOUISHED BY:	DATEITIME:
RECEIVED BY:	DATE/TIME:	RELINOUISHED BY:	DATEITIME:
RECEIVED BY: (SAMPLES UNVERIFIED)	DATE/TIME:	RELINOUISHED BY:	DATEITIME:
RECEIVED BY LAB: (VERIFIED)	DATE/TIME:	SAMPLES SHIPPED VIA: UPS FEDEX POST BUS OTHER _____	

Ku Tree Location

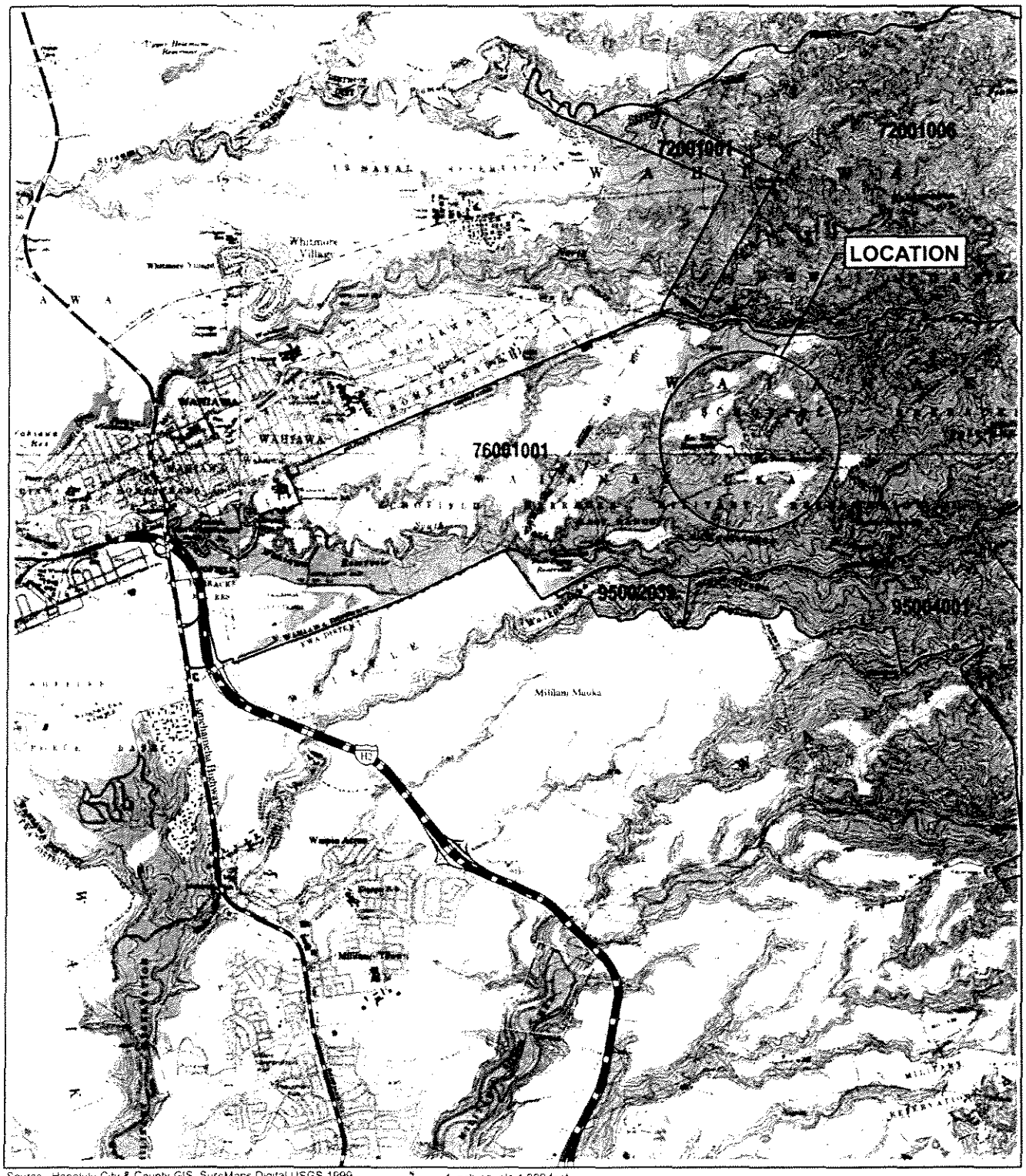
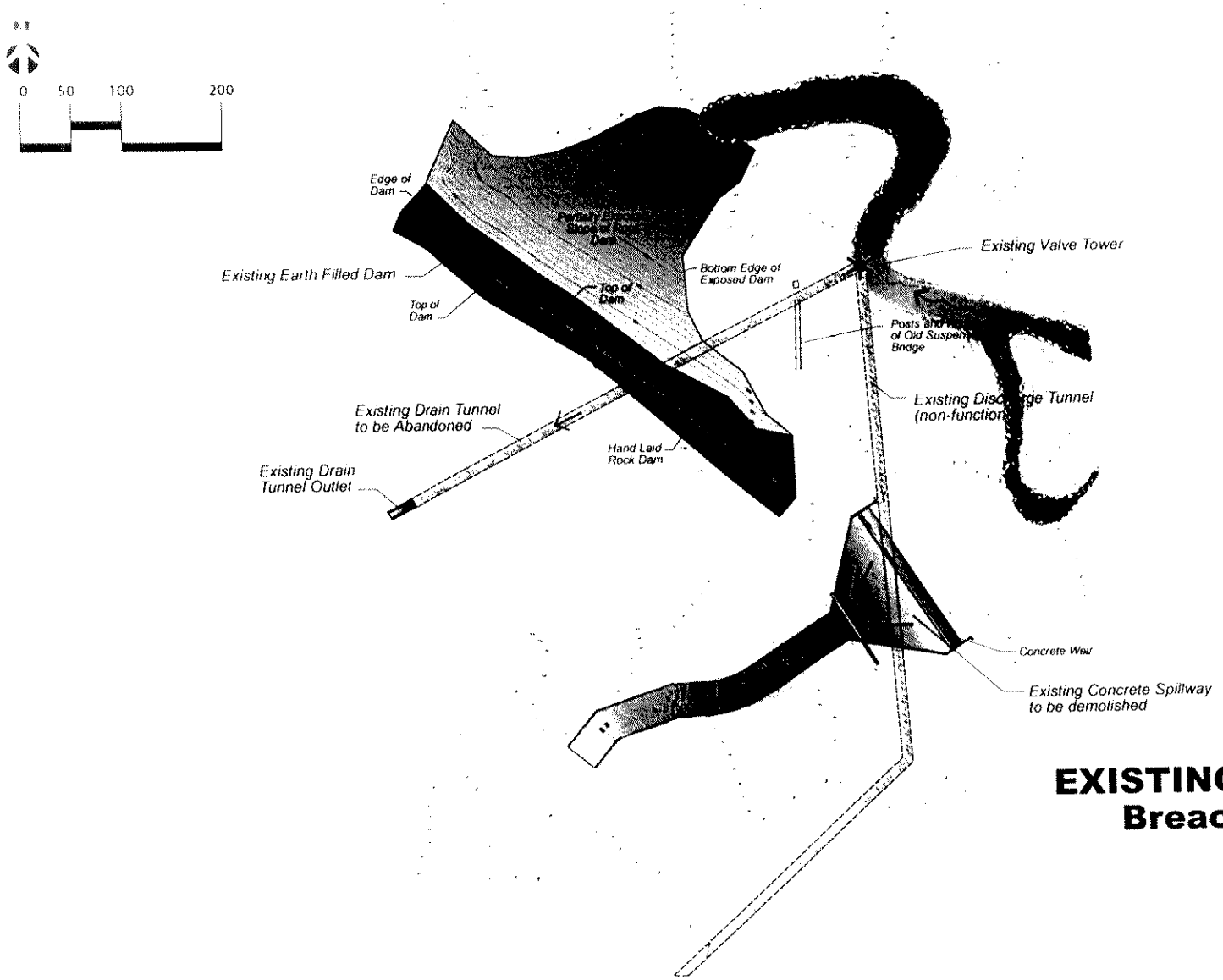


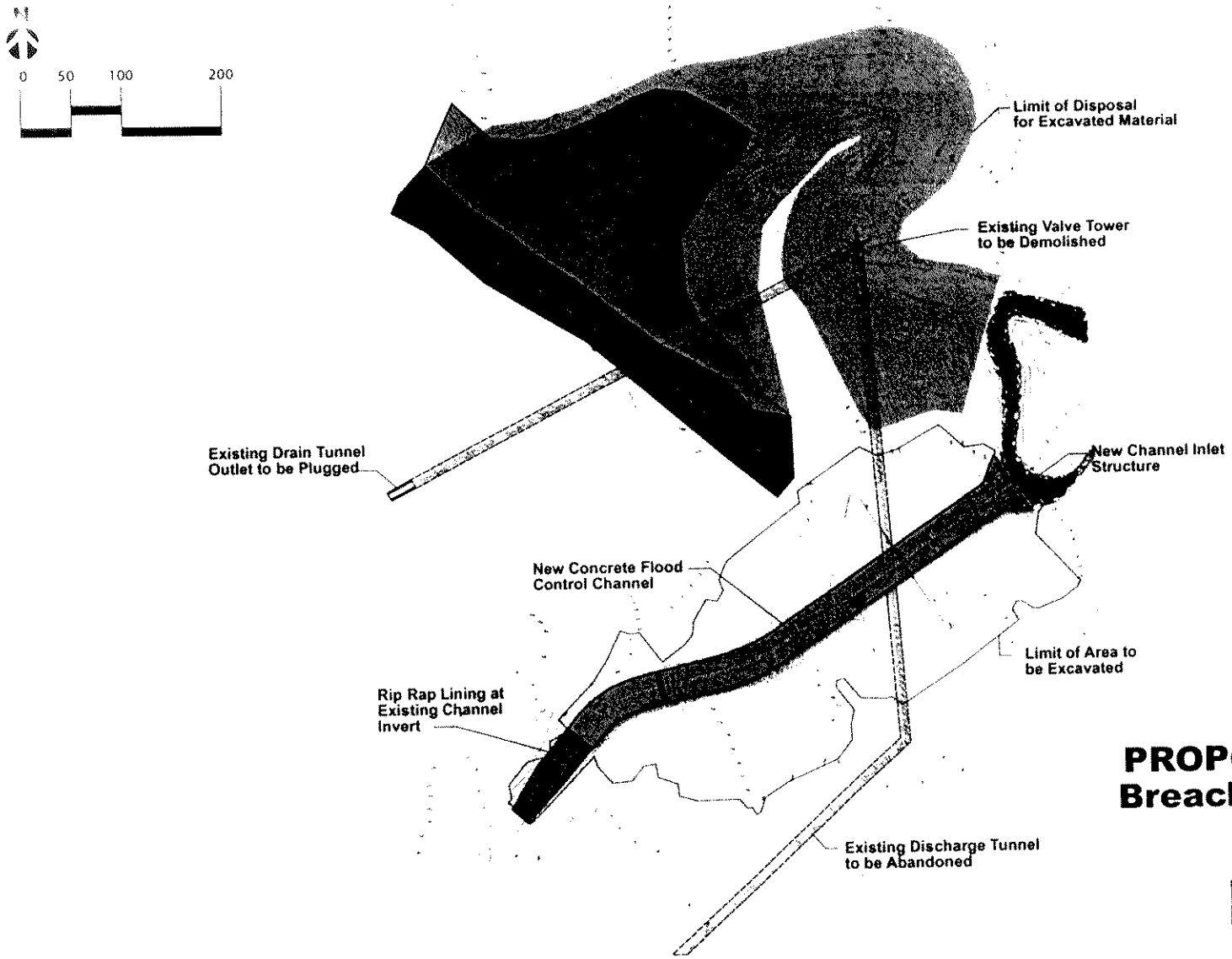
FIGURE 1



EXISTING CONDITIONS
Breach Ku Tree Dam

DRAFT

FIGURE 2



PROPOSED ACTION
Breach Ku Tree Dam

DRAFT

FIGURE 3

APPENDIX A

WATER QUALITY AND BIOLOGICAL SURVEY

AECOS No. 1051

Water quality and biological survey of an unnamed branch of Kaukonahua Stream at Ku Tree Dam, East Range, O`ahu

February 20, 2004

Prepared For:
M&E Pacific.
841 Bishop Street, Suite 1900
Honolulu HI 96813-3908

Prepared By:
AECOS, Inc.
Susan Burr
45-939 Kamehameha Highway, Suite #104
Kaneohe HI 96744
(808)234-7770

Water quality and biological survey of an unnamed branch of Kaukonahua Stream at Ku Tree Dam, East Range, O`ahu[1]

February 20, 2004 *AECOS* No. 1051

Susan Burr
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Introduction

Ku Tree Dam was constructed in 1925 on an unnamed tributary to the South Fork of Kaukonahua Stream to form a reservoir to supply water to the central O`ahu U.S. Army facility established in 1908 and known as Schofield Barracks. The dam and (now) former reservoir are located on a part of the Schofield Barracks Military Reservation known as East Range, located along the leeward (or westward) slope of the Ko`olau mountain in central O`ahu (Figure 1). Shortly after the reservoir was established, a drinking water well was built on Schofield Barracks and the use of Ku Tree Reservoir as a drinking water source was discontinued. In the early 1980's, the reservoir was drawn down to facilitate engineering studies and analysis of the dam structures because it was determined that the dam could not be certified against failure following an inspection under the National Dam Safety Program. The reservoir has remained empty since then and the U.S. Army Corps of Engineers (USACE) is again conducting studies and considering alternative approaches to removing the dam structure.

On January 12, 2004, two *AECOS* biologists conducted a reconnaissance survey of the stream just upstream and downstream from Ku Tree Dam. Water samples were collected and aquatic fauna and riparian vegetation were identified. This report presents the findings of those surveys.

General Site Description

The south and north forks of Kaukonahua Stream join together just upstream of the Wahiawa Reservoir (known also as Lake Wilson). Kaukonahua Stream then flows

[1] This report was prepared for use by M&E Pacific, Inc. in an Environmental Assessment for the Ku Tree Dam. The EA will become part of the public record.

from the reservoir and joins Poamoha Stream to become Ki`iki`i Stream as it flows through Waialua to Kaiaka Bay on the north shore of O`ahu. South Kaukonahua Stream is given State ID No. 3-6-06.02.1. South Kaukonahua Stream is made up of several tributaries, two of which join together just upstream from the Ku Tree Dam, which is located at the 1080 foot elevation. The reservoir and streams are in narrow, meandering, forested gulches, populated primarily by alien plant species. Upstream from the convergence of these two tributaries, water can be shunted into the reservoir from the windward face of the Ko`olaus via the Ko`olau Ditch Tunnel system (*AECOS*, 1984).

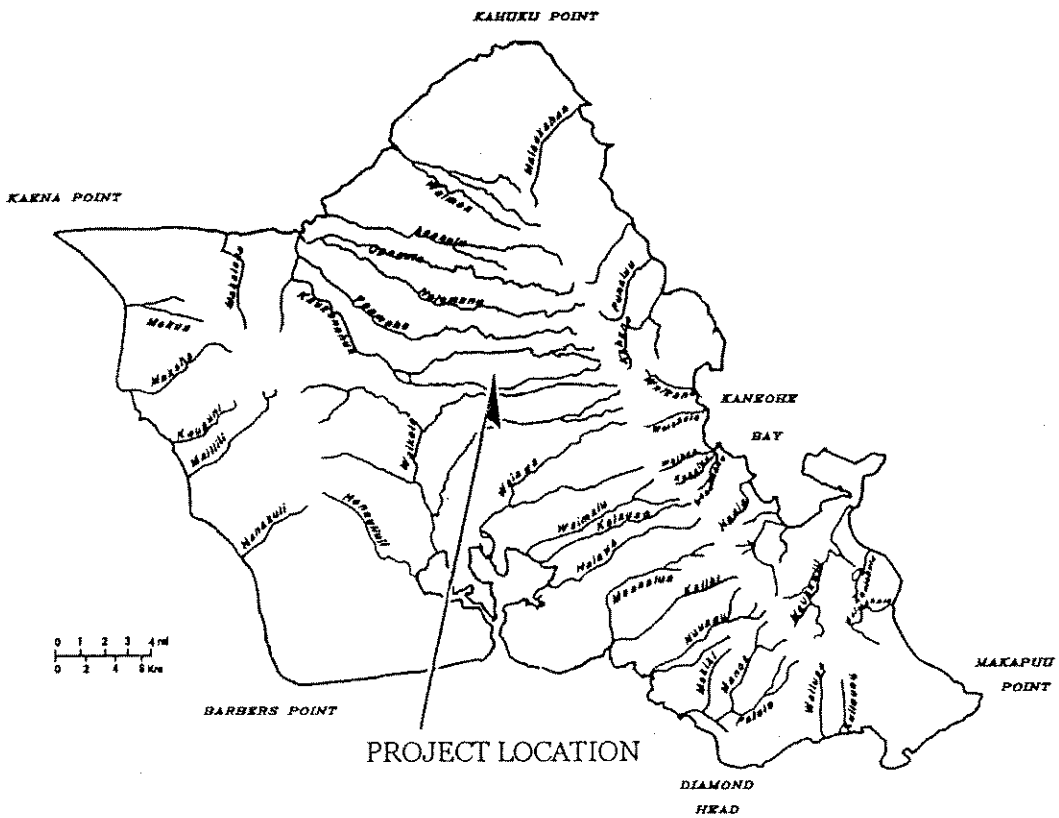

Figure 1. Ku Tree (project) location on the Island of O`ahu.

The following description of the dam and reservoir is from Mitsunaga and Associates (2002):

> The dam is approximately 550 feet long, 90 feet high with a crest width of 30 feet. Both upstream and downstream slopes are 1 vertical to 3 horizontal (1:3) with the upstream slope riprapped and the crest and downstream slopes grassed. The embankment is homogeneous with a timber diaphragm core wall. A reinforced concrete spillway is located on the left abutment, and consists of a 160 feet ogee weir and drop section into a silting basin. The

> outlet works control valves are located atop a gate house control tower and discharges through a 4 x 6 ft. partially lined discharge tunnel 2,500 feet long, and drainage tunnel 530 feet long.

The reservoir and streams are in a subtropical mixed forest, populated primarily by shrubs and trees alien to the Hawaiian Islands (introduced after 1796). *Eucalyptus* spp., fiddlewood, strawberry guava, and Moluccan albizia trees are common. Some native ohi`a and koa trees are present but relatively uncommon.

Upstream from the dam, the main basin of the former reservoir consists of a pool and the confluence and lower reaches of two perennial streams. The banks, which were under water when the reservoir was full over 20 years ago, are now forested with trees and shrubs and the flat bottom lands are comprised of a thick layer of sediment overgrown mostly with grasses. It was evident, through the observation of sediment on the lower branches of trees, flattened grasses, and a large amount of woody debris collected at the base of the dam, that much of the reservoir was recently flooded to a depth of around 2 meters (6.6 feet). This flood may have occurred on December 7, 2003 when 27.88 cm (10.96 in.) of rain fell over a 24-hour period in the East Range or may be the result of a January 1 - 2, 2004 storm in which another 7.6 - 17.8 cm (3 - 7 inches) of rain fell (NWS, 2004). The median annual rainfall for the South Fork of Kaukonahua Stream is between 127 and 191 centimeters (50 - 75 inches) (Taliaferro, 1959).

Ki`iki`i Stream System is ranked as "Moderate" for aquatic resource value by the State (Hawaii Cooperative Park Service Unit, 1990), with one native aquatic species, *`o`opu nakea* (*Awaous guamensis*), reported present or abundant in DLNR surveys. Ki`iki`i Stream System is a "blue ribbon" candidate stream for protection because of its outstanding recreation resources - likely due to the opportunities offered at Wahiawa Reservoir rather than upstream owing to limited public access (Hawaii Cooperative Park Service Unit, 1990).

The Ki`iki`i Stream System is listed as an impaired water body by the State. It is listed on the Hawaii Department of Health 2002 list of impaired waters in Hawaii — prepared under Clean Water Act §303(d) (HIDOH, 2002). Pollutants for which the stream is listed include nutrients and turbidity. The stream system was assigned a "medium" priority ranking. This ranking refers to the how quickly a study to determine the Total Maximum Daily Load (TMDL) of pollutants that can be discharged into the water body without it violating Hawaii's Water Quality Standards will be conducted for this stream system. The HIDOH has recently accepted a proposal to conduct a TMDL study on Wahiawa Reservoir and Upper Kaukonahua streams and the study may begin in 2004 or 2005. Once the TMDL is developed, the Department of Health may impose load reductions on discharge

permits (i.e., NPDES permits) and may request landowners to reduce non-point source pollution loads in order for the TMDLs to be met.

Water Quality

A US Geological Survey (USGS) gage station (No. 16208000) is located on the South Fork of Kaukonahua Stream, downstream from Ku Tree Dam, near the East pump at Wahiawa, 860 feet above sea level. For 2001 (the most recent available complete record), the annual mean streamflow at this station was 15.0 ft^3/s (cfs). The period of record (1957 - 2002) maximum discharge was over 5,000 cfs (USGS, 2004).

In January 2004, *AECOS* biologists collected water samples from three sites (downstream from the dam's discharge tunnel, upstream of the dam on the left tributary, and upstream of the dam on the right tributary) on the unnamed tributary to South Kaukonahua Stream (Figure 2). Some parameters were measured by field meter and others in water samples collected in appropriate containers and taken to the AECOS Laboratory in Kane`ohe (laboratory Log No. 18269). Table 1 lists field instruments and analytical methods used with these samples.

Table 1. Analytical methods and instruments used for the January 12, 2004 water quality sampling of an unnamed tributary to South Kaukonahua Stream, East Range, O`ahu.

Analysis	Method	Reference	Instrument
Dissolved Oxygen	EPA 360.1	EPA (1979)	YSI Model 550 DO meter
Nitrate + Nitrite	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II
Temperature	thermister calibrated to NBS cert. thermometer (EPA 170.1)	EPA (1979)	YSI Model 550 DO meter
Total Nitrogen	persulfate digestion/EPA 353.2	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion/EPA 365.1	Koroleff in Grasshoff et al. (1986)/EPA (1993)	Technicon AutoAnalyzer II
Total Suspended	Method 2540D	Standard Methods	Mettler H31

Analysis	Method	Reference	Instrument
Solids	(EPA 160.2)	18th Edition (1992); EPA (1979)	balance
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18th Edition (1992); EPA (1993)	Hach 2100P Turbidimeter

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Oceanogr.* 22(4): 760-764.
EPA. 1979. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, EPA 600/4-79-020.
EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100.
EPA. 1994. Methods for Determination of Metals in Environmental Samples, Supplement 1. EPA/600/R-94/111. May 1994.
Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.
Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater. 18th Edition. 1992. (Greenberg, Clesceri, and Eaton, eds.). APHA, AWWA, & WEF. 1100 p.

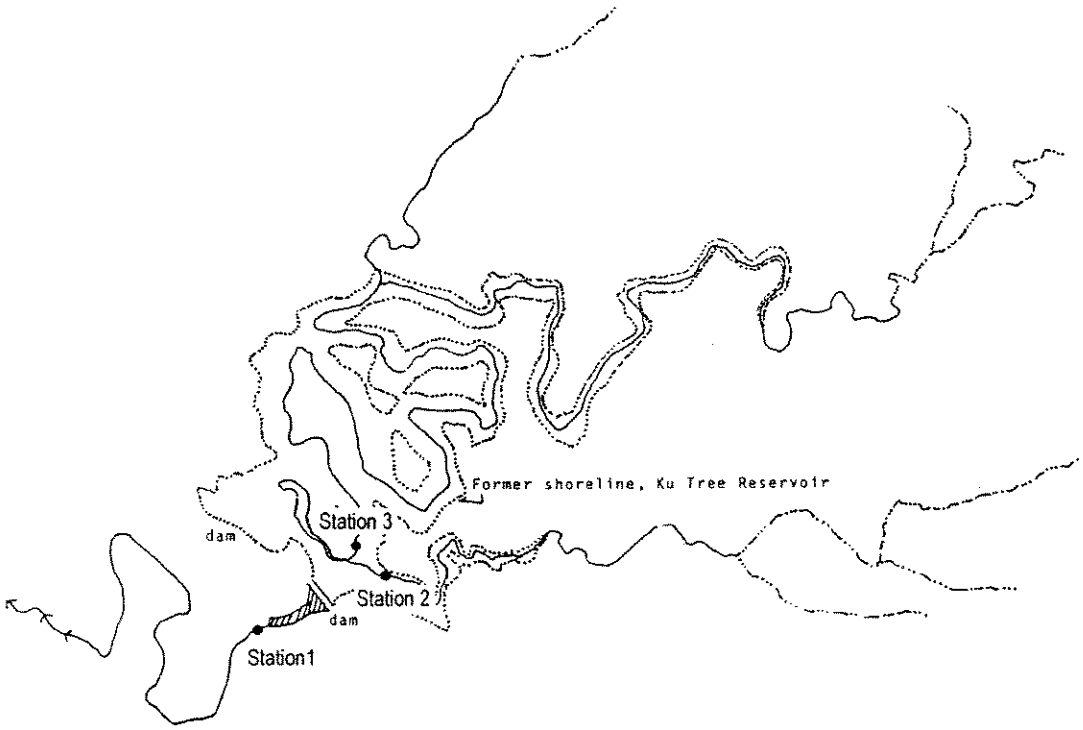

Figure 2. Sampling locations for the January 12, 2004 water quality sampling of an unnamed tributary to South Kaukonahua Stream, East Range, O`ahu.

The primary purpose of these water quality data is to characterize the existing aquatic environment, not to set baseline values or determine compliance with Hawaii's Water Quality Standards. In fact, the State criteria for turbidity, total suspended solids, and nutrients are based upon geometric mean values and a minimum of three separate samples collected over time is required to compute a geometric mean (DOH, 2000). Thus, this single sampling event is not strictly comparable with all State criteria. Nonetheless, the results can be evaluated against the water quality standards as long as the limitations are realized. The samples are best compared with the State criteria for streams (Table 2).

Table 2. State of Hawaii geometric mean criteria for streams (HAR §11-54-05.2(b)(1)).

Total Nitrogen (µg N/l)	**Nitrate + Nitrite Nitrogen** (µg N/l)	**Total Phosphorus** (µg P/l)	**Total Suspended Solids** (mg/l)	**Turbidity** NTU
250.0*	70.0*	50.0*	20.0*	5.0*
180.0**	30.0**	30.0**	10.0**	2.0**

* wet season - November 1 through April 30.
** dry season - May 1 through October 31
- pH - not vary more than 0.5 units from ambient and not be lower than 5.5 nor higher than 8.0.
- Dissolved oxygen - not less than 80% saturation.
- Temperature - not vary more than 1 °C from ambient.
- Specific conductance - not more than 300 µmhos/cm.

The analyses of the water quality samples collected from the unnamed tributary to South Kaukonahua Stream on January 12, 2004 (Table 3) show normal temperature and pH values, with high percent saturation of dissolved oxygen. Turbidity levels were slightly elevated but TSS concentrations were relatively low. The stream also had elevated levels of nitrate, nitrite, and total nitrogen, but low levels of total phosphorus.

The temperatures (19.3 °C - 19.4 °C) appear to be fairly low in this shaded section of the stream. Recent statewide surveys of 21 streams found the average summer daytime temperature in the upper reaches to be 23.2 °C (AECOS, 2002 and AECOS, 2003). Despite the fairly slow streamflow, the water was well saturated with dissolved oxygen (>90%), easily meeting the percent saturation of dissolved oxygen (DO) criterion established by the State Department of Health (> 80%) (HIDOH, 2000). The water at the two stations upstream from the dam was slightly acidic (pH = 6.35 and 6.66), but meets the low value of 5.5 set in the water quality standards.

Values recorded for turbidity (7.08 - 9.02 ntu) are slightly high, but TSS concentrations (2.2 - 9.6 mg/l) suggest that there is not a significant sedimentation problem in the watershed above the dam.

Table 3. Water quality characteristics of an unnamed tributary to the South Fork of Kaukonahua Stream from samples taken on January 12, 2004.

	Time	Temp. (°C)	DO (mg/l)	DO % sat	pH (pH units)
Station 1	1200	19.4	9.13	99	7.13
Station 2	1235	19.3	8.99	98	6.35
Station 3	1245	19.3	8.30	90	6.66

	Turbidity (ntu)	TSS (mg/l)	Nitrate + nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)
Station 1	9.02	7.0	204	304	11
Station 2	7.08	2.2	290	357	8
Station 3	8.56	9.6	191	287	10

The nutrient values measured are slightly elevated, but not unusual for an O`ahu stream. The proportion of inorganic nitrogen was high, with the concentration of nitrate + nitrate at 191 - 290 µg N/l. The total nitrogen concentrations were slightly elevated (287 - 357 µg N/l). The total phosphorus levels were low (8 - 11 µg P/l). There were no obvious signs of algae in the streams.

In 1984, just a couple of months after the reservoir had been drained, *AECOS* personnel collected water quality samples upstream and downstream from the dam. Upstream from the dam the turbidity ranged from 4.65 to 63.0 ntu, TSS ranged from 3.1 to 41.2 mg/L, and pH ranged from 6.4 - 7.3. Concentrations of nitrate-nitrogen were 28 - 216 µg/L, total nitrogen 304 - 901 µg/L, and total phosphorus 46 - 70 µg/L. Downstream from the dam in the spillway, turbidity was measured at 30.3 ntu, nonfilterable residue was 14.8 mg/L, pH was 7.9, nitrate-nitrogen was 22 µg/L, total nitrogen was 342 µg/L, and total phosphorus was 95 µg/L (*AECOS*, 1984).

AECOS also analyzed in 1984 sediment samples collected from the Ku Tree area for heavy metals and chlorinated hydrocarbons (*AECOS*, 1984). Only one sample (in the pond upstream from the outlet tower) showed evidence of chlorinated hydrocarbons. Appendix A contains the heavy metals results for the 1984 sediment sampling event. The majority of the samples met the screening guideline values established by the U.S. Environmental Protection Agency (USEPA, 1998) and the Canadian environmental quality guidelines (Environment Canada, 2002). The concentrations of chromium in the samples were high, but not unusually so for

weathered volcanic soils. The concentration of mercury was also somewhat elevated in some of the samples. The sediment at the base of the spillway had more than twice the concentration of some heavy metals (arsenic, chromium, lead, and selenium) than measured elsewhere at Ku Tree.

Aquatic Biota

Observations during this survey were limited to a short distance upstream and downstream of Ku Tree Dam. Our brief survey revealed only a few different introduced aquatic species present and possibly a native amphidromous (meaning that it migrates to and from the ocean) fish (Table 3). It is likely that few of the juvenile native amphidromous animals are able to migrate upstream past Wahiawa Reservoir to South Kaukonahua Stream.

Table 3. Checklist of aquatic biota observed in an unnamed tributary to the South Fork of Kaukonahua Stream in the inactive channel of Ku Tree Dam.

Species	Common name	Status	Abundance
INVERTEBRATES			
ARTHROPODA, CRUSTACEA	(crustaceans)		
DECAPODA, CAMBARIDAE			
Procambarus clarkii (Girard)	American swamp crayfish	Nat.	A
ARTHROPODA, INSECTA	(insects)		
ODANATA, COENAGRINOIDAE			
Ischnura posita (Hagan)	forktail damselfly	Nat.	U
VERTEBRATES			
VERTEBRATA, PISCES	(fishes)		
GOBIIDAE			
?*Awaous guamensis* (Valenciennes)	`o`opu nakea	Ind.	R (Possible sighting of one individual)
CLARIIDAE			
?*Clarius fuscus*	Chinese catfish	Nat.	R (Possible sighting of one individual)
POECILIIDAE			
Poecilia reticulata	rainbowfish, guppy	Nat.	O
Gambusia affins (Baird & Girard)	mosquitofish	Nat.	O
Xiphophorus helleri Heckel	green swordtail	Nat.	A
VERTEBRATA, AMPHIBIA	(frogs & toads)		
RANIDAE			
Rana catesbeiana Shaw	bullfrog	Nat.	R (heard, but did not sight, one or two individuals)

KEY TO SYMBOLS USED IN TABLE 3:

Status:

Nat. - naturalized. An introduced or exotic species.

Ind. - indigenous. A native species also found elsewhere in the Pacific.
End. - endemic - A native species found only in the Hawaiian Islands.
Abundance categories:
R - Rare - only one or two individuals seen.
U - Uncommon - several to a dozen individuals observed.
O - Occasional - regularly encountered, but in small numbers.
C - Common - Seen everywhere, although generally not in large numbers.
A - Abundant - found in large numbers and widely distributed.
P - Present - noted as occurring, but quantitative information lacking.
QC: All animals were observed in the field on January 12, 2004.

None of the species observed is listed as threatened or endangered, or otherwise would be considered rare or special by the State or Federal governments (DLNR, 1998; Federal Register, 1999a, b, 2001)).

Discussion

The breach of Ku Tree Dam is not likely to significantly directly affect downstream water quality. The water in the area of the dam is of similar quality to other mountain streams on O`ahu and breaching the dam should not alter the quality significantly. The breach of Ku Tree Dam may increase the ability of native amphidromous animals to migrate up and down the stream, although the hazards posed by Wahiawa Reservoir, further downstream on Kaukonahua Stream, are so great that the breach of this dam is unlikely to significantly increase the rate of survival of these animals. The breach of Ku Tree Dam is also not likely to have a significant effect on the recreational opportunities, including fishing, downstream in Wahiawa Reservoir.

There is some concern that ammunition from the surrounding training area may affect the quality of the sediments of the stream near and downstream from the dam. The sediments may become mobilized after the dam is breached. It is difficult for laboratories to effectively analyze samples for the rotting compounds that may have leached from ammunition into the soils. In addition, while some of these compounds are toxic, they do not bioaccumulate, so they do not pose a long-term health threat. Old, stockpiled ammunition is likely to cause the greatest threat to water quality, but unless there are large stockpiles close to the stream, the threat is minimal.

Construction activities required to breach the dam and the resulting changes in the use of the surrounding area in the East Range may have a greater impact on the aquatic environment than the actual breach of the dam itself. For example, the road leading to the dam may need to be widened or improved to bring in the heavy equipment, the construction equipment will need to be regularly maintained, and the area surrounding the stream may need to be modified through clearing and earthmoving to breach the dam. Proper best management practices (bmps) for all

of these activities must be in place during construction to ensure sediments and contaminants from the construction activities do not enter the stream. The widened road and elimination of the hazards caused by the unsafe dam may increase the frequency and intensity of training in the Ku Tree area. However, adherence to standard protocols will limit the environmental impact of the troops and their equipment.

The reservoir bottom itself represents a deposit of sediment that has been (since the reservoir was lowered) working its way into the stream. Down-cutting of a narrow channel is presently on the order of 0.75 - 1.25 m (2 to 4 ft), but considerably more material remains on the former reservoir bottom. The majority of this sediment leaves the system during high flow events, with some mitigation resulting from a ponding of the water behind the relatively small outlet drain. There would be no easy way to mitigate this sediment burden, which is slowly moving downstream to Lake Wilson. Options for mitigation include 1) physical removal and 2) on-site detention. Physical removal could prove somewhat messy given the long, narrow, meandering shape of the reservoir bottom. Detention would involve construction of a basin either downstream of or in the existing reservoir basin just upstream of, the dam. Presently, Lake Wilson acts as a detention basin between this Ku Tree sediment deposit and the coastal waters of the North Shore.

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Appendix A

Selected heavy metals concentrations in sediment samples from Ku Tree Reservoir (after *AECOS*, 1984).

CONCENTRATION [mg/Kg]

STATION	ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER
1 (wet)	1.7	2.9	<0.5	127.6	13	0.21	<0.2	0.8
1 (dry)	3.9	6.7	<1.2	295.4	30	0.49	<0.5	1.8
2 (wet)	1.9	8.7	0.9	140.6	13	0.15	0.3	0.5
2 (dry)	4.2	19.5	2.0	314.5	29	0.34	0.7	1.1
3 (wet)	1.8	10.2	0.7	125.2	11	0.16	0.2	0.5
3 (dry)	3.4	19.5	1.3	238.9	21	0.30	0.4	0.9
4 (wet)	0.9	7.9	0.8	151.5	15	0.20	0.2	0.5
4 (dry)	1.6	13.7	1.4	263.0	26	0.35	0.3	0.9
5 (wet)	2.2	10.2	0.9	177.1	17	0.21	<0.2	0.6
5 (dry)	3.4	15.6	1.4	271.6	26	0.32	<0.3	0.9
6 (wet)	1.1	10.9	0.9	118.9	13	0.16	<0.2	0.8
6 (dry)	1.9	19.1	1.6	208.6	23	0.28	<0.3	1.4
7 (wet)	0.7	8.3	0.5	104.8	10	0.19	<0.2	<0.5
7 (dry)	1.7	20.3	1.2	256.2	24	0.46	<0.5	<1.2
SPWY (wet)	11.6	8.7	1.2	280.3	24	0.47	1.4	0.9
SPWY (dry)	16.7	12.5	1.7	402.7	34	0.67	2.0	1.3

Appendix B:
Botanical Resources Assessment Study

BOTANICAL RESOURCES ASSESSMENT STUDY
KU TREE DAM
EAST RANGE, SCHOFFIELD BARRACKS, O'AHU

by

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February 2004

BOTANICAL RESOURCES ASSESSMENT STUDY
KU TREE DAM
EAST RANGE, SCHOFIELD BARRACKS, O'AHU

INTRODUCTION

Ku Tree Dam and Reservoir, constructed in 1925, is a hydraulic earth filled dam located on an unnamed tributary of the South Fork of Kaukonahua Stream in the East Range of Schoffield Barracks Military Reservation. It is approximately 550 ft. long and 90 ft. high with a crest width of 30 ft. The upstream slope is riprapped, while the crest and downstream slopes are grassed. A reinforced concrete spillway is located on the left abutment. The outlet works control valves are located atop a gate house control tower (Mitsunaga and Associates, Inc. 2002).

The reservoir was originally constructed as a potable water source for the U.S. Army's Schoffield Barracks. In 1938, a deep well pumping station was constructed and Ku Tree was abandoned. Since that time, Ku Tree Dam and Reservoir has been used as a troop training facility.

In 1978, the dam was determined to be unsafe. In 1983, the water level was lowered to facilitate engineering studies and analysis of the dam structure. Although the reservoir was completely drawn down, it offers only a temporary reduction of unsafe conditions at Ku Tree Reservoir Dam and is not considered a long-term solution to the dam safety problem (Mitsunaga and Associates, Inc. 2002).

A plan to breach the dam is being proposed. This will be accomplished by excavating a channel approximately 400 ft. long through the natural hillside which supports the existing concrete spillway.

Field studies to assess the botanical resources at the Ku Tree Dam and Reservoir and the area downstream of the dam were conducted on 09 February 2004. The primary objectives of the field studies were to:

1) provide a general description of the vegetation on the study site;
2) search for threatened and endangered species as well as species of concern; and
3) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

DESCRIPTION OF THE VEGETATION

The plant names used in this report follow Wagner et al. (1990) and Wagner and Herbst (1999) for the flowering plants. The few recent name changes for the flowering plants are those reported in the Hawaii Biological Survey series (Evenhuis and Eldredge, eds. 1999-2002). The names of the ferns and fern allies follow the most recent treatment by Palmer (2002).

A description of the vegetation on the dam and in and around the reservoir follows. A description of the vegetation along the access road down to the dam and downstream of the dam is also provided as these areas may be impacted by the project.

Dam and Reservoir

A large stand of ironwood trees (Casuarina equisetifolia) is found on the spillway crest and dam crest. In many places, strawberry guava (Psidium cattleianum) forms scattered thickets. Other understory shrubs include Kuster's curse (Clidemia hirta) and fiddlewood (Citharexylum caudatum). The fallen "needles" under the ironwood trees form a dense, thick carpet which excludes many smaller ground cover species. Where the ironwood tree cover is sparse or open, there are scattered clumps of Guinea grass (Panicum maximum), Hilo grass (Paspalum conjugatum), Spanish clover (Desmodium incanum), and vervain (Stachytarpheta cayennensis).

A few small stands of koa (Acacia koa), 20 to 30 ft. tall, are found on the

downstream slope of the dam. The mat-forming uluhe fern (Dicranopteris linearis) is associated with these stands of koa. Other native species found with the pockets of koa and uluhe include pala'a (Sphenomeris chinensis) and ni'ani'au (Nephrolepis exaltata ssp. hawaiiensis) ferns, a few small 'ohi'a trees (Metrosideros polymorpha), 'uki sedge (Machaerina mariscoides), and the woody 'ie'ie vine (Freycinetia arborea).

A large Chinese banyan tree (Ficus microcarpa) along with a few ti plants (Cordyline fruticosa), and small 'ohi'a are found at the toe of the dam. Open grassy spots in this area support uluhe fern, Hilo grass, Spanish clover, Koster's curse, golden beardgrass (Chrysopogon aciculatus), broomsedge grass (Andropogon viginicus), and carpetgrass (Axonopus fissifolius).

The reservoir is overgrown in most places with dense strawberry guava thickets and stands of larger emergent trees which include paperbark (Melaleuca quinquenervia), albizia (Falcataria moluccana), and jhalna (Terminalia myriocarpa). Shrubs such as Koster's curse, guava (Psidium guajava), and fiddlewood are common, but can become abundant and form small thickets. Small stands of ironwood and swamp mahogany (Eucalyptus robusta) are found on the slopes above the reservoir.

Ground cover tends to be sparse under the dense tree and shrub cover. In a few places, the shade-tolerant palmgrass (Setaria palmifolia) is locally abundant. Other shade-tolerant species encountered here include blechnum fern (Blechnum appendiculatum), thimbleberry (Rubus rosifolius), Hilo holly (Ardisia crenata), and seedlings of the woody components.

Open grassy areas on the reservoir bottom are found along the stream and pools of standing water. California grass (Brachiaria mutica), Guinea grass, Hilo grass, honohono (Commelina diffusa), Spanish clover, and a number of weedy, herbaceous species are abundant in these sunnier locations.

Access Road

The existing access road down to the dam passes through large blocks of forestry plantings. Swamp mahogany and other Eucalyptus species are the most abundant of the plantings. Smaller blocks of paperbark and ironwood are commonly encountered. Again, strawberry guava forms dense thickets, 12 to 15 ft. tall, under the tree canopy. Other plants noted along the road include a few trees of rose apple (Syzygium jambos), shrubs of Koster's curse, uluhe fern, Hilo grass, and woodfern (Christella parasitica).

Downstream

Large blocks of forestry plantings occur along the stream and on the slopes above the stream. These include swamp mahogany and other Eucalyptus species, paperbark, and ironwood. Scattered, smaller stands of albizia, silkoak (Grevillea robusta), and Java plum (Suzygium cumini) are also found here. Strawberry guava thickets are abundant in most of these forested areas. The understory plants found here include most of the plants already mentioned in the dam and reservoir section. These include Spanish clover, vervain, California grass, molasses grass (Melinis minutiflora), Guinea grass, etc.

On some of the steeper slopes and knolls above the stream, there are areas dominated by koa and uluhe with scattered, smaller trees of 'ohi'a. A number of native plants can be found here. These include ferns and fern allies such as ni'ani'au, pala'a, moa (Psilotum nudum), wawae'iole (Lycopodiella cernua), hapu'u (Cibotium chamissoi), and pakahakaha (Lepisorus thunbergiana); and 'ie'ie, sandalwood (Santalum freycinetianum), and 'uki.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the Ku Tree Dam and Reservoir site is composed primarily of introduced species such as ironwood, strawberry guava, fiddlewood, albizia, paperbark, Koster's curse, etc. Large blocks of forestry plantings, mostly various Eucalyptus species, are located on the slopes above the reservoir.

Introduced species are all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is, Cook's arrival in the islands in 1778.

Scattered pockets of native plants occur on the steeper slopes and knolls. These consist of koa trees and the matted uluhe fern along with a few other native species. None of the plants found on or adjacent to the project site is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999a, 1999b; Wagner et al. 1999). An earlier botanical survey of the Schoffield Barracks Military Reservation (Environmental Impact Study Corporation 1977) did not find any rare plants associated with the lowland disturbed forests. The pockets of koa and uluhe were not particularly diverse or species rich.

In summary, the proposed breaching of Ku Tree Dam is not expected to have a significant negative impact on the botanical resources as the vegetation is dominated by introduced or alien species. The dam at present provides some attenuation of peak flows. When the dam is breached, the ability to control flood waters will be significantly diminished. However, no significant negative impact is expected on the vegetation downstream as it too is composed largely of introduced species. No rare plant elements have been recorded from the Ku Tree Dam and Reservoir site or from the area downstream of the dam.

It is recommended that areas cleared of vegetation be grassed over as quickly as possible to prevent soil erosion and discharge of sediments into the stream. Hilo grass and carpetgrass, which are already present on the site, are recommended for the revegetation effort. Both can be started from plugs, are fast growing, and are adapted to the environmental conditions on the site.

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Appendix C:
Survey of Avian and Terrestrial Mammalian Species

DRAFT

A Survey of Avian and Terrestrial Mammalian Species, Ku Tree Dam, East Range, Schofield Barracks, Island of O'ahu, Hawai'i.

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February 2004

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Figures & Tables

Introduction

This report summarizes the findings of an ornithological and mammalian survey of Ku Tree Dam and the surrounding area. The dam and associated appurtenant structures is located within the east range of Schofield Barracks Military Reservation, Island of O'ahu (Figure 1). In 1978 the dam was determined to be unsafe following inspection under the National Dam Safety Program. The Corps of Engineers, Pacific Ocean Division (ACOE) indicated that failure was possible given the poor structural integrity of the dam and its associated structures (C-E Maguire, Inc. 1978). The ACOE is proposing to breach the dam, and demolish the remaining derelict structures associated with it Figures 2 and 3). Fieldwork was conducted on February 9th and 10th, 2004.

The primary purpose of the survey was to determine if there were any federally listed endangered, threatened, proposed, or candidate avian or mammalian species using resources within the immediate vicinity of the dam or in the immediate downstream area below the dam. Federal and State of Hawai'i listed species status follows species identified in the following referenced documents (DLNR, 1998, Federal Register, 1999a, 1999b, 2001, 2002).

Avian phylogenetic order and nomenclature follows *The American Ornithologist's Union Checklist of North American Birds 7th Edition* (American Ornithologist's Union, 1998), and the 42nd 43rd and 44th supplements to *Check-list of North American Birds* (American Ornithologist's Union, 2000, Banks et al. 2002, 2003). Mammal scientific names follow *Mammals in Hawaii* (Tomich, 1986). Plant names follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al., 1990). Place names follow *Place names of Hawaii* (Pukui et al., 1974).

General Site Description

The Ku Tree Dam and associated structures are located at approximately 303-meters above sea level, on an unnamed tributary of the Kaukonahua Stream, approximately five kilometers east of the town of Wahiawa, within the east range Schofield Barracks Military Reservation (Figure 1). The dam is approximately 167-meters long, 27-meters high with a crest width of 9-meters. The basin above the reservoir is irregular in shape, varying in width from 800-meters to 1200-meters, and is approximately 2400-meters long (Figure 2). The water within the reservoir was completely drawn down in 1983, and remains drawn down today. The various structures that the ACOE is proposing to remove our modified are illustrated in figure 3.

The vegetation immediately above and below the dam is dominated almost to the exclusion of native plants by alien (i.e., introduced to Hawai'i by humans) species. Vegetation components immediately surrounding the dam and associated structures

include ironwood (*Casuarina equisetifolia*), strawberry guava (*Psidium cattleianum*), Guinea grass (*Panicum maximum*), fig (*Ficus microcarpa*), and a few *koa* (*Acacia koa*) trees scattered in steeper areas. The ridge crests and steeper upper slopes of the river cut support several areas covered with *'uluhe* fern (*Dicranopteris linearis*) ground cover, and a few remnant *'ōhi'a* (*Metrosideros polymorpha*) trees.

The entire study area clearly shows signs of ongoing military training. There are numerous uncovered pits, foxholes and trails, as well as a lot of trash, including Meals Ready to Eat (MRE) packaging, expended shell casings, and remains of smoke grenades and other military training detritus.

Mammalian Survey Methods

All observations of mammalian species were of an incidental nature. With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or *'ōpe'ape'a* as it is know locally, all terrestrial mammals currently found on the Island of O'ahu are alien species. Most are ubiquitous. No trapping program was proposed or undertaken to quantify the use of the area by alien mammalian species. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all vertebrate species observed and heard within the study area.

Avian Survey Methods

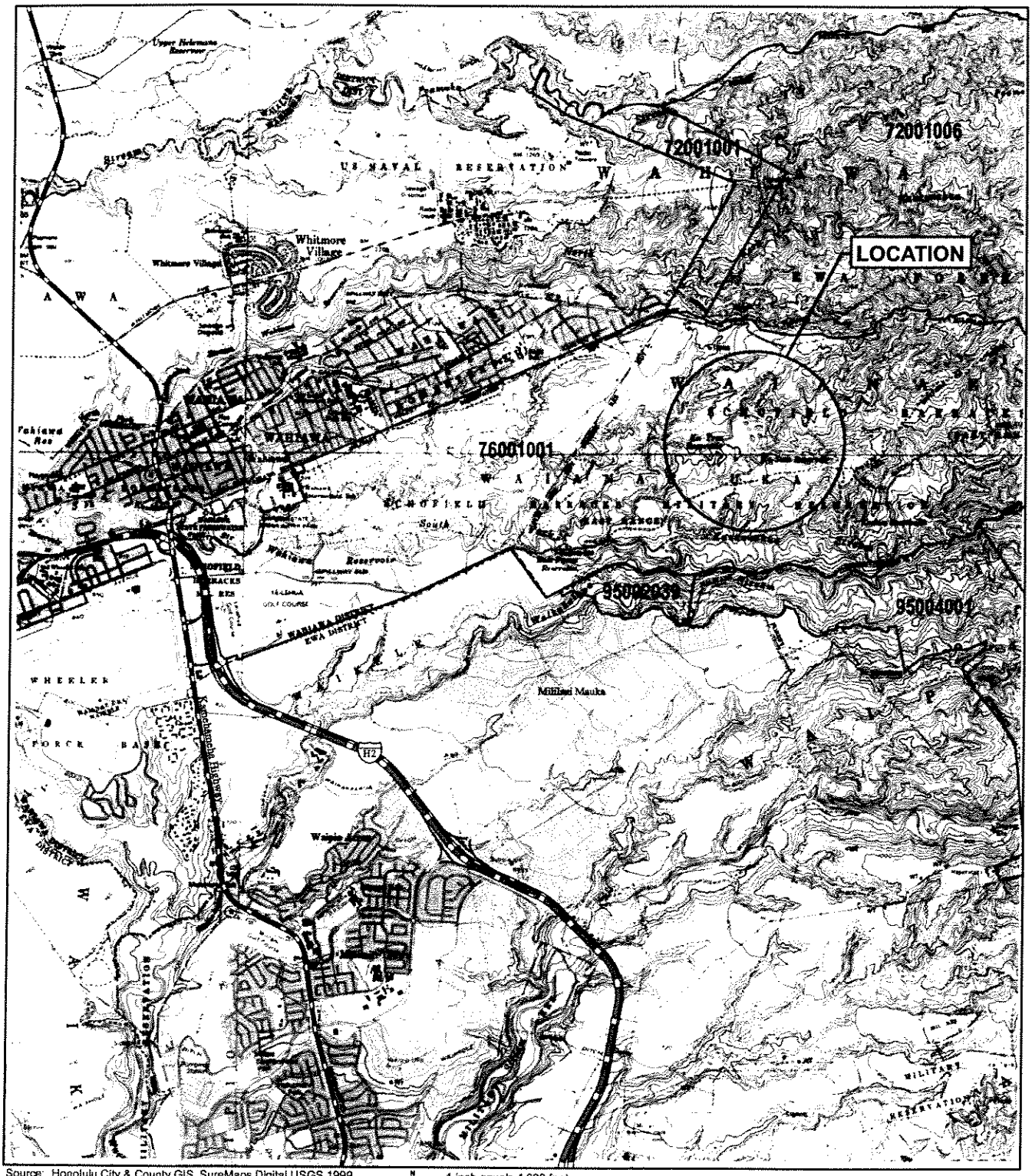
Following a site visit, and a rough assay of the different habitats present within the site, eight avian count stations were established within the project area. The first station was established 150-meters upstream from the dam structure, another was sited between the existing valve tower and the concrete weir, and an additional six stations were sited at 150 meter intervals below the weir (Figures 1 and 2). Eight-minute variable circular plot counts were made at each station. Stations were each counted once. Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated between 07:00 a.m. and 10:30 a.m., the peak of daily bird activity. Time not spent counting was used to search the surrounding area for species and habitats that were not detected during count sessions.

Mammalian Survey Results

Five alien mammalian species were detected during the course of this survey. No mammals were seen, however, tracks and sign of rat (*Rattus* sp.), dog (*Canis f. familiaris*), small Indian mongoose (*Herpestes a. auropunctatus*), cat (*Felis catus*) and pig (*Sus s. scrofa*) were encountered throughout the study area. All of the alien mammalian species recorded during this survey are deleterious to avian and floristic components of

Ku Tree Location

Figure 1



Source: Honolulu City & County GIS, SureMaps Digital USGS 1999.
March 2003

1 inch equals 4,000 feet
1:48,000

0 2,000 4,000 8,000 Feet

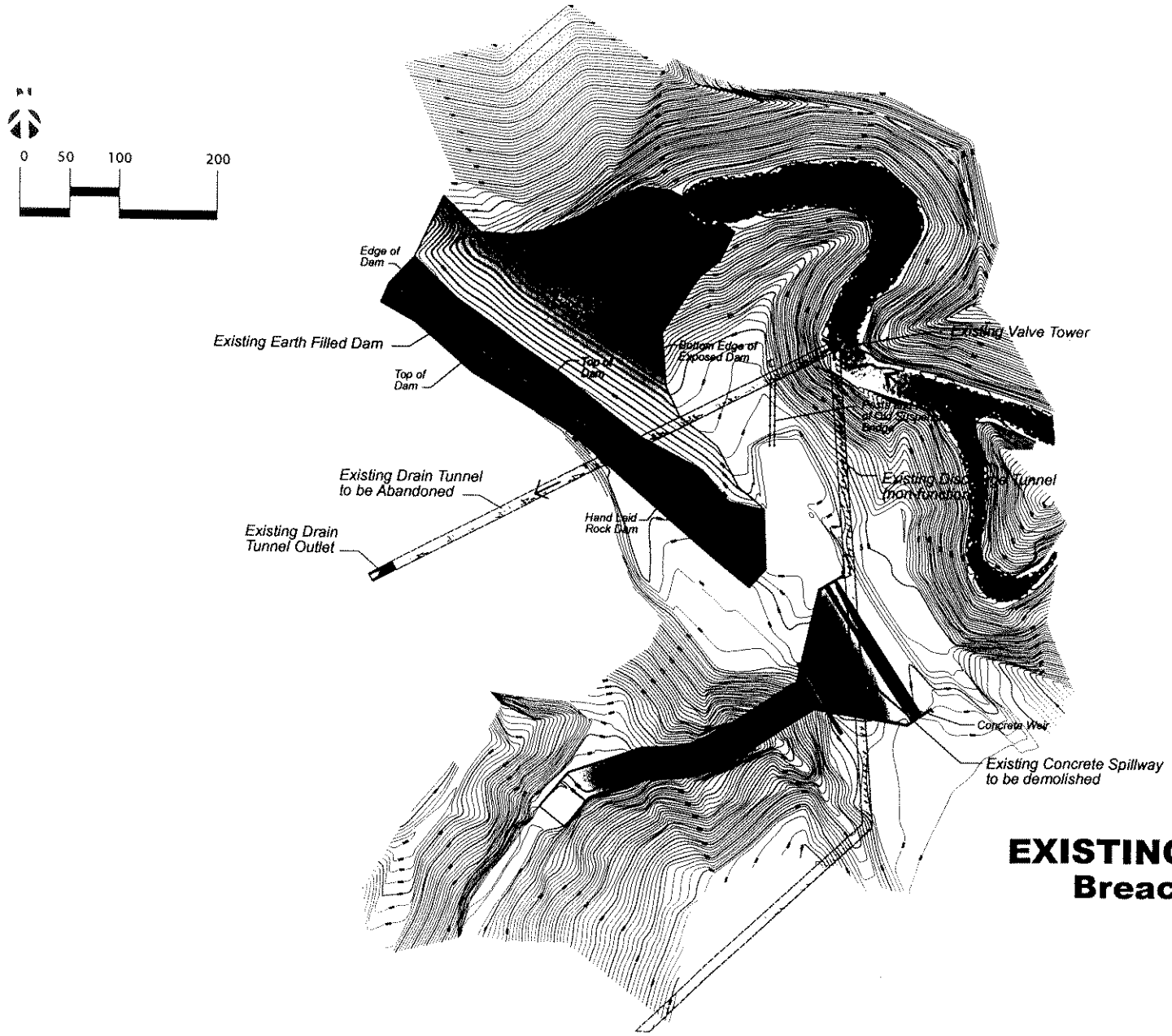


Figure 2

EXISTING CONDITIONS
Breach Ku Tree Dam

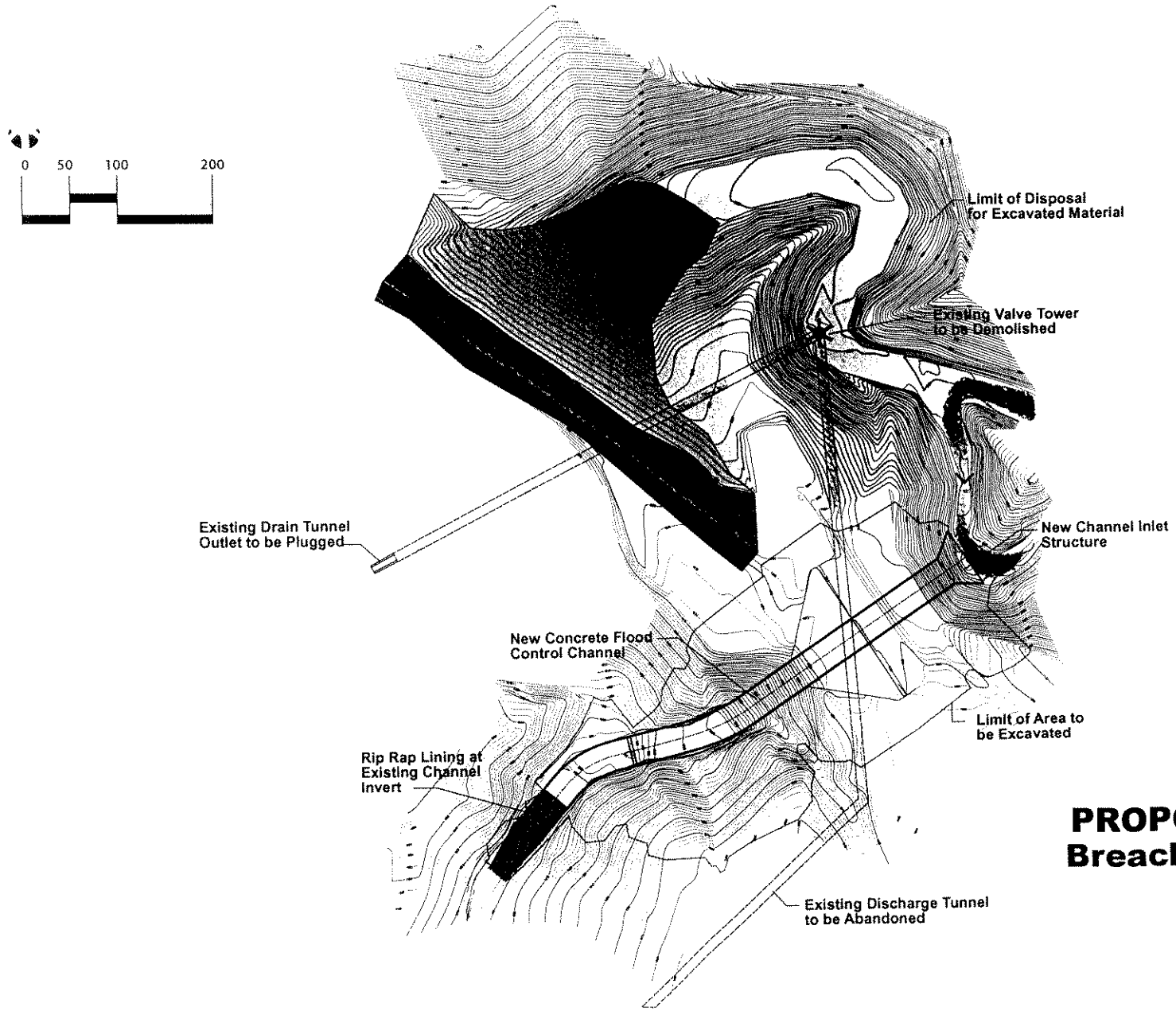


Figure 3

PROPOSED ACTION
Breach Ku Tree Dam

Avian diversity and densities were relatively low. All birds recorded during station counts and while on site were alien species. Two species, Common Waxbill (*Estrilda a, astrild*) and House Finch (*Carpodacus mexicanus frontalis*) accounted for 39% of the total number of all birds recorded during station counts. The most common avian species recorded was the Common Waxbill, which accounted for 18% of the total number of individual birds recorded. An average of 39 birds were detected per station count.

Discussion

A one-time survey can not provide a total picture of the wildlife utilizing any given area. Certain species will not be detected for one reason or another. Seasonal variations in populations coupled with seasonal usage and availability of resources will cause different usage patterns throughout a year or, in fact, over a number of years.

The findings of the mammalian survey are consistent with at least two other mammalian surveys conducted within the Schofield Barracks Military Reservation, and surrounding area in the recent past (David 2002, 2003). Although no live rodents were seen during the course of this survey, numerous discarded MRE packets displayed signs of rat gnawing, indicating their presence within the area. It is likely that roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), European house mice (*Mus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use resources within the study area. Without conducting a trapping program, it is difficult to assess the population densities of these often hard-to-see mammals. All of these introduced rodents are deleterious to native ecosystems and the native faunal species that are dependant on them.

The relatively low diversity and densities of avian species detected during this survey was in keeping with the results of at least two other avian surveys conducted within the Schofield Barracks Military Reservation, and surrounding area in the recent past (David 2002, 2003). The fact that no native avian species were encountered is not that surprising, but rather is an indication of the poor habitat present within the general project area. This coupled with the high density of mosquitoes in the study area, all but guaranties that few if any native birds are likely to use the area. Avian malaria is one of the major limiting factors for native Hawaiian birds, the disease is transmitted by mosquitoes.

Potential Impacts to Protected Vertebrate Species

No protected avian our mammalian species were detected within the study area, nor is the habitat present likely to support listed vertebrate species. It is highly unlikely that the removal of the various derelict structures associated with the Ku Tree Dam, and the construction of a new channel inlet and stabilization of the existing stream channel will have any impacts on protected avian or mammalian species (Figures 2 and 3). It is likely that during the construction and demolition phases of the proposed action that individual

alien birds and mammals may be temporarily disturbed. It is to be expected that following the completion of the construction phase of the project that any displaced birds and mammals will again resume use of the area.

The proposed breaching of the Ku Tree Dam may result in higher floodwater flows following major storms. Even though the gates of the dam are currently open, and have been since 1983, they do provide some attenuation of peak water flows. If the dam is breached, the ability to control floodwaters will be significantly diminished. Given the disturbed, alien dominated habitat presently found between the Ku Tree Dam and the Wahiawa Reservoir it is unlikely that any increased storm flow will result in deleterious impacts to any listed avian or mammalian species.

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Appendix D:
Habitat and Biological Assessment of the Ku Tree Reservoir Streams

Habitat and Biological Assessment of the Ku Tree Reservoir Streams, Koolau Mountains, Oahu

Technical Report
for
Kimura International, Inc.

Michael H. Kido

April 2004

EXECUTIVE SUMMARY

Ku Tree Reservoir, located on Oahu's Schofield Barracks Military Reservation (Koolau Mountain Range), was created by interrupting the natural flow of two small tributary streams of North Kaukonahua Stream with a graded dam and then drowning the existing valley terrain to form the reservoir basin. To accommodate discarded flows from the reservoir, a concrete spillway was constructed to transport water into the natural stream channel below the reservoir. Because of the significant volume of water potentially accumulating in the Ku Tree Reservoir and possible flooding to downstream areas enhanced by its presence, the U.S. Army Corp of Engineers embarked on a project to evaluate the existing condition and potential future uses of the abandoned reservoir site. In August 2003, previous plans to repair the dam were abandoned in favor of breaching the structure which will, in theory, diminish the capacity of the reservoir to hold floodwaters but presumably restore surface water flows in the area to a more natural condition. The Environmental Assessment (EA) for which this study is a part, was charged with evaluating the potential biological and physical effects of removing the dam and existing water impoundments. Applying the Hawaii Stream Bioassessment Protocol (HSBP) to four 100 m long stream study sites (two above and two below the reservoir), this particular study focused on determining the status of biological integrity and habitat condition in affected streams and to evaluate the potential effects of restoration / maintenance work undertaken on the dam and the return of flows to the natural stream channel.

Overall physical habitat quality and biological integrity in Ku Tree Reservoir streams were found to be severely "Impaired" by channel modifications, chronic sedimentation, stream flow reductions and the physical presence of the reservoir. HSBP ratings for these particular streams were, in fact, the worst yet determined for streams thus far surveyed in the Hawaiian Islands. Not only were no native aquatic species observed in stream study sites, but alien aquatic species diversity and abundance was also conspicuously low indicating very severe impairment of ecosystem function and loss of resilience. Riparian zones were dominated by invasive alien trees species like guava and paper bark with relatively open canopy in streams above the reservoir and excessively closed canopy in streams below. Flows in the stream channel below the reservoir were too low to measure and thus the 2.47 cfs (1.6 mgd) of flow entering the intake structure from the two streams above the reservoir took some alternate route to downstream reaches other than via the concrete spillway and natural stream channel.

Given the severely degraded physical and biological condition of streams associated with Ku Tree Reservoir, it is highly unlikely that construction activities associated with removal of the dam structures could further degrade the site. Reconnection of the natural stream channel above and below the reservoir / spillway with the proper grade would no doubt improve habitat conditions as flows presumably would be restored to downstream reaches. Of significant concern, however, is the fate of the tremendous quantities or sediment and organic trash currently deposited in the reservoir site when the dam is breached and stream flows restored. Simply allowing this material to passively transport to downstream reaches could have serious negative consequences from 'log jams' occurring downstream and sediment deposition in various unpredictable locations in lower Kaukonahua Stream and perhaps even Lake Wilson. The only viable option would seem to be physical removal of this material out of the reservoir prior to the restoration of stream flows. In any case, care should be taken to minimize the release and transport of sediment to downstream reaches of Kaukonahua Stream.

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Habitat and Biological Assessment of the Ku Tree Reservoir Streams, Koolau Mountains, Oahu

Michael H. Kido

April 2004

Background

Ku Tree Reservoir, located on Oahu's Schofield Barracks Military Reservation (Koolau Mountain Range), was essentially created by drowning two meandering tributaries of North Kaukonahua Stream at about 1159 ft elevation (Fig. 1). Kaukonahuu Stream is actually a headwater tributary of Kiikii Stream which empties into Kaiaka Bay in Haleiwa (HSA 1990). When Ku Tree Reservoir was in operation, a massive concrete control tower (see cover photo) constructed inside the reservoir was used to manage water levels through use of an intake drain located inside the tower. An elevated walkway provided access to the top of the tower and a concrete-lined spillway (Photo 1 in Appendix) was used to direct reservoir overflow into the disconnected natural stream channel about 100 feet lower in elevation than the upper rim of the dam. Ku Tree Reservoir, therefore, was engineered so as to interrupt the natural flow of the tributary streams, utilize the existing valley terrain as the reservoir basin and the natural stream channel to accommodate discarded flows from the reservoir.

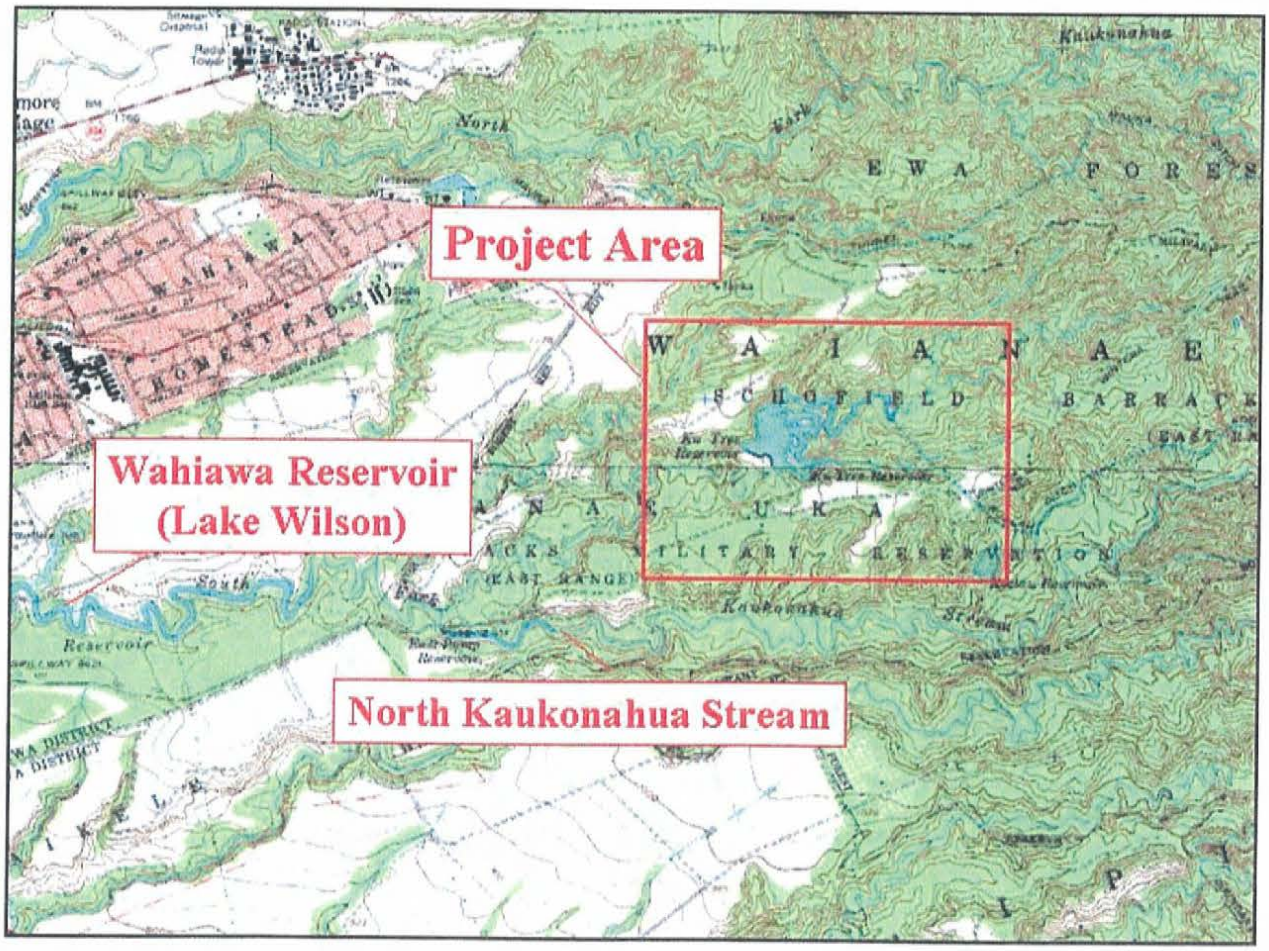

Figure 1. Project Area and location of Ku Reservoir in the Koolau Mountain Range on Oahu.

Surface water flows entering the natural stream channel from Ku Tree Reservoir merge with North Kaukonahua Stream at an elevation of about 980 ft before flowing into Lake Wilson (Wahiawa Reservoir) in the Wahiawa Freshwater State Recreation Area (Fig. 1). Elevation at Lake Wilson's spillway is about 842 ft and thus the lake is some 320 feet lower in elevation than Ku Tree Reservoir. The surface area of the lake is some 330 acres and thus is one of the largest bodies of freshwater in the state. The City's Wahiawa Wastewater Treatment Plant discharges about 2 million gallons of treated effluent into the Lake Wilson daily and water levels have been rising steadily since the Waialua Sugar Company closed operations and irrigation draw-downs in 1996. Populations of both alien large-mouth (*Micropterus salmoides*) and small-mouth bass (*Micropterus dolomieu*) are maintained in Lake Wilson by the Department of Land and Natural Resources as a recreational fishery http://www.hawaii.gov/dlnr/dar/pubs/ar_hcr200_2003_rpt.pdf and at least small-mouth bass has spread into the reaches of Kaukonahau Stream above Wahiawa town http://www.tuhi.us/Kaukonahua%20Stream%20story.pdf. In addition, the alien tilapia species, *Sarotherodon melantheron*, has also been reported from Lake Wilson http://www.aquanic.org/publicat/usda_rac/tr/ctsa/tilap95.pdf.

Because of the significant volume of water potentially accumulating in the Ku Tree Reservoir and possible flooding to downstream areas enhanced by its presence, the U.S. Army Corp of Engineers embarked on a project to evaluate the existing condition and potential future uses of the abandoned reservoir site. In August 2003, previous plans to repair the dam were abandoned in favor of breaching the structure which will diminish the capacity of the reservoir to hold floodwaters but presumably restore surface water flows in the area to a more natural condition. The Environmental Assessment (EA) for which this study is a part, is to evaluate the potential biological and physical effects of removing the dam and existing water impoundments. The Project Area, for the purposes of this study, was confined to the reservoir and the area immediately upstream and downstream of the dam site. Specifically, this study focused on determining the status of biological integrity and habitat condition in affected streams and to evaluate the potential effects of restoration / maintenance work undertaken on the dam and / or the return of flows to the natural stream channel.

Previous Studies

No information is provided in the Hawaii Stream Assessment (1990), for Kaukonahua Stream other that listing it as a tributary (HSA Code 3-6-06.2) of Kiikii Stream (HSA Code 3-6-06s, Haleiwa Quad). Kiikii Stream was ranked in the Hawaii Stream Assessment (1990) as having 'Moderate' levels of aquatic resource value with three native stream species and six alien species observed during four surveys the latest of which was in conducted 1989. However, given the distance of the Kaukonahua tributaries from its confluence with Kiikii Stream, the position of Lake Wilson (Wahiawa Reservoir) as a barrier to migrating native species, and countless intercepting plantation irrigation systems, it is highly unlikely that these two highly human-impacted and disconnected streams have had any biological or physical relationship (except possibly during flood flows) in modern times.

Interestingly, Timbol and Maciolek (1978) in their "Statewide Inventory of Streams" listed Kaukonahua Stream as the primary system and did not mention Kiikii Stream at all. Kaukonahua Stream was given an Index value of III (on a scale from I = Pristine /Preservation; II = Limited Consumptive; III = Exploitive Consumptive and IV = Construct-Alter) indicating "Moderate to Low environmental / biological quality and

well-exploited, modified or degraded ". As of this 1978 report, Kaukonahua Stream was determined to be "Continuous" (i.e. "naturally flowing to the sea year-round) and not channelized with eighteen stream diversions and twenty-six road crossings.

MATERIALS AND METHODS

Scope of Work and Study Objectives in Kaukonahua Stream

A reconnaissance survey of the Ku Tree Reservoir site was conducted in December 2003 and habitat / bioassessment surveys in March 2003. Four 100 m long study sites were established in natural stream channels below and above the reservoir. Two study sites were established about 100 m apart beginning 50 m downstream of the end of the concrete spillway below the reservoir and on each of two tributaries feeding the upper portion of the reservoir just upstream of their confluence. Study objectives were to:

1. evaluate the reach-specific and overall biological integrity of impacted streams as compared to Hawaiian "reference stream" standards and;
2. evaluate stream habitat quality and the functionality of riparian zones along the stream continuum as compared to Hawaiian "reference stream" standards;

At stream study sites, habitat condition and biological integrity were measured using the Hawaii Stream Bioassessment Protocol (HSBP) (Kido et al. 2002a). The HSBP was specifically designed for stream habitat (and not deep estuaries) utilizing sampling protocols and metrics for two integrated indices which evaluate: 1) the "biotic integrity" of the stream location (using the Hawaii Stream Index of Biotic Integrity (HS-IBI) and; 2) the condition of the supporting habitat for aquatic organisms and is described in more detail in subsequent sections of this report. According to HSBP protocol (Kido et al. 2002a), study site lengths were standardized to 20 times mean stream width (100 m minimum) and riparian habitat on each bank (stream edge to ~10 m inland) was evaluated for physical condition, species composition, and canopy closure. Where significant stream flow was present, volume and velocity measurements were made with a Swoffer flow meter and top-setting wading rod.

For sampling the fish and macroinvertebrate populations in the stream, only visual methods were used because of the highly sedimented condition of the stream reaches. Levels of primary / secondary productivity and standing crops of algae / mosses / invertebrates were extremely low or non-existent because of the extreme scarcity of natural rock habitat and very high sediment loads on the stream bottom in the study stream reaches. Benthic sampling, therefore, was not possible nor necessary since these organisms cannot survive on muddy stream bottoms.

The Hawaii Stream Bioassessment Protocol 3.01 (HSBP)

Evaluations of stream habitat and biological quality at study sites on a scale from "Excellent" to "Very Poor" provide valuable information useful in evaluating environmental impact or change in ecological condition over time. The Hawaii Stream Bioassessment Protocol (Kido 2002a) was developed specifically for this purpose and therefore was used in this study. The HSBP utilizes a standardized "multimetric"

Table 1. Native Hawaiian stream macrofaunal assemblage.

Taxa	Hawaiian Name	Status
Teleostei; Perciformes; Gobioidei		
Eleotridae - *Eleotris sandwicensis*	***'o'opu-akupa***	**endemic**
Gobiidae - *Awaous guamensis*	***'o'opu-nakea***	**indigenous**
Lentipes concolor	***'o'opu-alamo'o***	**endemic**
Sicyopterous stimpsoni	***'o'opu-nopili***	**endemic**
Stenogobius hawaiiensis	***'o'opu-naniha***	**endemic**
Arthropoda; Crustacea; Decapoda;		
Atyidae - *Atyoida bisulcata*	***'opae-kala'ole***	**endemic**
Palaemonidae - *Macrobrachium grandimanus*	***'opae-oeha'a***	**endemic**
Mollusca; Gastropoda; Neritidae		
Neritina granosa	***hihiwai***	**endemic**
Theodoxus vespertinus	***hapawai***	**endemic**
Theodoxus cariosus	***hapawai***	**endemic**

approach to evaluate both habitat condition and biological quality of the study stream reach. Protocols used in the study were restricted to visual observation to score ten "metrics" (or measures) that provide ecological insight from the individual, population, and community levels of organization of the native macrofauna (Table 1). The raw data is then used to calculate the Hawaii Stream Index of Biotic Integrity (HS-IBI) which rates biological quality in comparison to reference Hawaiian stream conditions on a scale from 0 % (< 40 % is impaired) to 100 % (Excellent) (Table 2,4).

Table 2. HS-IBI ratings, integrity classes, and class attributes.

HS-IBI Score as % of Reference	Integrity Class	Attributes
90 - 100 %	**Excellent**	**Comparable to reference conditions with minimal human disturbance; all expected native macrofauna present with alien *M.lar* either absent or in very low numbers; robust *'o'opu* population meeting density and size-class expectations including those for sensitive *'o'opu* species (i.e. *'o'opu-nopili* and/or *'o'opu-alamo'o*).**
79 - 89 %	**Good**	**All expected native macrofauna present; Alien *M. lar* present but in low proportionate abundance (< 10 %); total 'o'opu populaion densites generally attained but sensitive *o'opu* densities and/or size classes may be somewhat below expectations.**
69 - 78 %	**Fair**	**Most expected native macrofaunal species present; Alien *M. lar* present in greater proportionate abundance (> 10 %); total *'o'opu* population and sensitive species densities / size classes below expectations.**
59 - 68 %	**Poor**	**Few expected native macrofaunal species present; Alien *M. lar* as or more abundant than native species but other alien species absent or rare; total *'o'opu* population and sensitive species densities / size classes well below expectations.**
40 - 58 %	**Very Poor**	**Only one or two expected native macrofaunal species present and if present in very low abundance; Alien aquatic species dominate the community and may include tolerant fish species (e.g. Poeciliidae).**
< 39 %	**Impaired**	**Native aquatic macrofaunal species absent; Only alien species present including *M. lar* and tolerant fish species.**

Table 3. Habitat metrics for the HSBP (*FPOM=fine particulate organic matter; CPOM=coarse particulate organic matter).

Metric	Optimal	Suboptimal	Marginal	Poor
1.Habitat Availability	≥ 80% of eleven possible habitat types present for slope gradient type (low, med, high)	51% - 79% of eleven possible habitat types present	26% - 30% of eleven possible habitat types present	≤ 25% of eleven possible habitat types present
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Substrate Embeddedness	Gravel, cobble, and boulder particles 0% - 10 % surrounded by fine sediment	Gravel, cobble, and boulder particles 11% - 25 % surrounded by fine sediment	Gravel, cobble, and boulder particles 26% - 74 % surrounded by fine sediment	Gravel, cobble, and boulder particles ≥ 75 % surrounded by fine sediment
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. FPOM*/CPOM* Characterization	FPOM / CPOM localized covering ≤10% of sq m quadrat	FPOM / CPOM obvious covering 11%-25% of sq m quadrat	FPOM / CPOM widespread covering 26%-50% of sq m quadrat	FPOM / CPOM dominant covering ≥51% of sq m quadrat
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Velocity-Depth Combinations	≥ 80% of seven possible flow regimes present for slope gradient type (low, med, high)	51% - 79% of seven possible flow regimes present	26% - 30% of seven possible flow regimes present	≤ 25% of seven possible flow regimes present
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Status	Ratio of stream width to bank-full width ≥ 80 %	Ratio of stream width to bank-full width 79% - 65%	Ratio of stream width to bank-full width 64% - 50%	Ration of stream width to bank-full width ≤ 49%
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel Alteration	≤ 8 % of channel altered	10% – 23% of channel altered	24% - 44% of channel altered	≥ 45% of channel altered
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Bank Stability	≤ 8 % of stream bank unstable	10% – 23% of bank unstable	24% - 44% of bank unstable	≥ 45% of bank unstable
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Riparian Vegetation Zone Width	≥ 80% of riparian zone covered by trees/shrubs	51% - 79% of riparian zone covered by trees/shrubs	26% - 30% of riparian zone covered by trees/shrubs	≤ 25% of riparian zone covered by trees/shrubs
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
9. Percent Riparian Understory Coverage	≥ 80% of riparian zone covered by understory plants	51% - 79% of riparian zone covered by understory plants	26% - 30% of riparian zone covered by understory plants	≤ 25% of riparian zone covered by understory plants
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
10. Cobble / Boulder vs. Soil Presence	Boulder/Cobble substrate dominant feature; 0% - 10% of bottom affected by soil.	Boulder/Cobble substrate common feature;11% - 25 % of bottom affected by soil	Boulder /Cobble substrate marginal feature; 27%-50% of bottom affected by soil.	Boulder/Cobble substrate rare feature; > 51 % of bottom affected by soil deposition.
Points	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

The HSBP also evaluates stream habitat quality for various characteristics which support native aquatic organisms as well as riparian habitat for their ability to buffer the stream environment from land-based anthropogenic degradation (Table 3). Ten physical habitat metrics are scored in the protocol and rated according to a percentage scale (i.e. 0 % to 100 %) similar to that of the HS-IBI which rates habitat quality as compared to reference from Excellent to Poor (Table 3). Readers interested in more specific details of HSBP procedures are referred to an online version of the manual found on the Department of Health (Environmental Planning Office) website at <http://www.hawaii.gov/doh/eh/epo/wqrev.htm>

Table 4. Biotic metrics and scoring used in the Hawaiian stream bioassessment.

	SCORING CRITERIA		
METRIC	**pts 5**	**3**	**1**
1a. Number of native amphidromous macrofauna (S_{NAM}) - High/Moderate Slope Mid Reach	4 - 3	2 - 1	0
1b. Number of native amphidromous macrofauna (S_{NAM}) - Low Slope Terminal Reach	6 - 5	4 - 2	1 - 0
2. Percent Contribution Native Taxa (PNT)	100% - 75%	74% - 50 %	≥ 49 %
3. Percent Sensitive Native Fish (SNF)[1]	≤ 50%	49% - 20 %	≥ 19 %
4. Sensitive Native Fish Density (fish sq m^{-1})[2]	≤ 0.46	0.45 - 0.20	≥ 0.19
5. Sensitive Native Fish Size (% ≥ 6.0 cm)[3]	≤ 50%	49% - 25 %	≥ 24 %
6. *Awaous guamensis* Size (% ≥ 8.0 cm)[3]	≤ 50%	49% - 25 %	≥ 24 %
7. Total Native Fish Density (fish sq m^{-1})	≤ 0.75	0.74 - 0.36	≥ 0.35
8. Community Weighted Average (CWA)	1.0 - 4.0	4.1 - 9.0	9.1 - 10
9. Number of Alien Taxa (NAT)	0 - 1	2 - 3	>3
10. Percent Tolerant Alien Fish	0%	1 - 4%	≥ 5%
11. Percent Diseased / Parasitized Fish	≥ 1 %	2 % - 10 %	≤ 11 %
Maximum Possible Points = 55			

[1] Sensitive species are *'o'opu-alamo'o* and *'o'opi- nopili*; total no. individuals / total no. fish only

[2] Either *'o'opu-alamo'o* or *'o'opu-nopili* (whichever is in highest density) but not both.

[3] Excluding post-larval size-classes (≤ 3.0 cm TL).

RESULTS AND DISCUSSION

General Watershed / Stream Channel Observations

As suggested earlier, the engineering design of Ku Tree Reservoir was to interrupt the natural flow of two small tributary streams, utilize the existing valley terrain as the reservoir basin and then, with a concrete spillway, use the natural stream channel to accommodate discarded flows from the reservoir. With the reservoir drained, the natural landscape in and around the site was found to be highly disturbed by massive concrete control structures (Photo 2) with incredible quantities of loose soil / sediment deposited in stream channels immediately upstream and downstream of the reservoir. Recent flood flows had apparently compounded the degradation by lodging tons of organic debris into the base of the concrete control structure in the center of the reservoir (Photo 3) and along banks in riparian zones. No native plants were observed in the reservoir site which was found to be dominated by strawberry guava (*Psdium cattleianum*), paper bark trees (*Melaleuca quinquenervia*), and rose apple (*Syzygium jambos*).

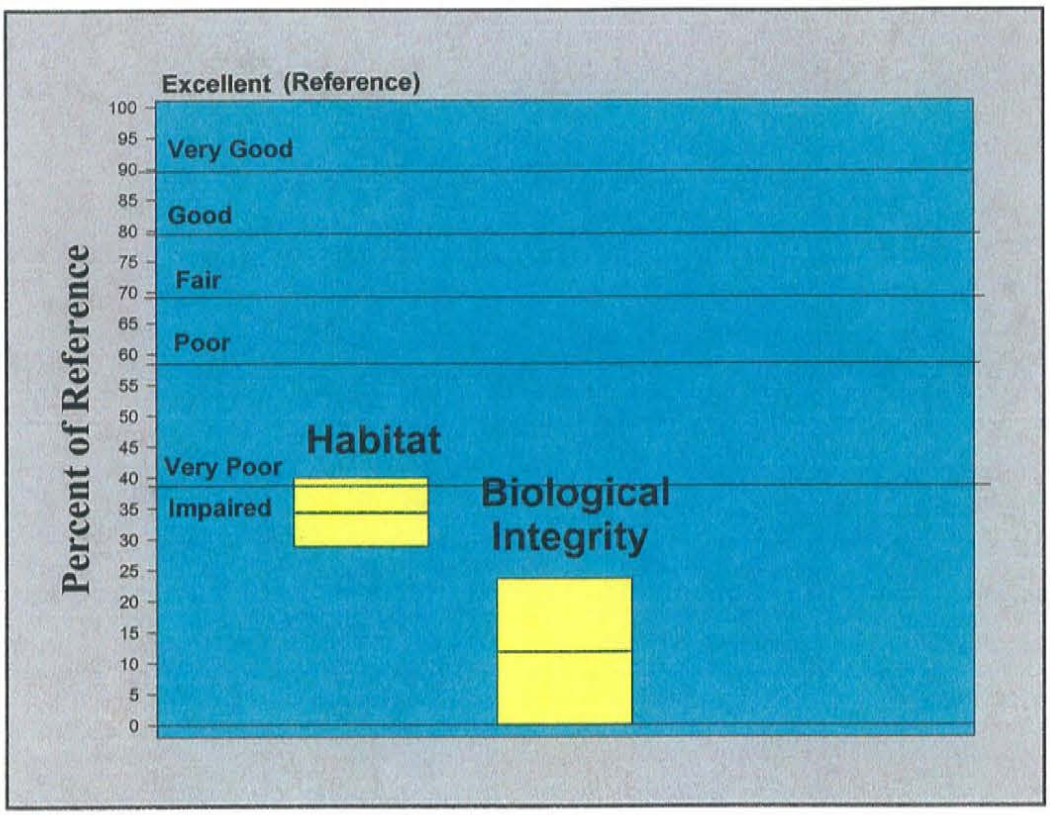

Figure 2. Box plots of overall Habitat and Biotic Integrity ratings by the HSBP of Ku Tree Reservoir streams (upper and lower lines of boxes indicate 90th and 10th percentiles respectively; dotted line inside box is the mean).

Based upon the surveys of the four formal HSBP bioassessment study sites established along the continuum of the stream above and below Ku Tree Reservoir, the overall habitat and biotic integrity condition of these streams were rated as being highly "Impaired" (34.4 $\pm$ 4.431 % and 11.8 $\pm$ 6.813 % of reference respectively) (Fig. 2). Impaired habitat and integrity ratings indicate that the stream system had been degraded to the point that it had lost natural ecosystem function and resilience.

Habitat Conditions

Table 5. Scores for habitat metrics obtained with HSBP above / below Ku Tree Reservoir.

HSBP METRIC % of reference	Below 1	Below 2	Above 1	Above 2
1. Habitat Availability	12.5	18.8	25.0	25.0
2. Embeddedness	5.0	5.0	2.0	2.0
3. FPOM / CPOM Characterization	30.0	40.0	50.0	20.0
4. Velocity-Depth Combinations	16.7	16.7	33.3	33.0
5. Channel Status	10.0	10.0	50.0	50.0
6. Channel Alteration	12.5	1.0	0	2.0
7. Bank Stability	68.8	90.0	80.0	95.0
8. Riparian Zone Width	100.0	100.0	100.0	100.0
9. Riparian Understory	30.0	25.0	80.0	100.0
10. Boulder Cobble vs. Soil Presence	1.0	22.5	1.25	0
Total Points (Max = 200 pts)	68.0	69	90.5	86
Habitat Score (% of Reference)	34.0	34.5	45.3	43.0

Habitat degradation was caused primarily by the extremely high levels of soil and loose sediment deposited on the stream bottom which was the most characteristic feature of stream channels above and below Ku Tree Reservoir (Table 5) (Photo 4). This condition was most severe in the two small streams feeding the reservoir where mud layers greater than 3 feet deep were common (Photo 5). This highly sedimented condition of stream channels nearly completely eliminated all natural rock habitat and was thus determined to be a primary factor contributing to the biological impairment of the stream ecosystem. Stream banks in the study sites were found to be relatively stable (Fig. 5); therefore, the source of soil inputs into stream channels were likely chronic and steadily deposited into stream channels from upstream sources.

Riparian zones in lower stream sites were found to be highly shaded (70 % closed) by yellow guava (*Psidium guajava*) and strawberry guava (*Psidium cattleianum*) (Table 6) while upper stream sites were found to be relatively open (2 % - 5 % closed) and dominated by large paper bark trees (*M. quinquenervia*) (Table 6). Lack of functional understory vegetation in lower stream sites (Table 6) appeared to be caused by a large biomass of strawberry guava leaves deposited on the forest floor. Exposed soil in riparian zones is likely another contributing factor to chronic soil deposition in stream channels at least in areas below the reservoir.

Table 6. Riparian zone coverage and species composition (% abundance) along stream sites.

Riparian Canopy Tree Species	Below 1	Below 2	Above 1	Above 2
Bignoniaceae				
***Spathodea campanulata* (African Tulip)**	**N**	**N**	**N**	**1.0**
Casuarinaceae				
(*Casuarina* sp.) (Ironwood)	**N**	**N**	**5.0**	**N**
Euphorbiaceae				
***Aleurites moluccana* (Kukui)**	**4.5**	**N**	**12.5%**	**N**
Fabaceae				
***Acacia koa* (Native Koa)**	**0.5**	**N**	**7.2%**	**N**
Myrtaceae				
***Melaleuca quinquenervia* (Paper Bark)**	**N**	**N**	**95.0**	**98.0**
***Psidium cattleianum* (Strawberry guava)**	**N**	**90.0**	**N**	
***Psidium guajava* (Yellow guava)**	**90.0**	**N**	**N**	**1.0**
***Syzygium jambos* (Rose Apple)**	**5.0**	**10.0**	**69.6%**	**N**
B. PERCENT CANOPY CLOSURE	**70.0 %**	**70.0 %**	**2.0 %**	**5.0 %**

Stream flow Characteristics

Combined flow from two small tributaries entering the Ku Tree Reservoir intake tower was measured to be 2.47 cubic feet sec^{-1} (cfs) (0.07 cubic meters sec^{-1} [cms]) or about 1.6 million gallons day^{-1} (mgd) (Table 7). Since flow measured in the smaller tributary was 0.353 cfs (Table 7), volume in the larger tributary was estimated at about 2.12 cfs (0.06 cms or 1.37 mgd) at the time flows were measured. About 86 % of the flow entering the intake tower, therefore, was coming from the larger tributary on the eastern side of the reservoir (Photo 5).

Flows in the stream channel below the reservoir and spillway were too low to measure (Table 7) and in fact the spillway and the stream channel directly below it were nearly completely dry except for isolated pockets of standing water. While a trickle flow appeared eventually in the stream channel about 200 m downstream of the spillway, it was apparent that surface flows entering the reservoir intake were finding some other path to downstream reaches. Of the reaches of stream sites studied, therefore, viable habitat for aquatic organisms was essentially only available in the two tributaries above the reservoir.

Table 7. Stream flow characteristics of Ku Tree Reservoir streams.

Parameter	Below 1	Below 2	Above 1	Both 1- 2
Stream Width (m)	**NA**	**NA**	**1.0**	**1.35**
Cross Section Area (sqm)	**NA**	**NA**	**0.106**	**0.288**
Mean Depth (m)	**NA**	**NA**	**0.106**	**0.213**
Wetted Perimeter (m)	**NA**	**NA**	**1.171**	**1.630**
Hydraulic Radius	**NA**	**NA**	**0.09**	**0.18**
Flow – cubic m / sec	**>0.0001**	**>0.0001**	**0.01**	**0.07**
cubic ft / sec			**0.353**	**2.47**
million gallons / day			**0.228**	**1.596**
Velocity – m / sec			**0.820**	**0.231**
ft / sec			**0.269**	**0.758**

The Biological Integrity of Ku Tree Reservoir Streams

Overall biological integrity for the Ku Stream Reservoir streams based upon averaged HS-IBI scores for the four study sites indicated that the ecosystem was severely "Impaired" (11.8 + 6.813 %) (Fig. 2) and thus had lost its resilience and natural biophysical ability to support robust populations of native stream animals. High sediment deposition coupled with the loss of the ecosystem's ability to transport this material can be viewed as the primary physical factors contributing to the loss of biological integrity in the Ku Tree Reservoir streams. The severe disruption of natural flows to the downstream reaches of stream below the reservoir is another significant factor since instream habitat is severely reduced except during periods of flooding. In addition, the reservoir, concrete spillway and dam structures are significant physical barriers to upstream migrating native stream animals that by some miracle were able to pass through the gauntlet of obstacles and predatory species present in Lake Wilson and Kiikii Stream.

Table 8. Species list and distribution of fish and macroinvertebrates in Ku Tree Reservoir stream study sites as determined by visual census (X indicates species presence).

Taxa	Below 1	Below 2	Above 1	Above 2
Fishes				
Cyprinodontiformes: Cyprinodontoidei				
Poeciliidae – *Poecilia reticulata* (guppies)	**N**	**N**	**X**	**X**
***Xiphophorus helleri* (swordtails)**	**N**	**N**	**X**	**X**
***Gambusia affinis* (mosquitofish)**	**N**	**N**	**X**	**X**
Aquatic Macroinvertebrates				
Arthropoda; Crustacea; Decapoda;				
Cambaridae – *Procambarus clarkii* (crayfish)	**N**	**N**	**X**	**X**

Not surprisingly, then, no native stream organisms were observed or collected in Ku Tree Reservoir streams. In the two streams above the reservoir where steadily flowing water was present, only alien pest Poeciliid fishes were observed along with the alien, mud-burrowing crayfish, *Procambarus clarkii* (Table 8) albeit in conspicuously low abundances.

SUMMARY AND CONCLUSIONS

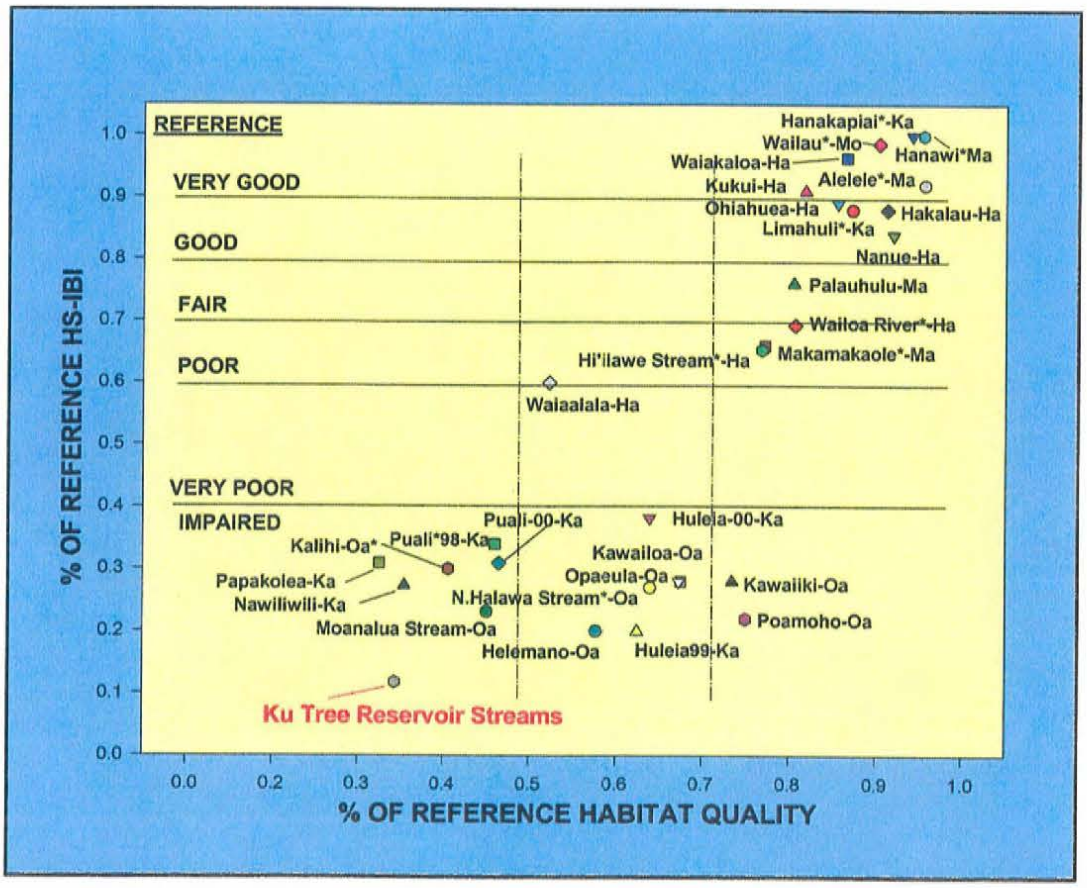

Figure 3. Statewide comparisons of stream biotic integrity (HS-IBI) and condition of supporting habitat in Ku Tree Reservoir streams (Oahu) (*averaged values in streams that have been sampled at multiple elevations and / or times, Ka = Kauai, Oa = Oahu, Ma = Maui, Mo = Molokai, Ha = Hawaii).

Overall physical habitat quality and biological integrity in Ku Tree Reservoir streams were found to be severely "Impaired" by channel modifications, chronic sedimentation, stream flow reductions and the physical presence of the reservoir. HSBP ratings for these particular streams were, in fact, the worst yet determined for streams thus far surveyed in the Hawaiian Islands (Fig. 3). Not only were no native aquatic species observed in stream study sites, but alien species diversity and abundance was also conspicuously low indicating very severe impairment of ecosystem function and loss of resilience.

Given the severely degraded physical and biological condition of streams associated with Ku Tree Reservoir, it is highly unlikely that construction activities associated with removal of the dam structures could further degrade the site. Reconnection of the natural stream channel above and below the reservoir / spillway with the proper grade would no

doubt improve habitat conditions as flows presumably would be restored to downstream reaches. Of significant concern, however, is the fate of the tremendous quantities or sediment and organic trash currently deposited in the reservoir site when the dam is breached and flows restored. Simply allowing this material to passively transport to downstream reaches could have serious negative consequences from 'log jams' and sediment deposition in various unpredictable locations in lower Kaukonahua Stream and perhaps even Lake Wilson. The only viable option would seem to be physical removal of this material out of the reservoir prior to the restoration of stream flows. In any case, care should be taken to minimize the release and transport of sediment to downstream reaches of Kaukonahua Stream.

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Kido, M. H. 2002a. The Hawaii Stream Bioassessment Protocol: A Manual for the Biological Monitoring and Assessment of Hawaiian Streams. Version 3.01. Report to the Hawaii Department of Health, December 1999.

Timbol, A. S. and J. A. Maciolek. 1978. Stream channel modification in Hawaii: Part A: Statewide inventory of streams, habitat factors and related associated biota. FWS/OBS-78/16, U.S. Fish and Wildlife Service National Stream Alteration Team. Columbia, Missouri.

APPENDIX (Project Photos)

Photo 1. Concrete-lined spillway for reservoir over-flow into the natural stream channel.

Photo 2. Top of concrete control tower and remnants of elevated access walkway.

Photo 3. Tons of organic debris deposited at the control tower base after flooding.

Photo 4. Excessive sedimentation of stream channel in Site 2 below Ku Tree reservoir.

Photo 5. High sediment deposition area in Site 4 above Ku Tree Reservoir intake tower.

Appendix E:
National Historic Preservation Act, Section 106 Consultation

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
DIRECTORATE OF PUBLIC WORKS
947 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5013

April 09, 2020

SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Waianae Ahupua'a, Waianae Moku, O'ahu (TMK: 7-6-001:001)

Dr. Alan Downer
Deputy State Historic Preservation Officer
State Historic Preservation Division
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamōkila Boulevard
Kapolei, Hawaii 96707

Dear Dr. Downer:

On behalf of the Commander of the U.S. Army Garrison, Hawaii (USAG-HI), I am writing to consult with you about a proposal to breach Ku Tree Dam. This proposed project will be conducted on federal land and carried out by the U.S. Army, and is considered a federal undertaking pursuant to Section 106 of the National Historic Preservation Act.

Ku Tree Dam is located approximately three miles east of Wheeler Army Airfield on Schofield Barracks East Range Training Area in central O'ahu. The earthen dam was constructed in 1925 to provide potable water to Schofield Barracks. Supply problems limited the dam's utility and after the Army drilled deep wells in 1938, Ku Tree Dam was no longer needed. The reservoir continued to provide irrigation water though the 1970s until it was emptied in 1983 to conduct a safety inspection. The components were found to be severely deteriorated, the dam was determined to be unsafe, and the reservoir was never refilled. Subsequent safety inspections by the State of Hawaii in 2014 and the U.S. Army in 2017 identified the potential hazards of catastrophic dam failure.

In order to eliminate the threats to life and property that could occur as a result of dam failure, USAG-HI proposes to create a permanent breach in the dam by removing the spillway and other concrete components, and excavating a channel down to the natural stream bed elevation. Project details, including a description of the undertaking and the 28.5-acre area of potential effects (APE), are provided in Enclosure 1.

USAG-HI has made reasonable and good-faith efforts to identify historic properties in the APE for the dam breach project. Those efforts include intensive survey, archival research, field reconnaissance, architectural analysis, and previous consultation with the State Historic Preservation Division, Native Hawaiian Organizations and interested parties. A description of the steps taken to identify historic properties is presented in Enclosure 1. The documentation of previous consultation is provided in Enclosure 2. The Historic American Engineering Record is provided in Enclosure 3.

Ku Tree Dam is the only property that was identified within the APE; no other buildings, structures, sites, or districts are present. As a result of archival research and consultation with the State Historic Preservation Division in 2004, 2008, and 2019, USAG-HI has determined that Ku Tree Dam lacks historic integrity and therefore is not eligible for nomination to the National Register of Historic Places. Accordingly, Ku Tree Dam is not considered to be a historic property for the purposes of Section 106 of the National Historic Preservation Act.

USAG-HI finds that the proposed Ku Tree Dam Breach Project will result in no historic properties affected because no historic properties are present in the APE. Enclosue 1 provides all documentation required to support this finding as set forth in 36 CFR 800.11(d), including the basis for determining that no historic properties are present or affected.

I am notifying you of the the Garrison's finding of *no historic properties affected* for this undertaking and respectfully requesting your review of the enclosed documentation. If you object to the finding, please respond in writing within 30 days of receipt of this letter specifying the reason(s) for the objection. The distribution list for this notification is presented in Enclosure 4.

If you have any questions about this undertaking or the Section106 process, please contact Mr. Richard Davis, USAG-HI Cultural Resources Manager, Directorate of Public Works. You may reach him at (808) 655-9709 or richard.d.davis154.civ@mail.mil.

Sincerely,

SUZUKI.RHONDA.L S.1275028912 Digitally signed by SUZUKI.RHONDA.L S.1275028912 Date: 2020.04.09 14:41:54 -10'00'

for Kent K. Watase, PE
Director of Public Works

Enclosures

Enclosure 1

SUBJECT: National Historic Preservation Act Section 106 Compliance for Project # CRS-19-013: Ku Tree Dam Breach Project, Waiʻanae Ahupuaʻa, Waiʻanae Moku, Oʻahu (TMK: 7-6-001:001)

Description of the Undertaking per 36 CFR § 800.11(d)(1)

The proposed project to breach Ku Tree Dam will be funded and carried out by the U.S. Army and is a federal undertaking that has the potential to cause effects on historic properties as defined in 36 CFR § 800.3(a).

Ku Tree Dam is located on federal land within the East Range Training Area of Schofield Barracks Military Reservation. The general location is in central Oʻahu, on the western slopes of the Koʻolau Mountains, roughly one mile southeast of upper Wahiawā, one mile north of Mililani Mauka, and three miles east of the entrance to Wheeler Army Airfield at Kamehameha Highway (Figure 1).

The purpose of the undertaking is to eliminate the danger and safety hazards associated with potential dam failure. Ku Tree Dam was determined unsafe in 1978 under the National Dam Safety Program. The reservoir was drained in 1983 to conduct a thorough inspection of all dam components. Due to failing mechanical and structural components, the dam was taken out of service and the reservoir was never refilled.

To address the safety concerns, the Army proposed to breach the dam in 2004 but never executed the plan. After a subsequent inspection in 2014, the State of Hawaii Department of Land and Natural Resources (DLNR) determined that Ku Tree Dam is in poor condition and is a threat to public safety, and required the Army to mitigate the hazards. The U.S. Army Corps of Engineers conducted another inspection in 2017 and found that Ku Tree Dam and Reservoir is in critical condition and needs immediate attention to minimize the risk of structural failure. The U.S. Army Corps of Engineers has determined that breaching the dam is the best option to eliminate the hazards**.**

The proposed undertaking involves breaching Ku Tree Dam and restoring the natural flow of Kalakoa Stream by demolishing the concrete spillway and excavating a 500-foot long channel through the hillside that supports the spillway. The channel excavation will be 80-90 feet deep to match the elevation of the existing stream bed. The channel bottom will be 50 feet wide with a natural stream bed. Benched side-slopes will be constructed on both sides of the new channel to minimize erosion and establish vegetation. The excavated channel will end at a constructed riprap basin to reduce water flow speed.

Except for the spillway, the dam structure will remain in place. The drain tunnels will be plugged. The concrete valve tower, spillway and footbridge will be demolished and used with the excess excavation material as fill on the upstream side of the dam to redirect water into the newly excavated channel. Vegetation will be removed from the working areas. The access route from the main road will be improved as necessary to accommodate the heavy equipment.

The area of potential effects (APE) for the undertaking is 28.5 acres and is illustrated in Figure 1. The APE includes the footprint of all demolition and construction activities, the access route from the East Range road, and sufficient space for storing equipment and material during the project.

Enclosure 1

SUBJECT: National Historic Preservation Act Section 106 Compliance for Project # CRS-19-013: Ku Tree Dam Breach Project, Waiʻanae Ahupuaʻa, Waiʻanae Moku, Oʻahu (TMK: 7-6-001:001)

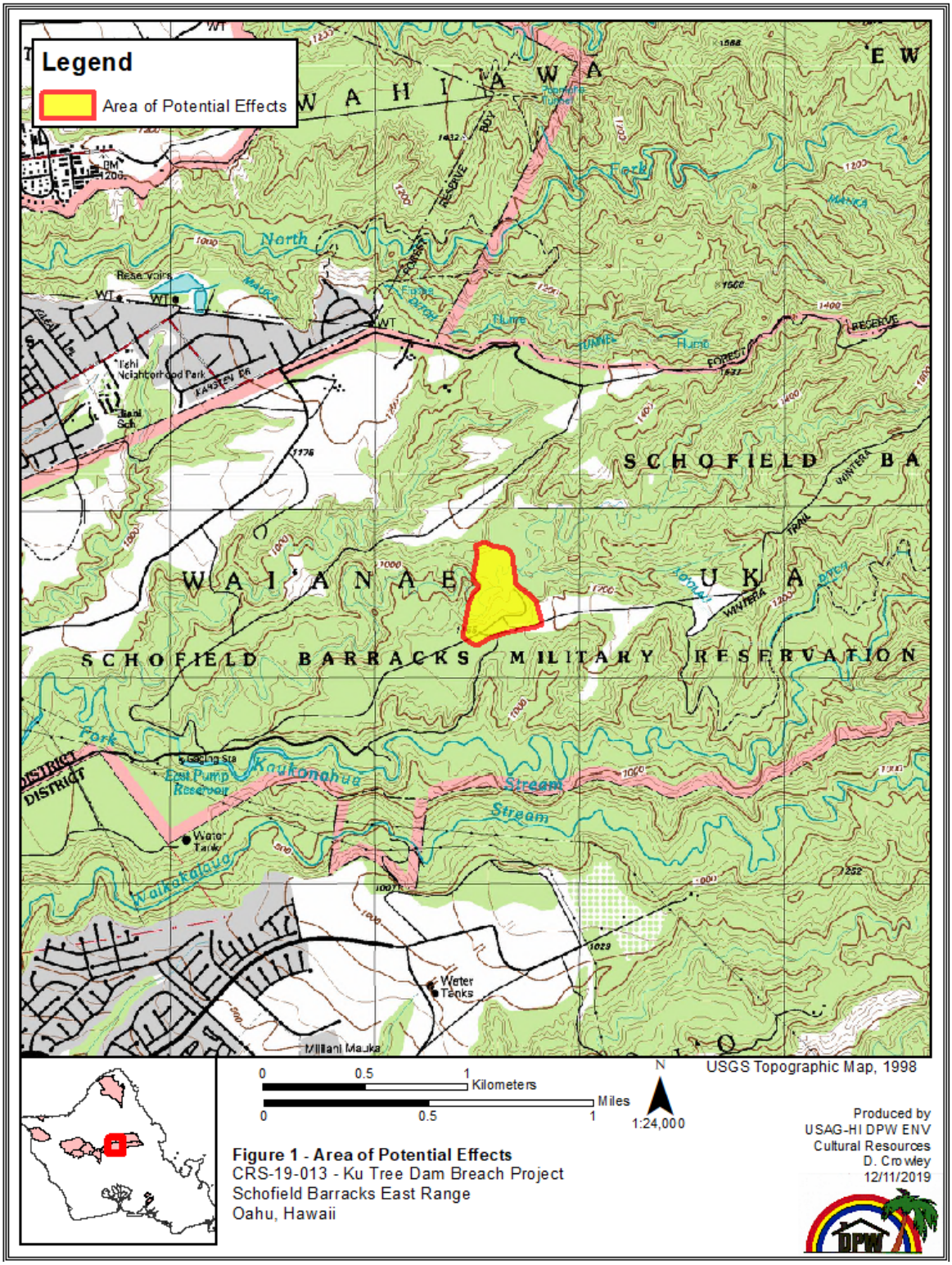


Figure 1 - Area of Potential Effects
CRS-19-013 - Ku Tree Dam Breach Project
Schofield Barracks East Range
Oahu, Hawaii

Figure 2 **(next page)** shows a close-up of the APE overlain on a 1927 aerial photograph of Ku Tree Dam. The dam, spillway, footbridge, and tower are all visible.

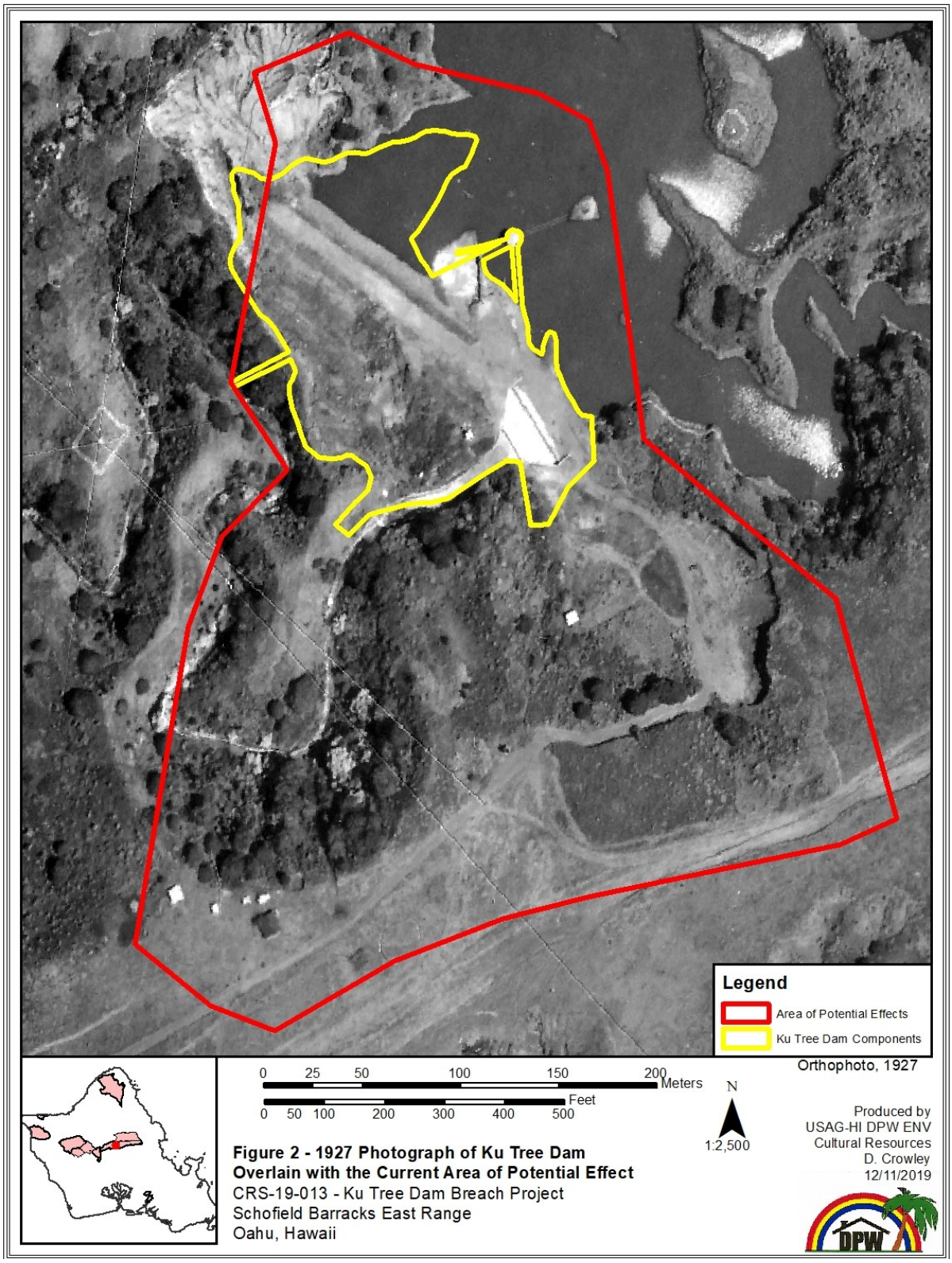


Figure 2 - 1927 Photograph of Ku Tree Dam Overlain with the Current Area of Potential Effect
CRS-19-013 - Ku Tree Dam Breach Project
Schofield Barracks East Range
Oahu, Hawaii

Figure 3 **(next page)** shows the construction **limits** for the proposed breach project overlain with the APE for the current proposal and the locations of the dam components.

Enclosure 1

SUBJECT: National Historic Preservation Act Section 106 Compliance for Project # CRS-19-013: Ku Tree Dam Breach Project, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)

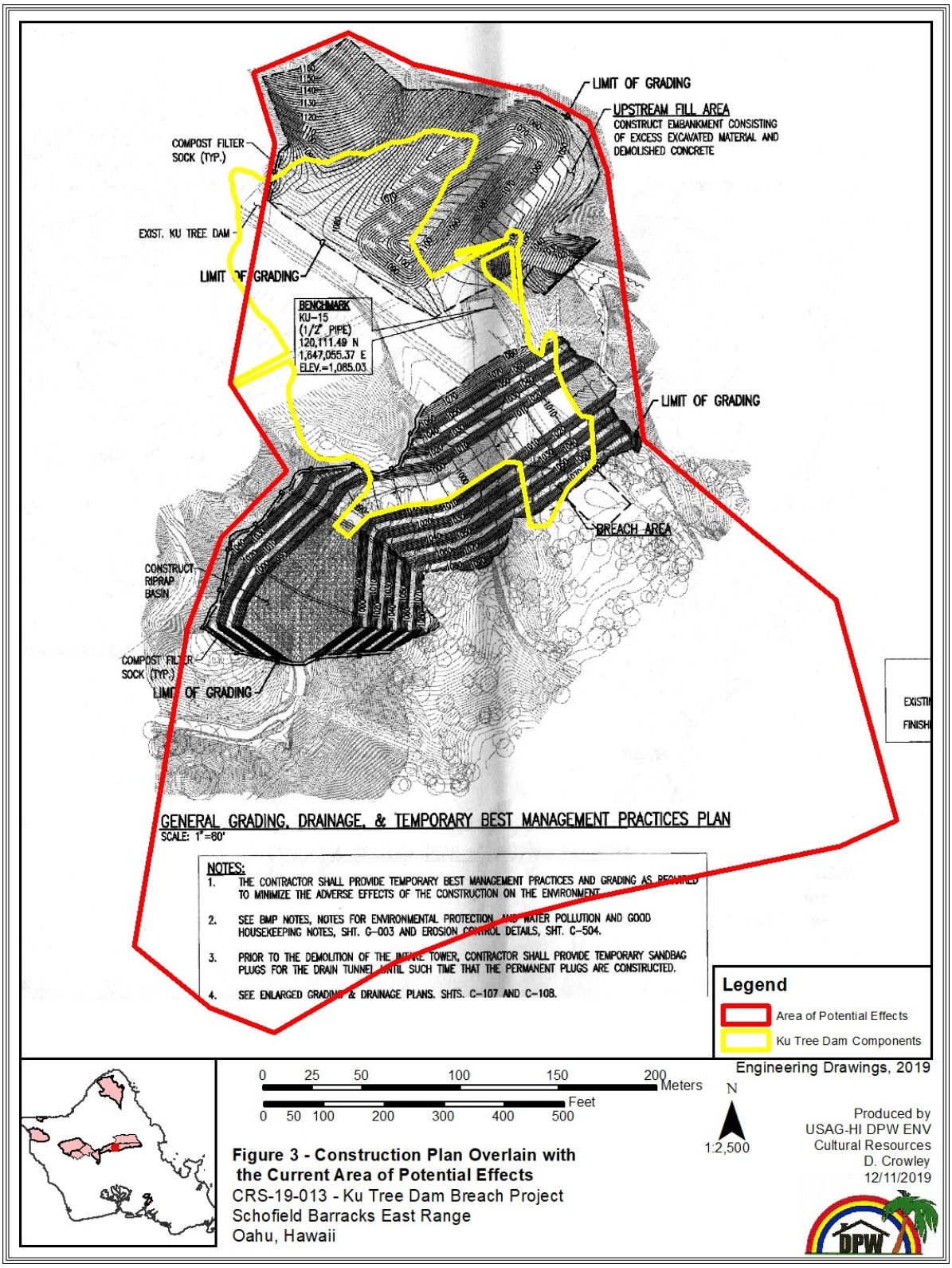


Figure 3 - Construction Plan Overlain with the Current Area of Potential Effects
CRS-19-013 - Ku Tree Dam Breach Project
Schofield Barracks East Range
Oahu, Hawaii

Steps Taken to Identify Historic Properties per 36 CFR § 800.11(d)(2)

The U.S. Army Garrison, Hawaii (USAG-HI) has taken several steps to identify historic properties in the project APE, including, intensive survey, field reconnaissance, consultation, archival research, and architectural analysis.

In 1997, USAG-HI contracted with Scientific Consulting Services (SCS) to conduct an intensive cultural resources inventory survey in a large portion of Schofield Barracks East Range (Robins and Spear 2002). That inventory survey covered more than half of the APE for the current undertaking. SCS identified Ku Tree Dam and its associated components as a *potential* historic property and assigned it State Inventory of Historic Places number 50-80-05-5509. They did not identify any other buildings, structures, sites, districts, or objects within the current APE for the dam breach project. Figure 4 (next page) shows the extent of the SCS cultural resources inventory survey relative to the current project APE with a modern aerial photo in the background. Note the dense vegetation growth in Figure 4 compared to the 1927 aerial photograph in Figure 2.

The SCS report documented four components of the historic-period structure: an earthen dam, a concrete control tower, a concrete foot bridge, and a concrete spillway. SCS inaccurately identified those four constructed components as “historic archaeological features” (Robins and Spear 2002:83). As part of the designed and engineered structure, they are actually architectural and engineering features. SCS recommended the Army that Ku Tree Dam could be considered eligible to the National Register of Historic Place under Criterion D because of the information potential of the engineered structure, and suggested that it be preserved as an example of an architectural type.

In 2004, the U.S. Army proposed an undertaking to breach Ku Tree Dam. That proposal was nearly identical to the currently proposed undertaking, the only difference being a slightly shorter, narrower, and concrete-lined channel in the 2004 proposal. In accordance with the National Historic Preservation Act, USAG-HI initiated consultation with the Hawaii State Historic Preservation Division (SHPD), the Office of Hawaiian Affairs, Hui Mālama I Na Kupuna O Hawaiʻi Nei, the Association of Hawaiian Civic Clubs, and the Historic Hawaii Foundation about the proposed undertaking and the potential effects to historic properties in the area.

The U.S. Army Corps of Engineers hosted an on-site inspection of the Ku Tree Dam project area with SHPD staff and Mr. Tom Lenchanko of the Hawaiian Civic Club of Wahiawa on June 9, 2004. During the visit, SHDP staff recommended that the Army complete Historic American Engineering Record (HAER) documentation of the dam components. None of the consulting parties expressed concerns about other historic properties or cultural resources in the area, although Mr. Lenchanko and the Wahiawa Civic Club expressed concerns about the impacts to natural resources resulting from the proposed concrete-lined stream channel and the burial of demolished concrete behind the dam.

Enclosure 1

SUBJECT: National Historic Preservation Act Section 106 Compliance for Project # CRS-19-013: Ku Tree Dam Breach Project, Waiʻanae Ahupuaʻa, Waiʻanae Moku, Oʻahu (TMK: 7-6-001:001)

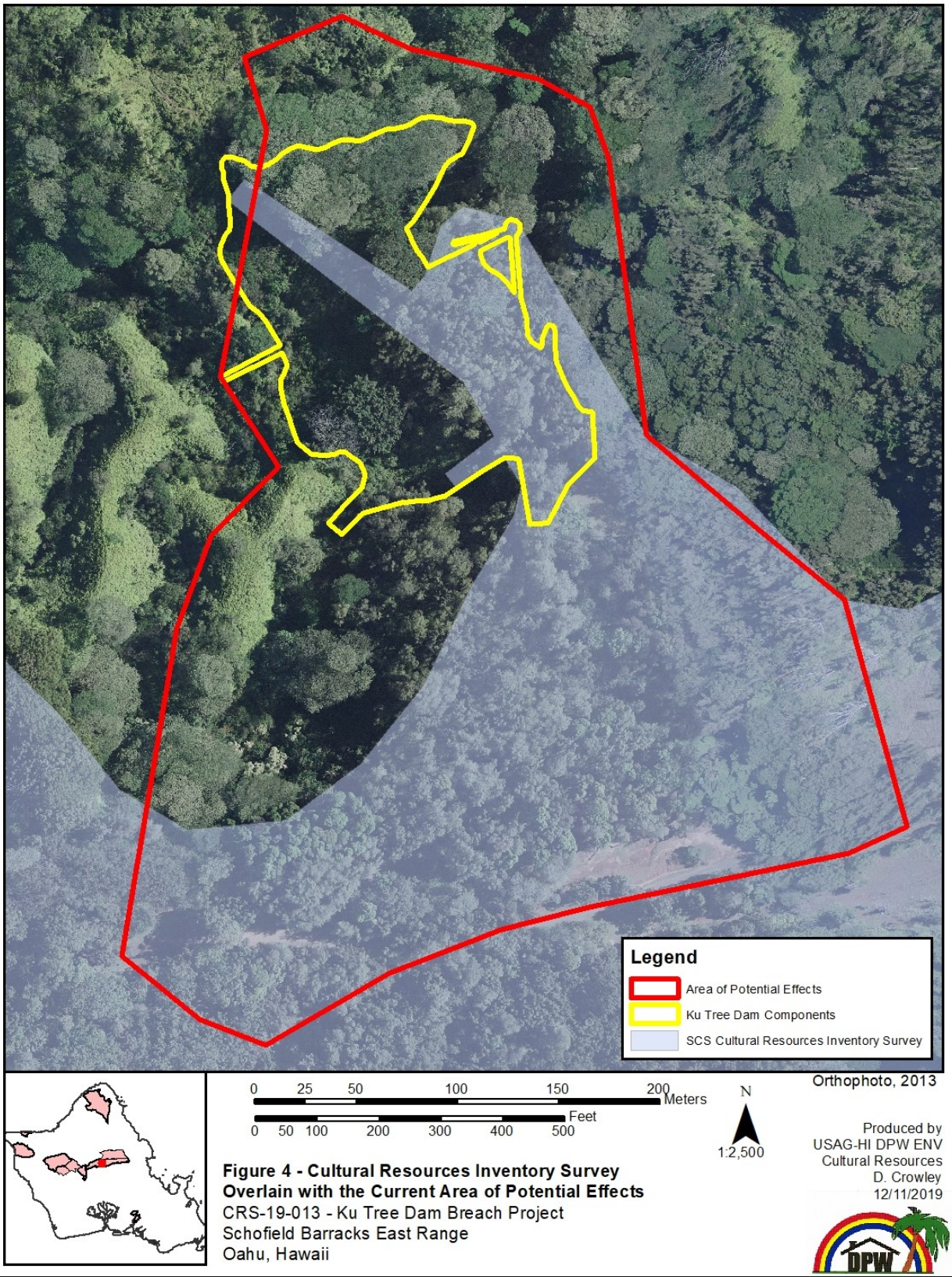


Figure 4 - Cultural Resources Inventory Survey Overlain with the Current Area of Potential Effects
CRS-19-013 - Ku Tree Dam Breach Project
Schofield Barracks East Range
Oahu, Hawaii

After the site visit, on June 30, 2004, USAG-HI sent a letter to the consulting parties accepting the SHPD recommendation to complete HAER documentation of the dam components as mitigation for proposed impacts to the dam. While USAG-HI did not make a determination of eligibility for Ku Tree Dam in the consultation letter, the letter stated that the HAER documentation "will mitigate the project impacts to no adverse effect."

The Office of Hawaiian Affairs, echoing the concerns of Mr. Lenchanko and Hawaiian Civic Club of Wahiawā, responded by mail on September 2, 2004. They expressed concerns about water quality, asked if there was a way to avoid lining the channel with concrete to support reintroduction of native species, and inquired if there was a better place to dispose of the demolition debris rather than burying it beneath the excess fill on the upstream side of the dam.

The SHPD responded to USAG-HI on May 22, 2008. The consultation response letter from the SHPD Archaeology and Historic Preservation Manager Nancy McMahon thanked the USAG-HI for the site visit with SHPD staff in 2004, noted that the Army staff agreed to SHPD's request for HAER documentation of the dam components, stated that the component structures of the dam have lost their historic integrity due to their dilapidated condition, and declared that there were no archaeological concerns because "the area has been previously disturbed and a great deal of fill was introduced to construct the earthen dam and therefore is unlikely to retain cultural deposits."

After receiving the letter from the SHPD in May of 2008, USAG-HI contracted with Mason Architects to complete the HAER documentation requested by the SHPD. The resulting HAER report (Enclosure 3) was submitted to the SHPD and the National Park Service on December 11, 2008 and subsequently filed with the Library of Congress (HAER Call Number HI-81). The Army also worked to redesign the project to address the concerns about water quality and the concrete-lined stream channel expressed by the Hawaiian Civic Club of Wahiawā and the Office of Hawaiian Affairs. For unknown reasons, the breach project was put on hold in 2009 and was not revived until the most recent safety inspections were conducted.

Upon receipt of updated and revised plans to breach the Ku Tree Dam in June of 2019, the USAG-HI Cultural Resources team of historians and archaeologists compared the current and previous proposals to determine any data gaps relative to the previous identification efforts, reviewed previous consultation documents, examined the records related to the dam construction, and analyzed historical photos and maps. The team noted that the current proposed dam breach project is slightly larger than the previous proposal in order to incorporate the 2004 consultation recommendation to create a natural stream channel instead of a concrete-lined channel. Additionally, the team identified an area downstream of the spillway as a target for additional field inspection and verification. The area in question was not included as part of the project proposed in 2004, did not appear to have been significantly disturbed by the dam construction, and, based on topographic maps and digital elevation models, seemed to offer a slight potential of having a relatively flat area that could possibly contain historic properties.

On December 10, 2019, USAG-HI archaeologists inspected the downstream portion of the project area to document current conditions and look for any cultural resources and potential historic properties that might be present. The team found the area to be a narrow, deeply incised stream channel that was heavily scoured by water, bounded by dangerously steep mud and clay walls and cliffs, and covered with dense, often impassible, vegetation (Figures 5-6).

No cultural resources were identified and no areas of reasonably flat ground were found along the streambank that could potentially contain intact buried archaeological resources. The team also attempted to reach the top of a hill adjacent to the stream channel to find any area with the potential to contain historic properties, but the effort was thwarted by the precipitous slopes and impassible vegetation, which created a significant safety hazard (Figure 7 – next page).

Figure 5 – Looking upstream at the mud and clay walls along the scoured stream channel at the end of the concrete spillway in the downstream portion of the APE.

Figure 6 – Looking downstream in the APE at the narrow incised stream channel below the spillway bounded by steep slopes and dense vegetation.

Figure 7 – Dense vegetation and steep slopes encountered while attempting to inspect the hill in the APE.

Considering the adjacent archaeological survey in nearby similar areas and the extremely steep nature of the APE, the probability that historic properties are present in the area is very low.

Employing a combination of intensive survey, field reconnaissance, consultation, archival research, and architectural analysis, USAG-HI has made a reasonable and good faith effort to identify historic properties in the APE for the Ku Tree Dam breach project.

Basis for Determining that No Historic Properties are Present or Affected per 36 CFR § 800.11(d)(3)

During the 1997 archaeological survey, SCS documented the Ku Tree Dam components. SCS did not find any other structures, buildings, districts, objects, or sites within or adjacent to the APE for the current project. In the 2002 project report, SCS recommended that Ku Tree Dam be considered eligible to the National Register under criterion D because of the information potential of the historic structure. It is very uncommon for historic period buildings and structures to be considered eligible for the National Register because of their information potential. SCS did not provide any rationale for their recommendation and USAG-HI did not request any clarification. After receiving the report from SCS, USAG-HI did not formally evaluate the significance and integrity of the structure against the National Register criteria to make official determination of National Register eligibility. USAG-HI instead chose to simply treat the dam as eligible based solely on the recommendation from the archaeological contractor, which was standard practice for the USAG-HI cultural resources program at the time.

The June 2004 consultation letter from USAG-HI to the SHPD and the other consulting parties acknowledged the National Register eligibility recommendation by SCS, but did not formally accept it. The letter recognized that the proposed project could result in adverse effects, offered the HAER documentation of the architectural elements as mitigation for proposed impact of the dam breach, and made a finding of "no adverse effect on historic properties."

USAG-HI received a consultation response letter from the SHPD in May of 2008, almost four years later (Enclosure 2). The SHPD response letter concluded that Ku Tree Dam components have lost their historic integrity and expressed the opinion that the determination of effect for architectural concerns is "no adverse effect." The letter also acknowledged that Army staff agreed to SHPD's request for HAER documentation for their records. Regarding potential archaeological concerns, the SHPD letter stated that "the area has been previously disturbed and a great deal of fill was introduced to construct the earthen dam and therefore is unlikely to retain cultural deposits."

The National Register eligibility recommendation by SCS was not conducted in accordance with the National Register criteria for evaluation found at 36 CFR § 60.4 and USAG-HI did not make a formal determination of eligibility. Subsequent correspondence between USAG-HI and SHPD did not clarify the National register

status of Ku Tree Dam. A formal application of the National Register criteria for evaluation is appropriate at this point as a basis for determining that no historic properties are present or affected.

Ku Tree Dam is an engineered structure consisting of four associated components: an earthen dam, a concrete tower, a concrete spillway, and a concrete footbridge. Constructed in 1925 with the intent of providing potable water to Schofield Barracks, Ku Tree Dam is associated with the context of U.S. Military development on Oahu during the inter-war years of the early 20th Century. The dam did not function well and persistent water shortages forced the Army to develop other sources of potable water. In 1933, the Army started developing plans to drill deep wells and by 1938, after less than 13 years, the Army abandoned Ku Tree Dam as a source of potable water. While the dam continued to hold water and was used for golf course irrigation from the 1940s into the 1970s, it was inconsequential to the development of the U.S. Military on Oʻahu.

Considering its limited utility and lack of association with a specific important event or events that made a significant contribution to the broad patters of our history in the context of U.S. Military Development on Oahu, Ku Tree Dam is not eligible for listing in the National Register under Criterion A.

Ku Tree Dam is not associated with the lives of any known individuals whose specific contributions to history can be identified and documented. Accordingly, Ku Tree Dam is not eligible for listing in the National Register under Criterion B.

According to the HAER documentation, the design and construction of the earthen dam and its reinforced concrete components was typical for its time in Hawaii and throughout the Nation. Ku Tree Dam is an average example of earthen dams built in Hawaii in the early 20th Century. It is one of 125 similar earthen dams in Hawaii, the majority of which were constructed between 1885 and 1940. The Ku Tree Dam components are common features found at other dams and there are no specific characteristics that distinguish it from other similar dams in Hawaii or the United States as a whole. It does not embody a distinctive type, period, or method of construction, represent the work of a master, or possess high artistic value and it is not eligible for listing in the National Register under Criterion C.

Ku Tree Dam and its components do not have the potential to provide important information or answer research question about human history. As a designed and engineered structure, the important information about Ku Tree Dam is found in the engineering records and photographs. That information has already been assembled by USAG-HI in the HAER documentation (Enclosure 3). There is no additional information or data in the physical remnants of the dam that could support eligibility for listing in the National Register under Criterion D.

Ku Tree Dam still exists where it was constructed and most of the original construction materials remain. Accordingly, it retains integrity of location and material.

The absence of working valves and controls and the inability to function as designed indicates the dam lacks integrity of design and workmanship. Overgrown and obscured by dense vegetation, lacking the characteristic reservoir of water, and far removed from the associated historic districts of Schofield Barracks and Wheeler Field, the dam does not retain integrity of setting or feeling.

Finally, with no direct link between an important historic event or person, Ku Tree Dam does not have integrity of association. Retaining only the integrities of location and material, and lacking the other five aspects of integrity specified in 36 CFR § 60.4, Ku Tree Dam lacks sufficient integrity to convey historical significance and cannot be considered eligible for the National Register.

On November 7, 2019 the USAG-HI Cultural Resources Manager Richard Davis, Architectural Historian Ken Hayes, and Archaeologist David Crowley met with the SHPD Architectural Historians Tanya Gumapac-McGuire and Julia Flauaus to discuss the Ku Tree Dam breach project. The group reviewed the National Register eligibility recommendation by SCS and the consultation letters from 2004 and 2008, discussed the condition and integrity of the dam components, and recognized that the Army has already completed the HAER documentation of the dam components as requested by SHPD.

At the meeting, the group reached a consensus on two points. First, findings reached as a result of the previous consultation, including the eligibility recommendation, the HAER mitigation, and the finding of no adverse effect, would not be acceptable under current standards. Second, there is no potential for Ku Tree Dam to yield significant information that would qualify it for eligibility to the National Register under criterion D and the dam lacks historical integrity because of its dilapidated condition, which began to deteriorate in the mid-1900s and was exacerbated when the reservoir was emptied in 1983.

The information presented above is the basis for the Army's determination that no historic properties are present or affected by this undertaking. In conclusion, USAG-HI has determined that Ku Tree Dam, does not meet any of the National Register criteria, lacks a majority of the aspects of integrity, and is not a historic property for the purposes of Section 106 of the National Historic Preservation Act. Accordingly, there are no historic properties present in the project APE, and no historic properties will be affected by this undertaking.

References

Robins, Jennifer and Robert Spear
2002b Cultural Resources Inventory Survey and Limited Testing, Phase II, of the U.S. Army Schofield Barracks Training Areas for USAG-HI Ecosystem Management Program, Island of Oahu, Hawaii. MS on file at the U.S. Army Garrison Hawaii Cultural Resources Office, Library # 1323.

ENCLOSURE 2
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
SCHOFIELD BARRACKS, HAWAII 96857-5000

REPLY TO
ATTENTION OF :

30 JUN 2004

FILE COPY

Directorate of Public Works

Mr. Peter Young
State Historic Preservation Officer
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Dear Mr. Young:

We are writing to open Section 106 consultation with your office concerning a proposed undertaking within Schofield Barracks East Range (SBE), Island of Oahu, Hawaii. The U.S. Army Garrison Hawaii (USAG-HI) is proposing to breach the Ku Tree Dam located along the eastern periphery of the Schofield Plateau (see Enclosure 1).

The dam site is approximately 3 miles east of Wahiawa town on an unnamed tributary to the south fork of Kaukonahua Stream. The dam, appurtenant structures, and access roads are the only cultural resources that have been identified within the Area of Potential Effect (APE) (see Enclosure 2).

Ku Tree Dam is a hydraulic earth-filled dam. The dam and its reservoir are located in rough and heavily vegetated terrain. The project involves breaching the dam by excavating a channel approximately 400 feet long through the natural hillside. The new rectangular channel will be concrete lined and have a bottom width of approximately 30 feet. The proposed channel will be tied to the existing discharge end of the spillway and stilling basin. Material from the required excavation will be placed along the upstream face of the existing dam. The existing tower will be demolished and buried beneath the waste fill. The drain tunnel will be permanently plugged near the inlet, a second permanent plug will be installed near the outlet of the drain tunnel, and a small-diameter drain will be installed to permit water seepage from the encased tunnel. A section of the existing discharge tunnel located beneath the new channel will be plugged to preclude any hazard of collapse (see Enclosure 3).

The proposed channel will provide Standard Project Flood (SPF) protection for the unnamed stream through Ku Tree Dam. SPF represents the flood that would result from the most severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the region. The project will be capable of controlling the SPF peak discharge of 3,900 cubic feet per second (cfs) upstream, and 4,300 cfs in the flood plain below the dam.

FILE COPY

Management of Ku Tree Dam is needed to prevent dam failure and possible environmental impacts associated with such an event. In 1978 the dam was determined to be unsafe following inspection under the National Dam Safety Program. In 1983, the water level of Ku Tree Dam was lowered to facilitate engineering studies and analysis of the dam structures. Although the reservoir was completely drawn down, it offered only a temporary reduction of unsafe conditions at the reservoir and was not considered a long-term solution to the safety problem.

A site visit of the project area was undertaken on 9 June 2004. Ms. Susan Tasaki of the State Historic Preservation Office was present. A summary of the site visit and Ms. Tasaki's recommendations are included in Enclosure 4.

Under Section 106 of the National Historic Preservation Act of 1966, as amended, we recognize that this proposed Federal action is an undertaking as defined in Sec. 800.3(a). The Ku Tree Reservoir and associated components (earthen dam, tower, footbridge and concrete spillway) have been assigned State Site #50-80-05-5509. It was recommended by Robins *et al.* (2002) that Site 5509 is eligible for the National Register of Historic Places under criterion "D" (site has yielded or has the potential to yield information important in prehistory and history). USAG-HI recognizes that through destruction or damage, the proposed project will have an adverse effect on State Site #50-80-05-5509. As mitigation for proposed impacts to Site 5509, USAG-HI will complete Historic American Engineering Record (HAER) documentation of all architectural elements of the site, which will be damaged or covered up. HAER documentation of State Site #50-80-05-5509 will mitigate the project impacts to "no adverse effect" on Historic Properties. We ask for your concurrence with our determination of effect.

We have also consulted with the Advisory Council on Historic Preservation, the Office of Hawaiian Affairs, Hui Malama I Na Kupuna O Hawaii Nei, the Association of Hawaiian Civic Clubs, and the Historic Hawaii Foundation on this matter.

If you have any questions about this project please contact Dr. Laurie Lucking, Cultural Resources Manager, USAG-HI at (808) 656-2878 ext. 1052, (808) 656-1039 (fax), (luckingl@schofield.army.mil).

References:

Robins, Jennifer J. and Robert L. Spear
2002 *Cultural Resources Inventory Survey and Limited Testing, Phase II, of the U.S. Army Schofield Barracks Training Areas for the U.S. Army Garrison Hawaii Ecosystem Management Program, Island of O`ahu, Hawaii,* Final Report Prepared for the U.S. Army Corps of Engineers, P.O.D, Scientific Consultant Services/Cultural Resource Management Services, Honolulu, Hawaii.

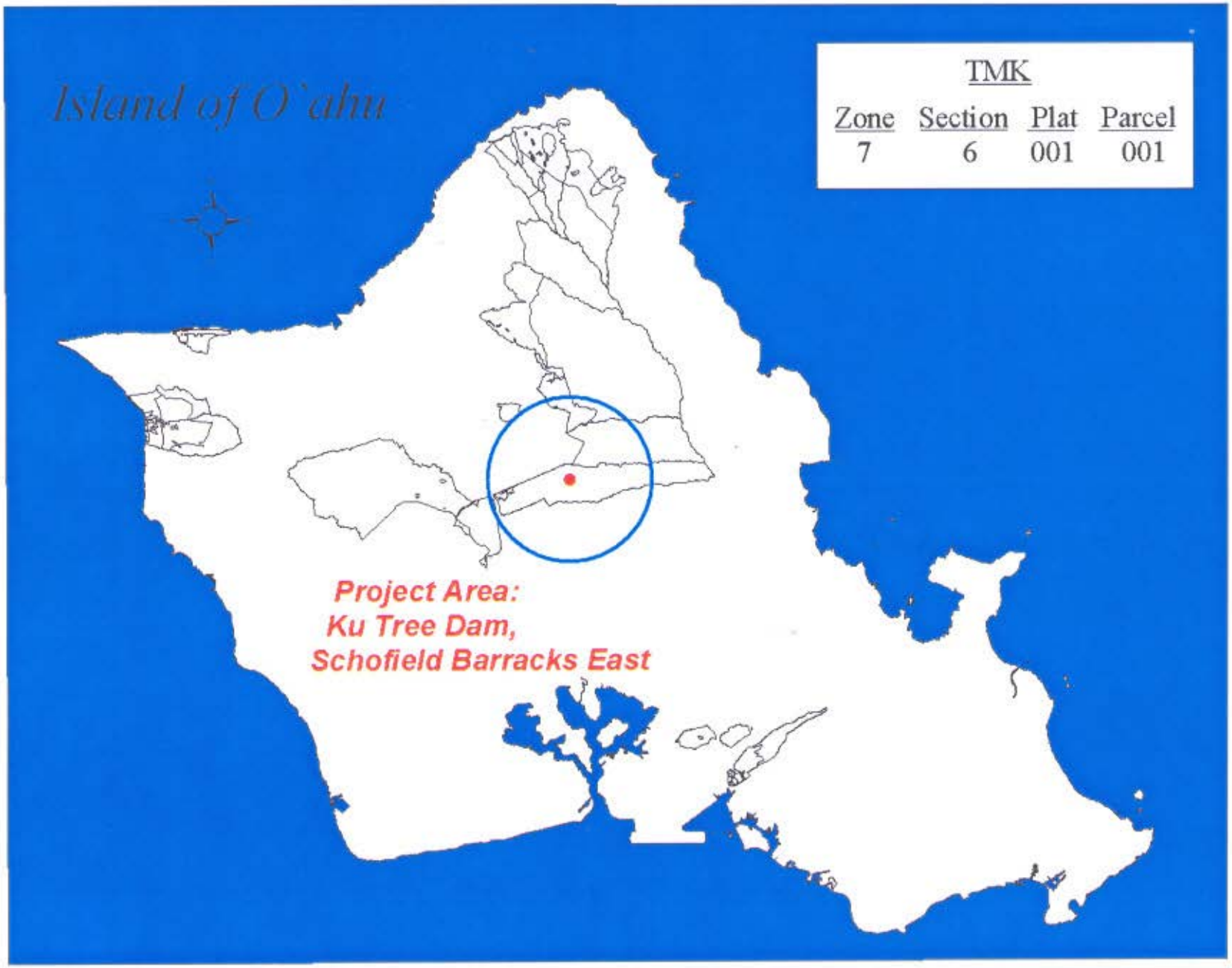
Robins, Jennifer J. and Robert L. Spear
1997 *Cultural Resources Inventory survey and Limited Testing, Phase I, of the Schofield Barracks Training Areas for the Preparation of a Cultural Resource Management Plan for U.S. Army Training Ranges and Areas, O`ahu Island, Hawaii (TMK 7-6-01 and 7-7-01)* [in Two Volumes], Draft Final Report Prepared for the U.S. Army Corps of Engineers, P.O.D, Scientific Consultant Services/Cultural Resource Management Services, Honolulu, Hawaii.

Sincerely,

Floyd A. Quintana
Colonel, US Army
Director of Public Works

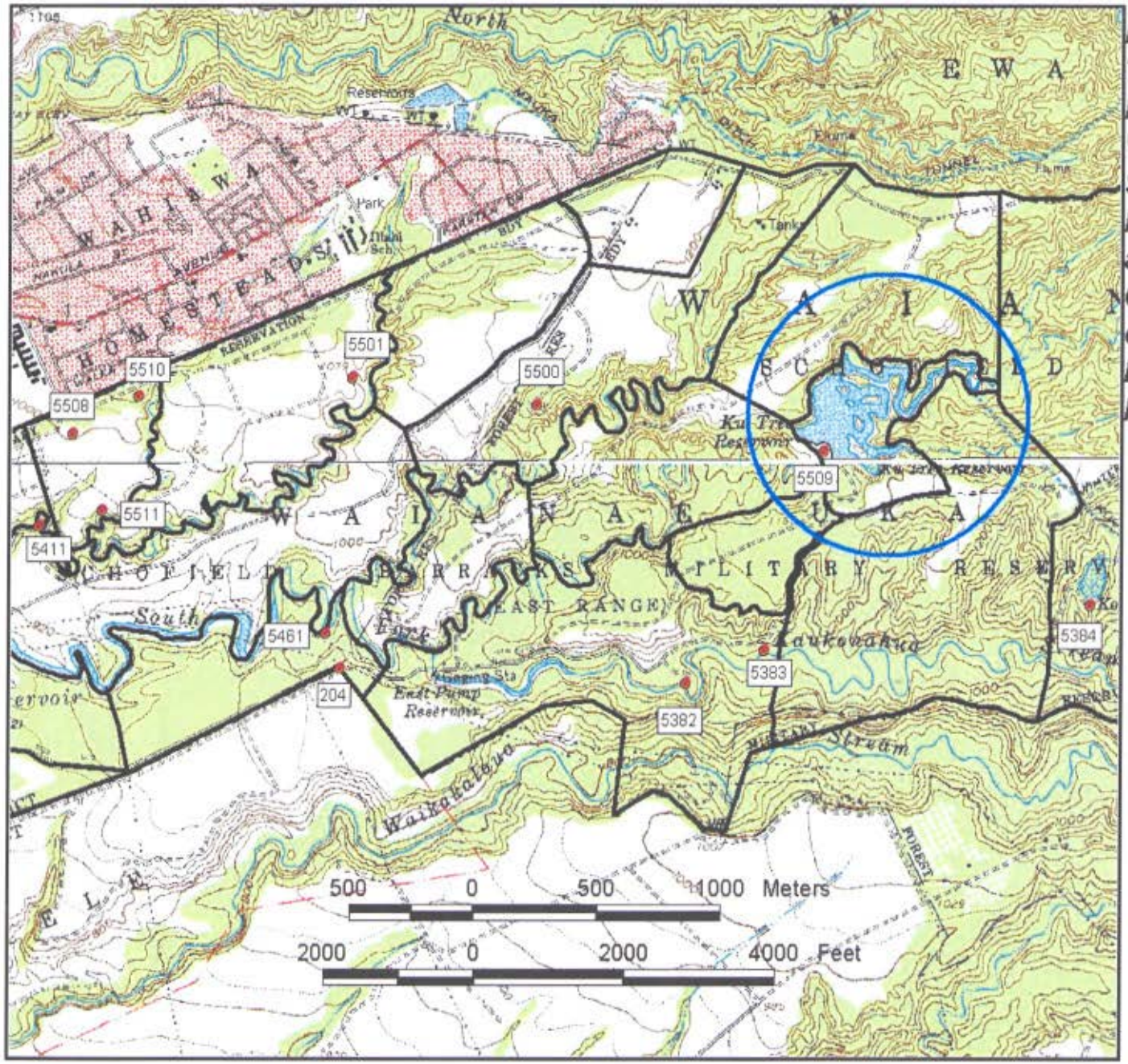
Enclosures (4)

ENCLOSURE 2
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)



Enclosure 1

ENCLOSURE 2
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)



Portions of USGS 7.5 Minute Series Hauula and Waipahu Quads, Showing Area of Potential Effect and Known Cultural Resources on Schofield Barracks East Range, Oahu

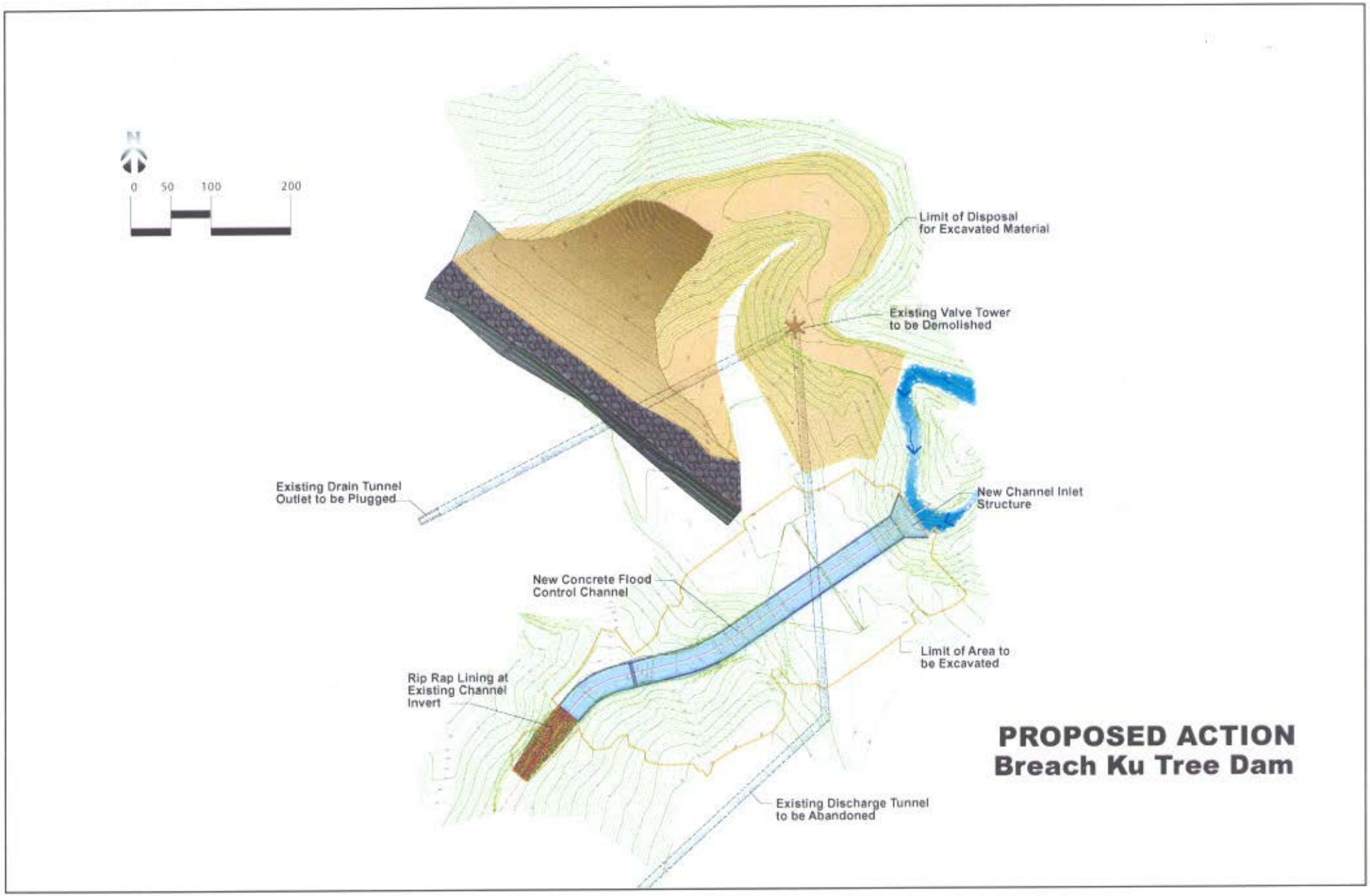
Scale 1:20,000

Legend

- APE
- Cultural Site

CEPOH-EC-E
March 2004

ENCLOSURE 2
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)



Enclosure 3

CEPOH-EC-E 21 June 2004

MEMORANDUM FOR RECORD

SUBJECT: Tour of the Ku Tree Reservoir and Dam for National Historic Preservation Act (NHPA) Section 106 Consultation, Schofield Barracks East Range (SBE), Island of Oahu, Hawaii.

1. Loren Zulick, Archaeologist, US Army Corps of Engineers (USACE), performed a tour of the Ku Tree Reservoir and Dam in SBE on 9 June 2004 (see Figures 1 and 2). He was accompanied by Craig Ueda, Program Manager, USACE, and Susan Tasaki, Historic Architect, State Historic Preservation Division (SHPD), Department of Land and Natural Resources (DLNR).

2. This tour was performed to familiarize the State Historic Preservation Office (SHPO) representative and the author with the proposed plan to breach Ku Tree Dam (see Figures 3 and 4). Management of Ku Tree Dam is needed to prevent dam failure and possible environmental impacts associated with such an event. The management plan involves breaching the dam by excavating a 400 foot long channel through the natural hillside on the southeast side of the dam. The new channel will be concrete lined and have a bottom width of approximately 30 feet. The proposed channel will be tied to the existing discharge end of the spillway and stilling basin (see Figures 5 through 7). Excavated material will be placed along the upstream face of the existing dam (see Figures 8 and 9). It is proposed that the existing tower will be demolished and buried beneath the waste fill (see Figure 10). The existing drain tunnel will be permanently plugged.

3. The group entered the project area at a bridge that extended over the existing concrete spillway (see Figure 11). The tour continued to the extant posts and railings of the old suspension bridge that led to the valve tower (see Figure 12). The group then walked down a slope to view the valve tower within the reservoir (see Figure 13). Finally, the existing earth-filled dam was examined. The plan proposes disposing of material excavated from the new concrete flood control channel behind (on the upstream side of) the earth-filled dam.

4. The SHPO representative offered the following NHPA compliance recommendations for the Ku Tree Dam project: Historic American Engineering Record (HAER) documentation of all elements of the dam which will be demolished or covered up.

Loren Zulick
Archaeologist, CEPOH-EC-E

ENCLOSURE 2
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)

PHONE (808) 594-1888

FAX (808) 594-1865

Copies to
COL Quintana
→ Environmental
Utilities

RECEIVED 9/21/19

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD04/1272 B

September 2, 2004

Floyd A. Quintana
Colonel, U.S. Army
Director of Public Works
Headquarters, U.S. Army Garrison, Hawai'i
Schofield Barracks, HI 96857-5000

RE: Request for Section 106 Consultation for a Breach of Ku Tree Dam, East Range, Schofield Barracks, O'ahu

Dear Floyd Quintana,

The Office of Hawaiian Affairs (OHA) is in receipt of your June 30, 2004, request for comments on the above project, which includes excavating a 400-foot-long channel through the natural hillside to provide Standard Project Flood protection for the unnamed stream through Ku Tree Dam. OHA apologizes for the delayed response and offers the following comments.

Tom Lenchanko – cultural consultant for the Wahiawa area, representative of the Wahiawa Neighborhood Board, and Kahu of Kukaniloko – told OHA staff that he was part of the June site visit, which was appreciated. He had some questions and concerns that OHA staff echoes.

We are concerned about impacts of the proposed action on the area's water quality. Because this is an ideal opportunity to re-establish the native freshwater habitat of the area and to flush out this waterway, we also wonder if there is a way to avoid lining the channel with cement, which does not support the reintroduction of native species into the stream.

OHA is also concerned about the proposal to bury the demolished remains of the tower beneath waste fill. Is there not a better place to dispose of that waste?

Please be sure to send a copy of the forthcoming Draft Environmental Assessment to:

Tom Lenchanko
Kahu of Kukaniloko
931 Uakanikoo St.
Wahiawa, HI 96786

Thank you for the opportunity to comment. If you have further questions, please contact Heidi Guth at 594-1962 or e-mail her at heidig@oha.org.

Sincerely,

Clyde W. Nāmu'o
Administrator

CC: Glenn T. Kimura, President
Kimura International, Inc.
1600 Kapi'olani Blvd, Suite 1610
Honolulu, HI 96814

Tom Lenchanko
Kahu of Kukaniloko
931 Uakanikoo St.
Wahiawa, HI 96786

ENCLOSURE 2
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 22, 2008

Colonel Floyd A. Quintana
Director of Public Works, U.S. Army
Headquarters, United States Army Garrison, Hawaii
Schofield Barracks, Hawaii 96857-5000

LOG NO: 2007.4028
DOC NO: 0801ST09
Architecture
Archaeology

Dear Colonel Quintana:

SUBJECT: **Section 106 (NHPA) Review**
Schofield Barracks East Range (SBE) – Breaching of the Ku Tree Dam
U.S. Army Garrison Hawaii (USAG-HI), Schofield Barracks, Island of Oahu, Hawai`i
TMK: (1) 7-6-001:001

Thank you for the submittal regarding breaching of the Ku Tree Dam located along the eastern periphery of the Schofield Plateau, Schofield Barracks East Range (SBE) on the Island of Oahu. A channel will be excavated through the hillside, tying the existing discharge end of the spillway and stilling basin. An existing tower will be demolished and buried under the waste fill. The existing drain tunnel near the inlet and a part of the existing discharge tunnel that is located under the new channel will be permanently plugged. A second plug will be installed near the drain tunnel's outlet and a small-diameter drain will allow water to seep from the encased tunnel. An archaeology report by Robins *et al* (2002) recommended that the Ku Tree Reservoir, earthen dam, tower, footbridge, and concrete spill (State Site #50-80-05-5509) are eligible for the National Register of Historic Places under criterion "D."

Architecture Concerns
Thank you for the site visit (7/9/04) by SHPD (Susan Tasaki) with Army (Loren Zulick, Craig Ueda) staff. The structures were built in 1925 and are therefore eligible for listing. However due to their dilapidated condition, they have lost their historic integrity. Therefore, we believe that the determination for the architecture concerns of the proposed project is "**no adverse effect.**" Army staff agreed to SHPD's request for documentation of the Dam and its components meeting Historic American Engineering Record (HAER) standards for our records.

Archaeology Concerns
The area has been previously disturbed and a great deal of fill was introduced to construct the earthen dam and therefore is unlikely to retain cultural deposits. However, in the event that historic resources (cultural deposits, historic artifacts, etc.), including human remains, are uncovered during the routine construction activities, all work in the vicinity of the find must stop, the find needs to be protected from additional disturbance, and the State Historic Preservation Division must be contacted immediately at (808) 692-8015.

Thank you for the opportunity to comment. Should you have any questions regarding architecture concerns, please call Susan Tasaki and regarding archaeology concerns, please call Lauren Morawski at (808) 692-8015.

Sincerely,

Nancy A. McMahon
Archaeology and Historic Preservation Manager

ENCLOSURE 3
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Wai'anae Ahupua'a, Wai'anae Moku, O'ahu (TMK: 7-6-001:001)

SCHOFIELD BARRACKS MILITARY RESERVATION, **HAER No. HI-81**
KU TREE RESERVOIR
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
1849 C Street, NW
Washington, D.C.

HISTORIC AMERICAN ENGINEERING RECORD

SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR

HAER No. HI-81

Location:	Kalakoa Stream (Tributary to the South Fork of Kaukonahua Stream) East Range, Schofield Barracks Military Reservation Wahiawa Vicinity City and County of Honolulu Hawaii USGS 7.5 minute series topographic map, Waipahu, HI 1998 Universal Transverse Mercator (UTM) coordinates: 1. 04.606000.2377830 3. 04.605440.2377300 2. 04.606000.2377300 4. 04.605440.2377830
Date of Construction:	1922-1925
Engineers & Builders:	Office of the Quartermaster General and Office of Chief of the Fourth Construction District
Present Owner:	U.S. Army
Present Occupant:	U.S. Army (training area)
Present Use:	Reservoir drained and abandoned.
Significance:	The Ku Tree Reservoir is associated with the history of water infrastructure development on Oahu. Also, from its opening in 1925 until 1938 it served as the primary source of water for Schofield Barracks Military Reservation. Thus, the reservoir is historically significant for its associations with the development and expansion of this Army post.
Report Prepared by:	Don J. Hibbard, Ph.D., Architectural Historian as subcontractor to and with assistance from Mason Architects, Inc. 119 Merchant Street, Suite 501 Honolulu, HI 96813
Date:	June 2008

GENERAL DESCRIPTION AND LOCATION

The Ku Tree Reservoir is a complex with a number of man-made components: hydraulic earth-fill dam, valve tower, valve tower foot bridge, drain tunnel, discharge tunnel, portal number 6, spillway, and spillway foot bridge. The dam, valve tower, valve tower bridge, and spillway are individually addressed in the following reports (HAER No. HI-81-A, 81-B, 81-C, and 81-D). The drain and discharge tunnels and portal number 6 are covered in the report on the valve tower (HAER No. HI-81-B), and the spillway bridge is discussed in the spillway report (HAER No. HI-81-D). Other structures associated with the water supply for Schofield Barracks Military Reservation (the Canon and Koolau Reservoirs, the intake tunnel, and the concrete tunnels, ditches, and siphons which transported water from Canon Reservoir to Ku Tree Reservoir) will not be affected by the breaching of the Ku Tree Reservoir, and therefore are not being documented.

Ku Tree Reservoir is located in Tax Map Key (TMK) parcel 7-6-001: 001. This is within the East Range of Schofield Barracks Military Reservation along the eastern extremity of the Schofield Plateau. No longer functioning as a reservoir, its earth-filled dam and other structures are approximately three miles east of the town of Wahiawa, at a point on the Kalakoa Stream approximately two miles above its confluence with the South Fork of Kaukonahua Stream. The approximate USGS coordinates of the dam are: 21 degrees, 30 minutes North latitude and 150 degrees, 59 minutes West longitude. The nearest public roadway is Kamehameha Highway (State Highway 99), which is three miles to the west of the reservoir. Access to the reservoir is via Higgins Road (also known as East Range Road), a military road which is paved up to a locked gate and then becomes an unpaved dirt road. Except for the dam, appurtenant structures, and access roads, no permanent man-made structures exist in close proximity to the reservoir site.

HISTORICAL CONTEXT

Early Development of Schofield Barracks

On August 12, 1898, Hawaii was formally annexed as a territory of the United States. Over the next six years the military analyzed and discussed the strategic role of the islands in the defense of America. Finally in 1905, in an address to Congress, President Theodore Roosevelt declared Hawaii to be, “the most important point in the Pacific to fortify in order to conserve the interests of this country” (Meeken, 1974: 3).

The logic behind this decision was based on the fact that the effective range of a naval fleet at that time was approximately 1,500 miles. Thus any planned invasion of the United States from across the Pacific would require Hawaii as a stepping stone. By controlling Hawaii, the United States safeguarded its west coast.

The naval fleet based at Pearl Harbor was conceived as the islands' first line of defense. To protect the harbor, a series of coastal defense forts were proposed, and to protect these coastal artillery units from a rear land attack, a mobile infantry, cavalry, and field artillery force was to be stationed on Oahu. As early as 1902 the Kahauiki Tract, the present site of Fort Shafter, and 14,400 acres at Waianae-Uka, the present site of Schofield Barracks, were considered as potential locations to establish the Army's command post on Oahu. The major argument in favor of the former Crown lands at Waianae-Uka was its strategic location, situated on a plateau between the island's two major mountain ranges, offering central access to the North Shore of Oahu as well as to Pearl Harbor Naval Base and Honolulu to the south. However, the Waianae-Uka area was initially passed over because it had no readily available water source, and Fort Shafter was developed as the primary installation for the U.S. Army in Hawaii (Alvarez, 1982: 50; and Addleman, 1939: 3).

Following the establishment of Fort Shafter, construction commenced on Schofield Barracks in late 1908. These lands had been obtained by the United States government when Hawaii was annexed as a territory, and in turn were transferred to the War Department for military use in 1899 through Executive Order Number G.O. 147. On December 4, 1908, Captain Joseph C. Castner, construction quartermaster, arrived on Oahu to begin building a temporary cantonment on the Waianae-Uka military reservation. Captain Castner, with the help of local laborers, constructed tents for the officers and men, followed by temporary wooden barracks. The cantonment was informally known as Castner Village among military personnel. People in Honolulu referred to it as the Leilehua Barracks after the Leilehua Plain on which it was located. On January 13, 1909 the Fifth Cavalry Regiment, 473 men strong, occupied the new installation. At this time the post included 248 temporary buildings and a sewer and water system. In 1910 the Fifth Cavalry was joined by the First Field Artillery Regiment, and the following year the Second Infantry Regiment was also assigned to Schofield Barracks.

In 1913 construction commenced on permanent buildings for the post, and the 25th Infantry Regiment augmented the troop level so that by 1914 6,000 men were stationed at Schofield Barracks, with the 1st Field Artillery, 1st Infantry Regiment, 25th Infantry Regiment, and 4th Cavalry all garrisoned there. World War I saw the post's troop level reduced to nearly nothing, but in the years between 1920-1940 the post greatly expanded in size and population. By 1927, a cavalry post initially composed of tents had developed into a thriving military complex, and by the early 1930s, Schofield had become the United States Army's largest installation; in 1938 over 14,000 troops were stationed there (Addleman, 1939: 6 & 43-44; *Infantry Journal*, 1927: 447-455; and *Honolulu Star Bulletin*, February 1, 1933: p. 6 and June 27, 1933: sec. 3, p. 2).

Schofield Barracks' Water Supply

Throughout the first twenty-nine years of Schofield Barracks' history, the infrastructure issues related to water remained critical problems. When building the post, Captain

Castner's laborers were quartered in Wahiawa for lack of water at Leilehua. In February 1909, Congress passed an act which granted Wahiawa Water Company a right of way through Schofield Barracks to construct reservoirs, canals, and their laterals upon the proviso that the company, "shall furnish free of charge all the water needed for post or encampment purposes" (U.S. Army, Office of the Judge Advocate General, 1916: 105). Until those improvements were built troops had to transport water from Fort Shafter to Schofield, and as late as December 22, 1912 the *Pacific Commercial Advertiser* (p. 5) reported that the "water question at Schofield Barracks is still unsolved and the lack of water there may prevent the stationing of further bodies of troops until the new reservoir and piping system are installed." In 1912 horses were still taken down to the Wahiawa reservoir for water.

Both the Koolau and Waianae mountains were exploited as sources of water for the new installation. The Army's real estate records, held by the Directorate of Public Works, and the drawings for Ku Tree Reservoir give some indications of the early history of water supply for Schofield Barracks. In early years water was pumped from three shallow tunnels in the Waianae mountains. In late 1913, Lord-Young Engineers were awarded a contract to construct a new reservoir system on the Koolau mountain-side of the Army post to supply the burgeoning military reservation. Over the next five years the Canon and Koolau Reservoirs were constructed, with Canon completed in April 1919, and Koolau in the following month. Canon Reservoir featured a 20-foot-high, 50-foot-long, stone intake dam on Kaukonahua Stream. The reservoir held 7,011,000 gallons, with tunnels and flumes transporting its waters to the Koolau Reservoir. The Koolau Reservoir had a capacity of 45,000,000 gallons, and its 70-foot-high, 270-foot-long earth-filled dam was reinforced by concrete retaining walls. A pipeline delivered water from the reservoir to Schofield Barracks (*Honolulu Advertiser*, December 23, 1952: 4).

Despite the construction of this reservoir system, water shortages continued to affect military activities at Schofield, and on March 12, 1921 a Post Water Conservation Officer was appointed to enforce restrictions on the use of water as rainfall had been light and the post's total storage capacity provided only for thirty days of consumption. To meet the barracks' increasing demand for water the Ku Tree Reservoir was constructed. In addition, tunnels and siphons were constructed to allow the new reservoir to directly access the Canon Reservoir's water supply.

Development of Ku Tree Reservoir

Described by the *Honolulu Advertiser* (September 14, 1924: 7) as, "one of the most important building projects in the history of the Hawaiian department of the army," the Ku Tree Reservoir was completed in 1925. Its dam is approximately 550' in length and 90' high, with a crest width of about 30'. With a capacity of almost 300 million gallons, Ku Tree Reservoir connected into the pipeline of the existing Koolau Reservoir, providing Schofield Barracks with total water storage of 340 million gallons.

Planning for the reservoir began in 1919 when two representatives of the construction service, attached to the Quartermaster General in Washington D.C., visited Hawaii to make a site inspection. They returned to the nation's capital and drew the plans for the new structure with the aid of members of the construction service stationed in the islands *(Honolulu Advertiser,* September 14, 1924: 7). [The names of the engineers or designers are not known, but the initials, under "Drawn by", on the 1919 drawings are W.W.B., while those on most of the 1923 and 1924 drawings are G.N. All the drawings are shown in the title block as being issued in Honolulu, with four of the sheets from the Office of the Constructing Quartermaster, but the majority from the Office of the Chief of the Fourth Construction District.] In designing the reservoir, the dam was advantageously sited at a narrow opening in the gulch, with four site alternatives considered. In 1921 Congress appropriated the necessary funds to construct the reservoir. The reservoir was planned and built by the construction service of the Quartermaster Corps, which had the responsibility for all army construction projects with the exception of coastal defense systems, which fell under the domain of the Army Corps of Engineers. Because of the distance between Hawaii and Washington, D.C., the chief of the Fourth Construction District in Honolulu was responsible for overseeing the Ku Tree Reservoir project.

Construction of the reservoir commenced in October 1922, and by August 1924 the reinforced concrete foundation for the dam had been laid, the redwood core wall was in place, and 105,000 of the 175,000 cubic yards of earth had been placed on the embankment walls. Historic photos show that a combination of man-, animal-, and machine-power was used in the construction efforts. The dirt for the dam was set in place hydraulically. In order to transport the dirt to the site, a 200-gallon-per-minute pumping plant was constructed. Water, obtained from the stream through a diversion tunnel, was pumped to the top of a hill north of the dam. The hill was comprised of a red-and-yellow-colored volcanic soil of a clayey nature. The soil was first loosened by dynamite and black powder, and then carried off to the dam site by the pumped water. The water carried the large and fine particles of soil via a flume to the dam site where appropriately placed lateral flumes deposited the mixture to make the embankments. In the early stage of the project, it was discovered the soil was of such a consistency that the rim would not hold itself. As a result a wire mesh was used to retain the large particles until they were sufficiently hard to hold themselves. The metal screens were then removed and lifted to a higher level (*Honolulu Advertiser*, February 21, 1925: 1).

The construction of the reinforced-concrete elements of the reservoir (valve tower, which was over one hundred feet high, cutoff wall, and spillway) presented another problem, as all the materials for their construction had to be brought in to this wilderness location and prepared on site. The reservoir was completed on February 21, 1925. The total cost of the reservoir was $498,079.78 (Directorate of Public Works, and *Honolulu Advertiser*, February 21, 1925: 1).

Abandonment

Although the Ku Tree Reservoir greatly increased Schofield Barracks' water supply, the military reservation continued to face threats of water shortage. In times of drought, the reservoir dried up. In May 1926, the water supply fell below what was deemed safe for fire protection, forcing the Army to move almost all the troops from Schofield Barracks to other camps. A month later, following a period of heavy rains, the troops moved back. Because of the water situation, off-base summer maneuvers were often scheduled. Restrictions on water use were again put in effect in February 1934, because of a dwindling supply. In addition to Ku Tree Reservoir's inability to serve as a stable and sufficient source of water, its quality was often in doubt and the water was heavily chlorinated.

In order to solve the need for additional water, Harold T. Stearns, a geologist with the U.S. Geological Survey, in September 1933 suggested to Major General B. H. Wells that the Army consider drilling an artesian well equipped with an air-lift pump. After three years of discussions and investigations, in 1936 the Army Corps of Engineers commenced work on a 1,700-foot-long inclined shaft, located outside the gate at Wheeler Air Field, in order to develop artesian wells to provide Schofield Barracks with water. At the end of the shaft, pump rooms were carved out of the rock (Stearns, 1936). In 1938 the underground engine room, electric pumps, and piping needed to bring water to Schofield Barracks was completed and the new water source inaugurated (U.S. Army Museum of Hawaii, n.d.). Schofield still relies on this artesian well today.

After the Ku Tree Reservoir was abandoned as a source of domestic water, it continued to be used for irrigation purposes, with its waters, as well as those in Canon and Koolau Reservoirs, held in reserve. The reservoir was kept operational into the 1970s, when the Army considered using it for recreational fishing. There was a record of draining the reservoir in 1975 to repair service tunnels or gates (C-E Maguire, Inc. 1978: 26-27). Soon thereafter, events on the mainland affected the decisions about the continued use and repair of this and other dams.

Following the disastrous failure in 1976 of the Teton Dam in Idaho, which resulted in eleven persons losing their lives and over $400 million in property damage, President Carter issued an April 23, 1977 directive requiring all federal agencies with dam construction responsibilities to review their dam building practices. This directive and subsequent laws modified the design, construction, and operation of federally controlled dams. In 1978 the Ku Tree dam was determined to be unsafe following an inspection under the National Dam Safety Program. The Army recognized they had to take measures to appropriately manage Ku Tree Dam to prevent dam failure and possible environmental impacts associated with such an event. In 1983 they secured the services of Walter Lum Associates, Inc. to inspect and make a structural evaluation of concrete, reinforced concrete, and metal appurtenant structures associated with the reservoir and make repair recommendations to extend the life of the facility for at least twenty-five years. The water in the reservoir was completely drawn down and emptied in order to facilitate the study of the structures, and the reservoir has remained empty since that time.

SOURCES

Original 1920s drawings for Ku Tree Reservoir, Job No. S3603, are digitally archived at the Directorate of Public Works, U.S. Army Garrison, Hawaii. There is also one 1943 drawing of the water system, showing the Canon, Koolau, and Ku Tree Reservoirs.

Doc. Number	Title & Sheet #	Date	Office in Title Block	Drawn by	Traced by
S3603001	Ku Tree and Koolau Reservoirs Sites with Connecting Tunnels… Sheet 1	July 1923	Constructing Quartermaster	G.H.E.	G.H.E.
S3603002	Contour Map [upstream portion] Sheet 2	May 1919	Constructing Quartermaster	W.W.B.	S.S.
S3603003	Contour Map [showing dam area] Sheet 3 Alt dam sites	May 1919	Constructing Quartermaster	W.W.B.	S.S.
S3603004	Plan of Dam Sheet 4	June 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603005	Concrete Cutoff Wall & R.W. Core Wall Sheet 5	Oct. 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603006	General Plan, Spillway Sheet 6	Nov. 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603008	Lower Half of Spillway Sheet 8	Nov. 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603011	Valve Tower Elevation and Section Sheet 11	Sept. 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603013	Valve Tower Details [Elev. 999'] Sheet 13	June 1924	Chief of the Fourth Construction District	G.N.	F.L.
S3603014	Valve Tower Details [Elev. 996'] Sheet 14	June 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603015	Valve Tower Details [Elev. 1030'] Sheet 15	Oct. 1924	Chief of the Fourth Construction District	G.N.	F.L.
S3603016	Valve Tower Details [Elev. 1030' to Top] Sheet 16	July 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603017	Valve Tower Operating Floor Detail Sheet 17	Oct. 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603018	Valve Tower - Details Sheet 18	Oct. 1924	Chief of the Fourth Construction District	G.N.	F.L.
S3603019	Valve Tower Details Sheet 19	Mar. 1923	Chief of the Fourth Construction District	B.H.	B.H.

S3603020	Valve Tower Details of Grizzly Sheet 20	Nov. 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603021	Valve Tower Gauge Sheet 21	June 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603022	Valve Tower Platforms & Ladder Sheet 22	Sept. 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603023	Valve Tower, Reinf. Steel Details Sheet 23	July 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603024	Valve Tower Reinf, Steel Schedule Sheet 24	Oct. 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603025	Valve Tower Steel Bending Diagram Sheet 25	Oct. 1924	Chief of the Fourth Construction District	G.N.	L.T.
S3603026	[Valve Tower] Thimbles for Sluice Gates Sheet 26	Mar. 1923	Constructing Quartermaster	Harrison	
S3603027	Valve Tower C.I. Thimbles and Screens, Inlet Gate Sheet 27	Nov. 1923	Constructing Quartermaster	G.N.	G.N.
S3603028	Valve Tower Gates Sheet 28	Dec. 1923	Constructing Quartermaster	G.N.	G.N.
S3603029	Suspension Bridge to Valve Tower Sheet 29	June 1924	Chief of the Fourth Construction District	W.F.J.	W.F.J.
S3603030	Suspension Bridge, Approach Sheet 30	July 1924	Chief of the Fourth Construction District	W.F.J.	W.F.J.
S3603031	Suspension Bridge, Details Sheet 31	June 1924	Chief of the Fourth Construction District	W.F.J.	W.F.J.
S3603032	Suspension Bridge, Steel Details Sheet 32	Oct. 1924	Chief of the Fourth Construction District	G.N.	G.N.
S3603033	Ku Tree Conduits, Sheet 33	Feb. 1923	Constructing Quartermaster	Johnson	Johnson
F132073001	Expansion of Ku Tree – Koolau Water System	Dec. 1943	U.S. Engineer Office	(Designed) A.C.W.	(Drawn) G.A.R.

Note: Sheets 7, 9, 10, and 12 are not included in the digitized database of plans and drawings for this Job at the Directorate of Public Works.

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PROJECT INFORMATION

The following documentation was prepared under a larger contract for an Environmental Assessment (EA) to Breach Ku Tree Dam. The purpose of this documentation was to historically record the architectural elements of Ku Tree Reservoir. The Ku Tree Reservoir / Dam is located within the East Range of Schofield Barracks, along the Kalakoa Stream which feeds into the South Fork of the Kaukonahua Stream. The U.S. Army proposes to breach the dam by excavating a 400-foot-long channel through the natural hillside on the southeast side of the dam, in the area where the spillway is now located. The new channel will be concrete lined and have a bottom width of approximately 30 feet. The proposed channel will be tied to the existing discharge end of the spillway and stilling basin. Excavated material will be placed along the upstream face of the existing dam. It is proposed that the existing valve tower will be demolished and buried beneath the waste fill. The existing drain tunnel under the dam will be permanently plugged. The Army and the Hawaii State Historic Preservation Division (SHPD) have agreed that the reservoir structures are eligible for the National Register. The SHPD noted that "due to their dilapidated condition, they have lost their historic integrity. Therefore, we believe that the determination for the architecture concerns of the proposed project is 'no adverse effect' " (McMahon 2008). The Army agreed to the SHPD's request for documentation meeting Historic American Engineering Record (HAER) standards.

The project manager for the HAER documentation was Ann Yoklavich of Mason Architects, Inc. Don J. Hibbard, Ph.D. was the researcher and author of the reports, prepared as a subcontractor to Mason Architects. Both are architectural historians who meet the Secretary of the Interior's Professional Qualifications in architectural history. Carol Stimson of Mason Architects assisted with the editing and production of the reports. The large-format photographs were taken by David Franzen of Franzen Photography. Clearing of vegetation for the photography was done by the crew of Glad's Landscaping & Tree Trimming. Administrative coordination and the location map were provided by Wil Chee - Planning, Inc.

Figure 1: Location map.

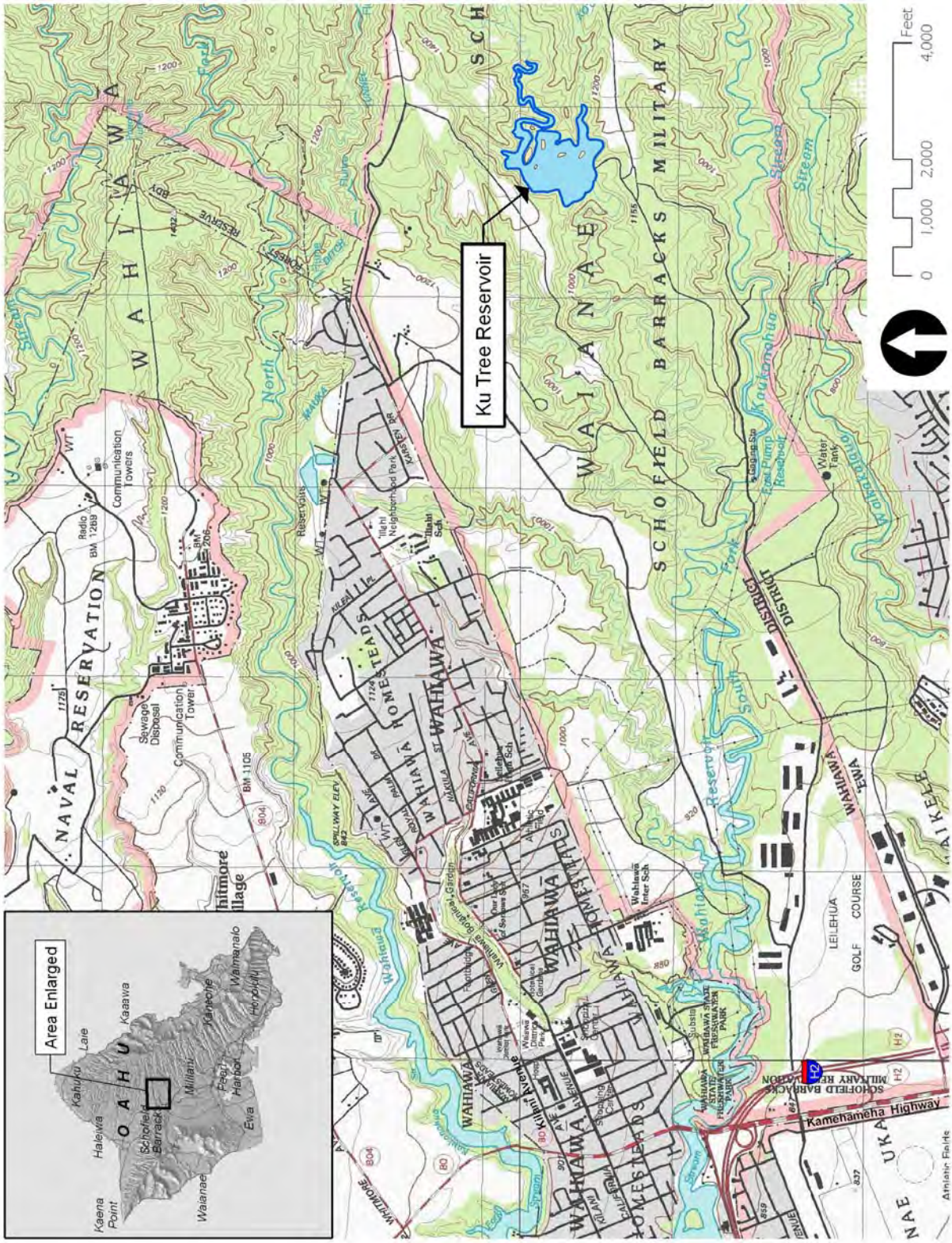

Figure 2: Plan of Dam, Ku Tree Reservoir. Job No. S3603, Sheet 4, dated July 1924.

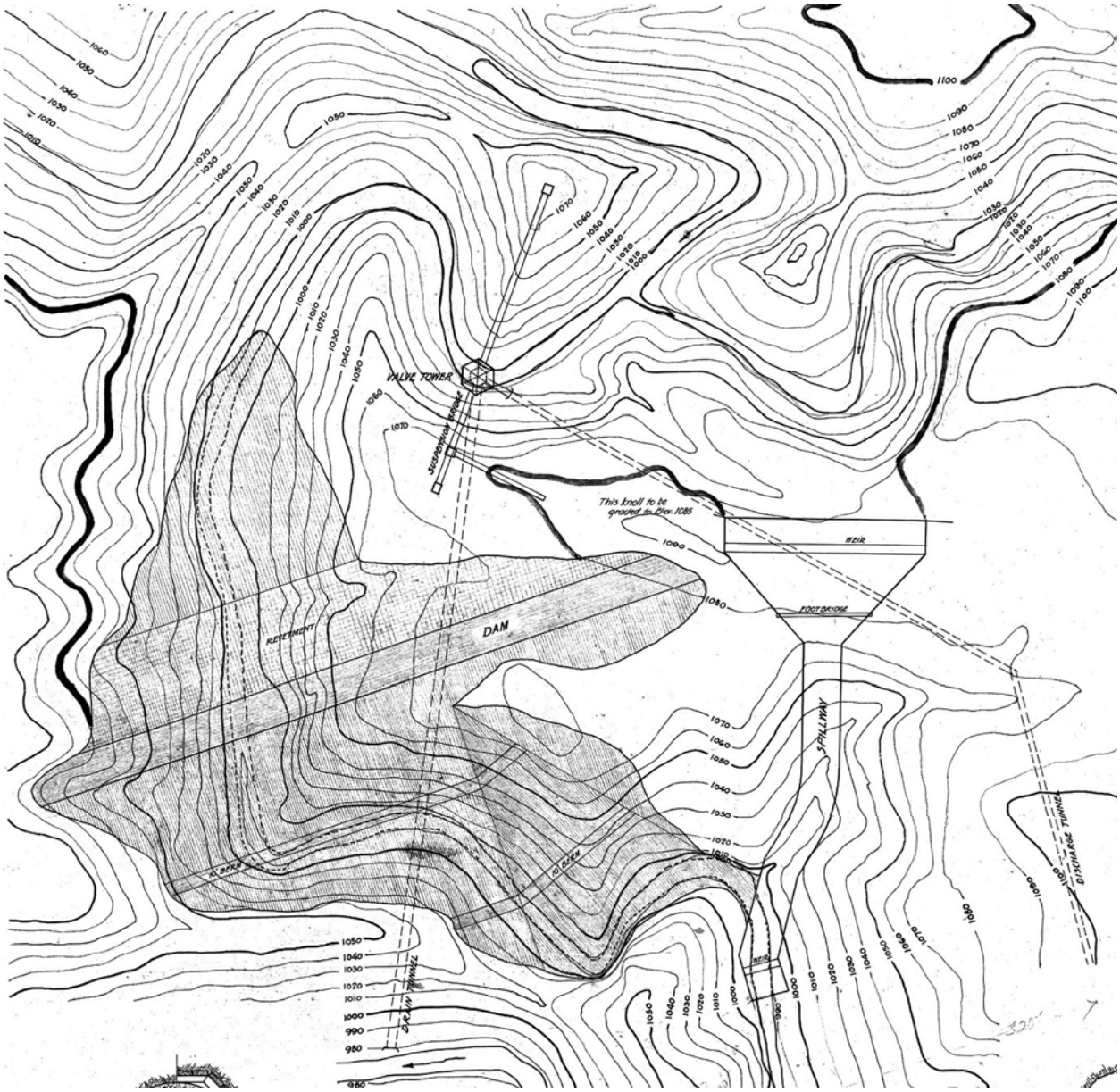

Figure 3: Schofield Barracks Water Supply, Ku Tree Reservoir Site with Connecting Tunnels & Pipelines. Job No. S3603, Sheet 1, dated July 15, 1929.

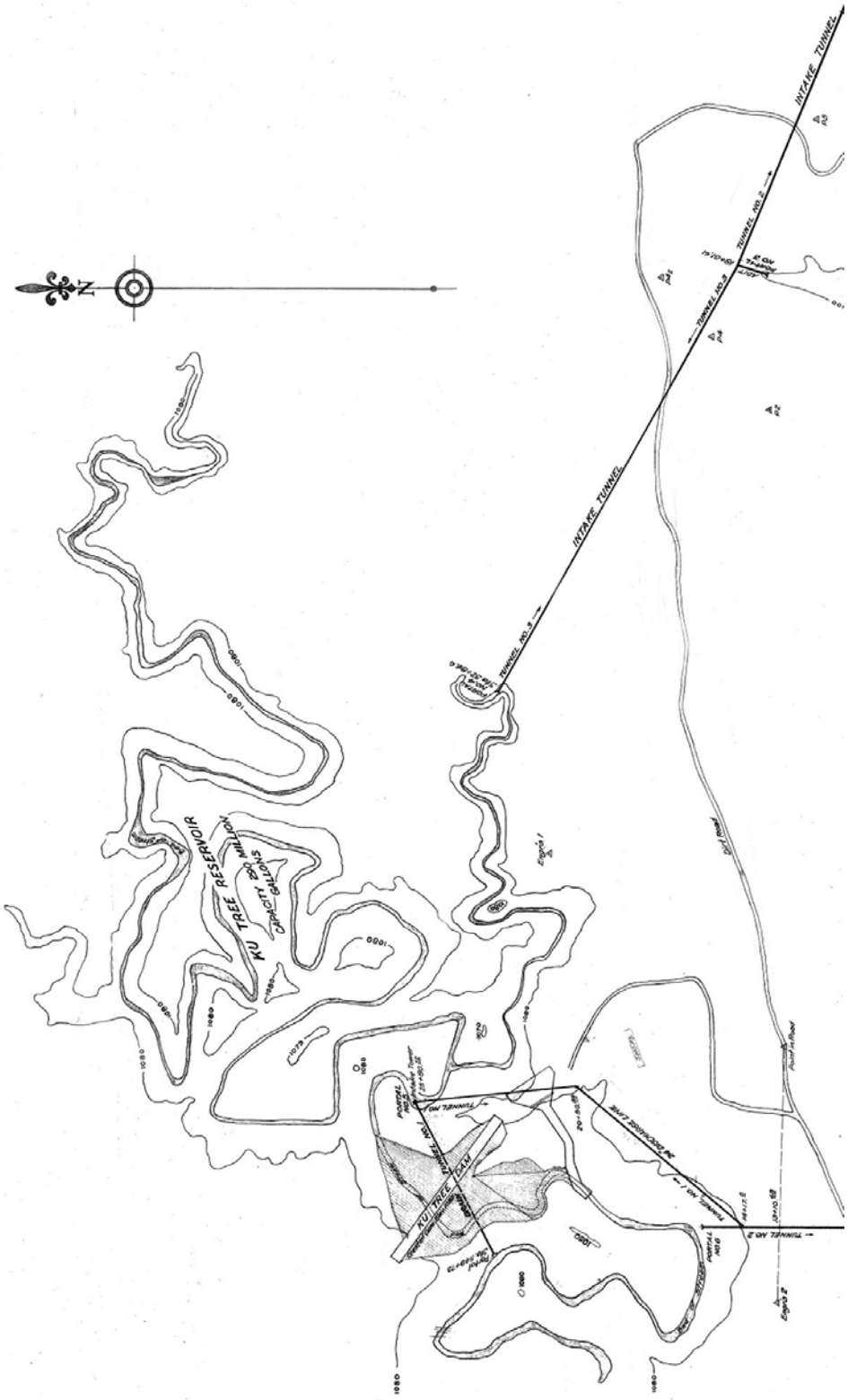

Figure 4: Ku Tree Dam (upper center) and Koolau Reservoir (lower center) on July 25, 1938. (National Archives II, Still Photo Section, photo order # 18-AA-51-37)

Figure 5: Starting point, Ku Tree Dam. (Tropic Lightning Museum, Schofield Barracks, Hawaii, Historical photograph 87.76.01-06)

Figure 6: Ku Tree Dam, c. 1923-25, under construction. (Tropic Lightning Museum, Schofield Barracks, Hawaii, Historical photograph 87.76.01-03)

Figure 7: Workers' camp, Ku Tree Dam, 1925. (Tropic Lightning Museum, Schofield Barracks, Hawaii, Historical photograph 87.76.01-21)

Figure 8: Dam with footbridge and valve house on tower in background. (U. S. Army Museum, Fort DeRussy, Hawaii, Historical photograph USAMH 6349)

SCHOFIELD BARRACKS MILITARY RESERVATION, **HAER No. HI-81-A**
KU TREE RESERVOIR, DAM
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
1849 C Street, NW
Washington, D.C.

HISTORIC AMERICAN ENGINEERING RECORD

SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR, DAM

HAER No. HI-81-A

Location:	Kalakoa Stream (Tributary to the South Fork of Kaukonahua Stream) East Range, Schofield Barracks Military Reservation Wahiawa Vicinity City and County of Honolulu Hawaii USGS 7.5 minute series topographic map, Waipahu, HI 1998 Universal Transverse Mercator (UTM) coordinates: 04.605640.2377530
Date of Construction:	1922-1925
Engineers & Builders:	Office of the Quartermaster General and Office of Chief of the Fourth Construction District
Present Owner:	U.S. Army
Present Occupant:	U.S. Army (training area)
Present Use:	Reservoir drained and abandoned, dam not in use.
Significance:	The Ku Tree Reservoir dam is significant as a major element of the Ku Tree Reservoir and as a good example of a hydraulic earth-fill dam constructed in Hawaii during the period 1900-1940. Designed to impound water for irrigation, domestic use, and other conservation purposes, the dam is typical of its period in its use of materials, method of construction, craftsmanship, and design.
Report Prepared by:	Don J. Hibbard, Ph.D. Architectural Historian as subcontractor to and with assistance from Mason Architects, Inc. 119 Merchant Street, Suite 501 Honolulu, HI 96813
Date:	June 2008

For additional information see the main report on the Ku Tree Reservoir (HAER No. HI-81), as well as the individual reports on the other related structures in this complex (HAER Nos. HI-81-B, HI-81-C, and HI-81-D).

DESCRIPTION

The Ku Tree Reservoir Dam is a hydraulic earth-fill structure. Its description is largely based on sheets 4 and 5 of the 1924 reservoir drawings. Its measurements are approximately 550' in length and 90' high, with a crest width of about 30'. It is oriented on a northwest-southeast axis, with the reservoir to the northeast. The upstream side of the dam has a three-to-one (ratio of the horizontal to vertical) slope with hand-placed stone rip-rap running from the embankment crest (elevation 1,085 feet) down to elevation 1,060. The downstream face of the dam also follows a three-to-one slope, with its originally grassed surface now overgrown with mature trees, shrubs, and staghorn fern. Ten-foot wide berms are situated on this face at the 1,055- and 1,025-foot elevations, but are somewhat difficult to discern today, due to the heavy overgrowth and erosion. The two faces of the dam contain approximately 175,000 cubic yards of earth. Both exterior surfaces are heavily overgrown, and the upstream rip-rap is no longer intact, although the materials are readily evident. Foxholes, used in combat training, have been dug into the dam in multiple locations.

The dam has homogenous embankments and a redwood diaphragm core wall. The core wall is composed of three four-inch layers of California redwood, one horizontal layer of 4” x 12” boards encased on either side by a vertical layer of 4” x 12” boards. The butt joints on the exterior layers are covered by waling, also consisting of horizontal 4” x 12” boards. The core wall is set in a reinforced-concrete cutoff wall. Sheet 5 shows that this was designed to be 3'-0" in width at its top, transitioning to 2'-6" in width at its bottom. The depth measurements of this cutoff wall vary, because the builders were instructed to excavate “to suitable bearing.” The cutoff wall was designed with a grooved top, into which the core wall was set and grouted in place. The cutoff wall ties into the hillsides at either end of the dam, and on the east side extends over to, and ties into, the spillway.

A concrete-lined, segmental-arched drain tunnel, measuring 6'-0" in height and width, penetrates the dam at its base, discharging drained waters from the valve tower to the downstream section of the original stream at the 980-foot elevation. The smooth face of the tunnel on the downstream side has the date 1923 imprinted above its segmental arched opening. The tunnel has approximately two feet of silt covering its floor.

The dam was designed to impound the waters of the Kalakoa Stream and store the waters from this stream and its tributaries, as well as the waters deriving from Canon Reservoir. At spillway crest the reservoir had a capacity of 293 million gallons, or 900 acre-feet, of water, and a surface area of approximately 32 acres. The basin behind the dam is irregular in shape, varying in width from 0.5 to 0.75 miles, and is approximately 1.5 miles in length. Its drainage area covers approximately 0.83 square miles, with

three tributaries feeding into the basin (U.S. Army Corps of Engineers, 1984: 1-3). The Ku Tree drainage basin lies entirely within military lands, originating on the precipitous leeward slopes of the Koolau Mountain range, with elevations ranging from 995' at the dam to 1,747'.

The dam retains its integrity, and there have been no alterations or additions made to it. However, the embankments have not been maintained and are now overgrown, and the upstream rip-rap facing has been altered by military exercises and vegetation growth.

HISTORICAL CONTEXT

Planning for the Ku Tree Reservoir began in 1919, following a decision to locate the dam at a narrow opening in a gulch, about 200 feet upstream of a protruding shoulder of the adjoining hill, which caused the Kalakoa Stream to make an almost-right-angle turn. Four site alternatives were considered: the selected site, one further downstream, and two further upstream. A table on Sheet 3 of the original drawings shows that selection considerations included the amount of material needed to construct the dam and the resulting capacity. The selected site apparently was one that was a compromise between the site that had greatest reservoir capacity and that which required the least amount of fill for the embankments.

In 1921 Congress appropriated the necessary funds to construct the reservoir. Construction started in October 1922. Because of the distance between Washington D.C. and Hawaii, construction and supervision of the dam was undertaken by the construction service of the Quartermaster Corps' Fourth Construction District, Honolulu. The final elevations and sections for the cutoff wall and redwood core were drawn in December 1923, and plans for the dam were drawn and traced in June and July of 1924, well after construction had started on the dam. These 1924 plans deviated very little from the 1919 conceptual-phase drawings. The principal changes involved the replacement of a proposed reinforced concrete revetment on the upstream side of the embankment with hand-placed rip-rap and the addition of two ten-foot wide berms on the downstream side of the dam.

The dam is a good example of a hydraulic earth-fill dam in Hawaii. There are 125 extant earth-embankment dams in Hawaii that are 25' or more in height or have an impounding capacity of 50 acre-feet or more. Of these, 107 were constructed between 1885-1940, with the overwhelming majority built by the sugar industry to irrigate their plantation fields. Earth-fill dams are the most commonly constructed dams, as they utilize materials in their natural state which require a minimum of processing. In addition the foundation requirements for earth-fill dams are less stringent than for concrete dams.

The Ku Tree Reservoir was one of seven earth-fill reservoirs in the state designed primarily to furnish water for domestic use. With its 90' height, the Ku Tree Reservoir

dam was the third tallest earth-fill dam constructed in the islands prior to World War II. Only the Alexander Dam (113', built 1930) and Puu Lua Dam (105', built 1925) on Kauai are higher. The Ku Tree Reservoir had a capacity of 293 million gallons, or 900 acre-feet, of water at spillway crest. Of the pre-World War II reservoirs, only the Nuuanu 4 (1910) and Lake Wilson (1906) reservoirs have a greater capacity on Oahu, and the only other reservoirs to retain more acre-feet are the Alexander (1930), Koloko (1890), and Kapaia (1910) reservoirs on Kauai (Division of Water and Land Development, 1992). As such the Ku Tree dam was one of the larger earth-fill dams constructed in Hawaii. However, a number of larger hydraulic earth-fill dams remain throughout the American west, most notably the Fort Peck Dam in Montana, which was constructed as a Works Progress Administration project by the Army Corps of Engineers between 1933-1940. Standing 250' in height and 10,578' in length, the Fort Peck Dam remains the largest hydraulic earth-fill dam in the United States (U.S. Army Corps of Engineers, Omaha District, 2008).

The Ku Tree dam's design and method of construction were typical of its time. It is classified as a diaphragm hydraulic earth-fill dam. As the classification indicates, the dam is composed of soil as its primary material, which was laid down in layers by the hydraulic method of construction, and uses a thin diaphragm of impermeable material, in this instance a redwood core wall, to form a water barrier.

The hydraulic method of dam construction was developed in the American West, having emerged out of the technologies of hydraulic mining. In order to employ this method, an abundant deposit of clayey soil had to exist in an area near the proposed dam site, and a sufficient supply of water, capable of generating five to ten cubic feet of water per second, had to be available. The water, pumped under pressure, would be used to erode the deposit of soil and then carry it by way of flumes to the dam construction site, where the suspended sediment would be laid down in courses with lateral flumes distributing the sluiced materials. Thus the material to construct the embankments of the dam could be transported to the dam site in a cheap and effective manner. A hose shooting ten cubic feet of water per second could remove and relocate approximately 2,000 to 4,000 cubic yards of soil in twenty four hours. This method offered a 20-25% savings over the ordinary method of construction, which used sweepers and carts. In the case of the Ku Tree dam, the builders found it more expedient to blast the red and yellow clayey volcanic soil loose with dynamite and black powder, prior to subjecting it to the water (*Honolulu Advertiser*, September 14, 1924: 7).

Anthony Chabot, a mining engineer, was the earliest person known to utilize this method of dam construction, having employed it to make additions to the Oakland Reservoirs in the 1870s. The Tyler, Texas reservoir dam (1894), designed by engineer J. M. Howells, is the earliest known dam to be constructed totally by this method. The prominent Los Angeles-based engineer James Dix Schuyler utilized this method in Hawaii when constructing the Waialua Plantation Reservoir in 1907, which is now known as Lake Wilson. With few exceptions, hydraulic earth-fill dams were not constructed after 1940, as they were supplanted by rolled-earth dams, which were

made possible by the development of larger, more economical earth-moving equipment. The present rolled-earth technique has proven to be not only more reasonable in price than hydraulic but also allows less seepage and provides a better structural performance. With the hydraulic method it was difficult to control the density of the placed materials. As hydraulic earth-fill dams' embankments tended to be loose in relative density, they have displayed a greater potential for slope movement during seismic events, which was vividly demonstrated in the 1971 San Fernando, California earthquake (ASCE Task Committee, 2000: II-10, Committee on the Safety of Existing Dams, 1983: 213-214; U.S. Department of Reclamation, 1977; and Smith, 1972).

The use of a redwood core wall in the Ku Tree dam was also typical of its time and place. As with the hydraulic method of construction, the redwood core wall in earth-fill dams was developed in the western United States, as redwood proved to be an inexpensive and durable core material, which when dampened expanded to prevent excessive seepage into the downstream embankment. It was used previously in Hawaii in the Nuuanu 4 Reservoir dam and also the dam for Waialua plantation.

The design of the dam was also typical of its period, closely following the recommended standards set forth in the civil engineer Edward Wegmann's book -- *Design and Construction of Dams*, which was first published in 1899, and was in its 7th edition in 1922. Wegmann recommended the crest of the dam should have a width of 10' to 30', and the Ku Tree dam's width at the crest is about 30'. Similarly, the embankments on each side have a 3:1 slope, while Wegmann recommended an upstream slope between 2:1 and 3:1, and a downstream slope of 1.5:1 to 2.5:1. He also indicated, for earth-fill dams of considerable height (60-100 feet), the downstream embankment should be broken by one or more berms placed about 30' apart vertically (Wegmann, 1907: 223). The Ku Tree dam has two ten-foot-wide berms, which are situated at the 1,055- and 1,025-foot elevations.

The dam's use of hand-placed rip-rap, a facing of randomly placed stone, on the upper 25' of its upstream side was typical for its period in terms of materials, craftsmanship, and method of construction. Hand-placed rip-rap proved to be the most economical and successful material to prevent erosion, scour, or sloughing of an embankment. It extended from the anticipated low-water line to the crest. Hand-placed rip-rap ideally utilized rectangular stones 15-24 inches thick placed on a 12-18 inch layer of broken, 2"- to 3"-diameter stones. Although the pattern of the stones has been disrupted by vegetation growth and other factors, the drawings clearly indicate hand-placed rock. The added effort of hand placement, as opposed to dumped rip-rap, is an indication of this period in the history of dam construction.

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PROJECT INFORMATION

See main report for Ku Tree Reservoir, HAER No. HI-81.

Figure 1: Section Thru Dam. Job No. S3603, Portion of Sheet 4, dated June 1924.

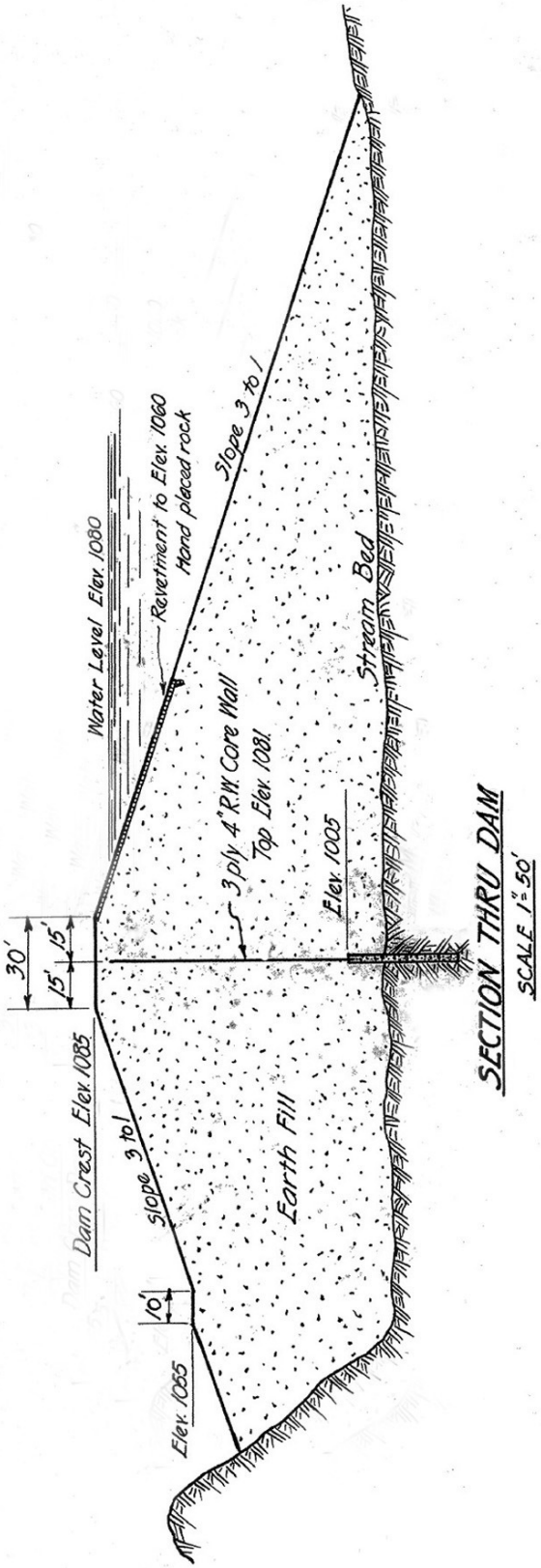


Figure 2: Details of Redwood Core Wall. Job No. S3603, Portion of Sheet 5, dated Dec. 29, 1923

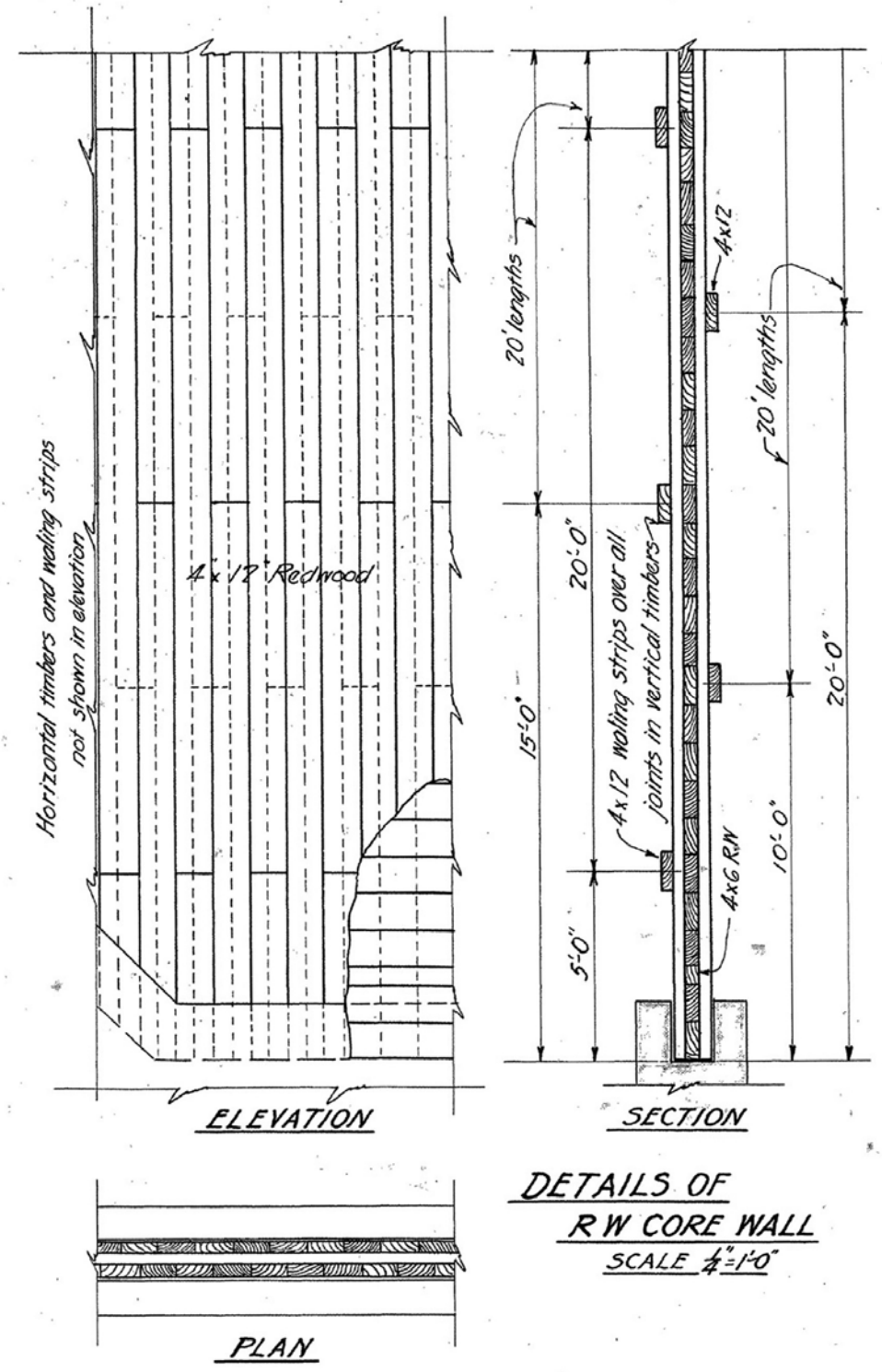


Figure 3: Ku Tree Dam, 1924. (Tropical Lightning Museum, Schofield Barracks, Hawaii, Historical photograph 87.76.01-29)

Figure 4: Ku Tree Reservoir, with stepped face of dam in foreground, Feb. 15, 1932. (National Archives II, Still Photo Section, photo order #18-AA-51-43)

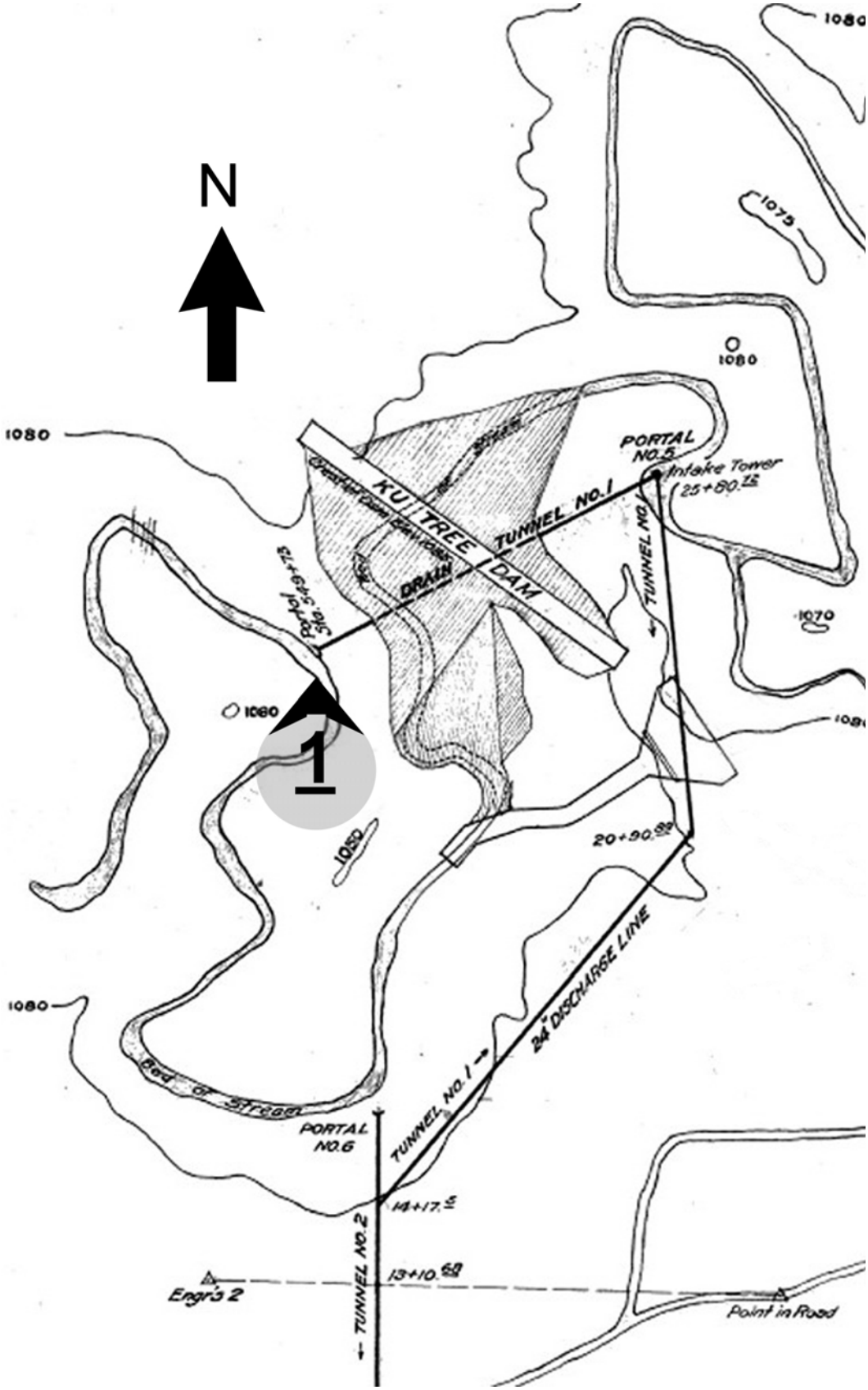
HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

SCHOFIELD BARRACKS MILITARY RESERVATION, HAER No. HI-81-A
KU TREE RESERVOIR, DAM
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

David Franzen, Photographer April 17, 2008

HI-81-A-1 DRAIN TUNNEL PORTAL. VIEW FACING NORTH.


N
1
1080
1075
1070
1050
KU TREE DAM
TUNNEL NO. 1
DRAIN
PORTAL NO. 5
Intake Tower
25+80.75
TUNNEL NO. 1
20+90.92
24" DISCHARGE LINE
Bed of Stream
PORTAL NO. 6
TUNNEL NO. 1
14+17.5
TUNNEL NO. 2
13+10.68
Engr's 2
Point in Road

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HAER No. HI-81-A-1

SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR, VALVE TOWER
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

HAER No. HI-81-B

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
1849 C Street, NW
Washington, D.C.

HISTORIC AMERICAN ENGINEERING RECORD
SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR, VALVE TOWER

HAER No. HI-81-B

Location:	Kalakoa Stream (Tributary to the South Fork of Kaukonahua Stream) Approximately 3 miles east of Wahiawa East Range, Schofield Barracks Military Reservation Wahiawa Vicinity City and County of Honolulu Hawaii USGS 7.5 minute series topographic map, Waipahu, HI 1998 Universal Transverse Mercator (UTM) coordinates: 04.605680.2377540
Date of Construction:	1922-1925
Engineers & Builders:	Office of the Quartermaster General and Office of Chief of the Fourth Construction District
Present Owner:	U.S. Army
Present Occupant:	U.S. Army (training area)
Present Use:	Reservoir drained and abandoned, valve tower's operating room not extant.
Significance**:**	The valve tower is significant as an element of the Ku Tree Reservoir and as a rare example of a masonry valve tower constructed in Hawaii in the 1920s. The structure is typical of its period in its use of materials, method of construction, craftsmanship, and design. Because of their relatively small scale, very few reservoirs in Hawaii employ valve towers. Thus, Ku Tree's tower is one of the few examples of this type of structure in the islands.
Report Prepared by:	Don J. Hibbard, Ph.D., Architectural Historian as subcontractor to and with assistance from Mason Architects, Inc. 119 Merchant Street, Suite 501 Honolulu, HI 96813
Date:	June 2008

For additional information see the main report on the Ku Tree Reservoir (HAER No. HI-81), as well as the individual reports on the other related structures in this complex (HAER Nos. HI-81-A, HI-81-C, and HI-81-D).

DESCRIPTION:

Valve towers are watertight, hollow, vertical masonry chambers, which allow water to be drawn from a reservoir. Typically located near the toe of the inner slope of a dam, a valve tower rises from the bottom of the reservoir, through the reservoir waters, to above the surface. An enclosed operating room is built on a platform at the top of the tower to protect the mechanisms that operate the various intake and discharge valves that regulate the flow of water out of the reservoir. A footbridge usually provides access to the tower from the shore. Almost half the sheets of the drawing set for the Ku Tree Reservoir are for the details of the valve tower.

The Ku Tree Reservoir's valve tower is hexagonal in plan and built of reinforced concrete. It is sited at a 52-degree angle from the axis of the dam, and about 260' from the dam crest along that line. At its base the width of the tower is 29'-5½" (measured between parallel faces) or 34'-0" (measured corner to corner). Its height is 102'-0", measured to its reinforced-concrete service platform. At the base, each face of the hexagonal tower is 17'-0" wide. The main shaft width is 13'-0" (measured between parallel faces) from elevation 1030' to the top, but the bottom 30'-0" of the main shaft has walls 2'-6" thick, while the wall thickness of the top 25'-0" is 2'-0", around a wider hexagonal well. Ribs, or buttresses, measuring 2'-0" thick, project approximately 2' from each of the six corners of the hexagonal shaft. The diameter of the tower (from elevation 1030' to the top), including ribs, is generally 20'-0". The ribs flare out at the top to create supporting brackets for the operating room platform. The ribs near the bottom, from elevation 1000' to 1030', taper from a projection of about 6' to the 2' dimension on the upper part of the tower. Additional tapered buttresses support the tower below elevation 1000'. A lateral face of one of the ribs on the tower’s east side features a gauge with numerals, each measuring 2'-0" high and 8" wide, incised in the concrete. Numbered in ten-foot increments with intervening one-foot hash marks, the gauge indicated the water level within the reservoir. The front face of another rib has 1¼"-diameter metal ladder rungs embedded in it, from the 993-foot elevation to the top.

The original drawings and historic photographs show that a wood-frame operating room, which is not extant, stood on top of the service platform, which measures 21'-6" between parallel sides. The operating room sheltered the controls for the nine sluice gates that managed the flow of water into and out of the tower. The hexagonal-plan operating room had a 1/1 double-hung sash window in each of its walls, and doorways on two sides (for access via boat or bridge). Photos in a 1983 report show that the wood-stud framing was exposed on the interior and the exterior had vertical tongue-and-groove siding with textured paint (Walter Lum Associates, Inc. 1983: A-3 & A-20). The structure was capped by a hipped hexagonal roof with overhanging eaves and

exposed rafter tails. At the center of the room a pipe railing surrounded a grate-covered well opening in the operating-room floor. The various valve and gate controls were located around the sides of the well.

This hexagonal-plan inner well measures 7'-0" (lower 30' of shaft) or 8'-0" (upper 25' of shaft) in width between parallel walls. Water used to flow from the reservoir into the tower's well through five 18" x 24" sluice gates. These gated intakes for the well are located on various exterior faces of the tower at invert elevations of 1065', 1050', 1035', 1020' and 1005'. Concrete service platforms, approximately 4' wide, are located above each sluice gate. Metal ladder rungs, 1¼"-diameter, imbedded in the walls of the well provided access to each platform. The rungs, especially near the top, have been compromised by rust and corrosion. The sluice gates could be manually operated, with vertical slide mechanisms, but these are missing or inoperable due to rust. Each gate had a protective trash screen.

Two tunnels connected to the base of the tower transported the water to desired locations on the downstream side of the dam. The drain tunnel returned waters from the reservoir back into the Kalakoa Stream on the downstream side of the dam. This tunnel still carries the flow of the stream under the dam embankment. The 6'-0" wide and equally high concrete-lined tunnel is approximately 515' long. The initial 15' of the drain tunnel (closest to the valve tower) has a gable-shaped ceiling which rises from straight walls 5'-0" high, while the ceiling of the remainder is segmental arched, springing from 4'-6"-high straight walls. The first 100' of the drain tunnel from the tower is sloped at approximately six percent, the following 160' at four percent, and the remainder of the tunnel at one percent (Walter Lum Associates, Inc., 1983, 17). The reinforced-concrete lining in the tunnel for the first 15' is 2'-0" thick, while the remainder is at least 6" thick. The drain tunnel runs under the dam discharging drained waters from the valve tower to the downstream section of the Kalakoa Stream at elevation 980'. The smooth concrete face of the tunnel on the downstream side has the date 1923 imprinted above its segmental-arched opening.

The discharge tunnel and its pipe took the reservoir waters to the end users. The partially lined discharge tunnel, measuring approximately 5' wide and a little more than 6' tall, holds a 24"-diameter cast-iron pipe. Its tunnel number 1 runs approximately 1300', with a portion going under the upper end of the spillway. The pipe in tunnel number 1 connected with a 20"-diameter cast-iron pipe that ran 1,600' in tunnel number 2 before joining with an 18"-diameter cast-iron pipe from the Koolau Reservoir, to feed a 24"-diameter cast-iron pipe that ran to urban core of Schofield Barracks.

Portal No. 6 is located on the east bank of the Kalakoa Stream downstream of the spillway, at the point where the stream bends to the west. This partially lined tunnel, with its concrete floor and rock walls, runs approximately 125' into the mountain, providing access to the junction of tunnels 1 and 2 of the discharge pipe. The portal has a round-arched opening and a concrete floor with a walkway on the right side. The

walls of this access tunnel are carved out of the stone. The sides of the portal are grooved at its opening, indicating it may have had a gated entry at one point.

An engineering report (Walter Lum & Associates, Inc., 1983: 11) noted that, when functional, the flow from the Ku Tree Reservoir valve tower could go two ways:

1. through a 24" x 24" sluice gate into a 24"-diameter cast-iron pipe in the discharge tunnel, which fed into the Schofield Barracks' water distribution system, or
2. water would flow into the tower through two 36" x 72" sluice gates at Invert Elevation 995', then out, into the drain tunnel, through a 36" x 72" sluice gate at Invert Elevation 992'.

The drain tunnel runs under the dam and, since the reservoir was drained, has been the route for passing the water back into Kalakoa Stream below Ku Tree dam.

All sluice gates have vertical stems extending up to floor stands mounted on the operating platform. The control gate valves are now closed and rusted. When they were operational, the maximum capacity of the outlet works was 619 cubic feet per second.

The valve tower retains its integrity, as there have been no alterations or additions made to it. However, since the drawing down of the reservoir in 1983 it has deteriorated. Its operating room has collapsed, with some of its debris still remaining on the platform. The tower's mechanisms have rusted, and a number of the sluice gates are missing. In 1983 when the Ku Tree Reservoir was drawn down, the drain tunnel sluice gates were left in the open position, and water from the reservoir side of the dam continues to pass through the drain tunnel to rejoin the Kalakoa Stream on the downslope side. The discharge tunnel and pipe are no longer functional.

HISTORICAL CONTEXT

Reservoir valve towers built of masonry came into use in Europe during the mid-nineteenth century. The valve tower served as the outlet works for the reservoir, releasing and regulating the waters impounded by the dam. Outlet works were designed to release specific amounts of water, as dictated by downstream needs, including flood control regulation, and storage requirements for irrigation and drinking water.

The other option for discharging waters from reservoirs was to use pipes embedded in the dams, with their flow controlled by a valve house on the downstream side of the dam. The 1919 Koolau Dam is an example of a small dam with a valve house on the downstream side of the dam. Problems inherent in the downstream valve house approach included the placement of stressful pressures on pipes whenever the water flow through larger dams was stopped; also repairs were difficult, if a pipe should burst or spring a leak. Masonry valve towers, although expensive to construct, successfully

eliminated these problems by placing the outlet works on the upstream side of the dam. Another advantage of the valve tower was that it allowed water to be drawn from near the surface of the reservoir where it was least turbid and discolored, providing a better-quality water to the end user. In addition, usually one intake was placed sufficiently low on the tower to draw the reservoir down to the bottom if necessary.

Masonry valve towers that stand independent of the dam were usually associated with earth-fill dams. Masonry dams frequently incorporated valve towers or shafts into the dam structure itself, as the structural integrity of the masonry dam was less threatened by seepage.

Because of the size of the Ku Tree Reservoir and its dam, an intake tower was planned from the start, as shown in the 1919 contour map of the overall reservoir (Sheets 2 and 3 of the reservoir's original drawings). After Congress appropriated the necessary funds to construct the reservoir in 1921, more detailed drawings were prepared. The two 1919 sheets and five 1923 drawings (sheets 1, 26-28, and 33) display the title block of the Office of the Constructing Quartermaster, Honolulu, T.H. The title blocks for the other original drawings of the reservoir indicate they were done by staff in the Office of Chief of the Fourth Construction District, Honolulu. Unfortunately the names of the designers are not known and typically only initials are shown on the drawings. The plans for the outlet tunnels were drawn by Johnson in February 1923. The details for the valve tower's gates and screens were completed in March 1923 by Harrison. Because of these early 1923 dates, done before the particulars of the Ku Tree valve tower were finalized, they were probably based on standard designs for such elements. This may also be the case with the drawings by G.N. dated November and December 1923, which show additional details of valve tower gates. The final plans for the valve tower, also with the initials G.N., were dated between June and November of 1924.

In addition to the Ku Tree Reservoir valve tower, other known valve towers in Hawaii include those at Lake Wilson in Wahiawa and at Nuuanu 4 Reservoir in Honolulu. The tower at Lake Wilson is approximately 40' in height, while the one in Nuuanu, which was constructed in 1933-34, is about 70' tall.

The Ku Tree Reservoir's valve tower's design, method of construction, and material were typical of its time. It was constructed of reinforced concrete, which by the 1920s was an accepted building material for industrial buildings, bridges, and other utilitarian structures. American engineer Thaddeus Hyatt published his ground-breaking book, *An Account of Some Experiments with Portland Cement Concrete, Combined with Iron, as a Building Material,* in 1877; however, reinforced concrete did not begin to gain acceptance as a building material until the last decade of the nineteenth century, with Ernest Ransome being a pioneer in the field. By the late 1890s, reinforced concrete was used in the United States to build grain elevators and storage tanks as well as factories and industrial buildings. In 1903 the fifteen-story Ingalls Building in Cincinnati became the first skyscraper to be constructed out of reinforced concrete. Until that

time, no reinforced concrete structure had gone more than six stories, as engineers, familiar with ordinary concrete's low tensile strength, feared wind loads would collapse taller structures, despite the metal reinforcing bars.

Concrete was first used as the main structural material of dams in 1904; however, it had been used in valve towers even earlier. Two picturesque examples which survive to the present include the 170-foot-high Vyrnwy valve tower with its Gothic Revival-style operating room and bridge. Located in Wales, this reservoir's stone dam (Great Britain's first large-scale masonry dam) and concrete valve tower were constructed in the 1880s. In New Zealand the Karori Reservoir's valve tower (1873), with its High-Victorian-style operating room, included a concrete shaft (Wymer, n.d.: 2, and Vernon-Harcourt, 1907: 187-188).

The design of the Ku Tree valve tower was typical for its period. The placement of intake valves at different elevations and the use of two separate pipes, one for drainage and one for discharge, were common elements present in valve towers of the period. Also designing the tower as an independent structure placed away from the dam had become a standard practice by the 1920s for large earth-fill dams. The Ku Tree Reservoir tower's hexagonal-plan design with ribs at the corners was also an already established form. For instance, James Dix Schuyler's Sweetwater Reservoir near San Diego, California (1899) included a hexagonal-plan stone valve tower. The hexagonal shape allowed for a stable, quasi-circular form while providing flat surfaces to facilitate easy operation of the sluice gates (Schuyler, 1909: 220-223 and Wilson, 1910: 449-452).

The drain and discharge tunnels also followed standardized forms of the period. The second most common reason for the failure of earth-fill dams in the nineteenth century was the faulty laying of outlet pipes, with leakage from the pipes undermining the dam (see the spillway report, HAER No. HI-81-D, for the number-one reason for failures). On large dams the weight of the dam alone was sufficient to compromise the integrity, if not crush, any outlet pipes laid in the dam. To counter this problem, drain tunnels running through earth-fill dams were concrete-lined and of sufficient size to allow work crews to inspect and repair them. The drain tunnel running under the Ku Tree Reservoir's dam is concrete-lined and its 6'-0" width is sufficiently large to allow room for a repair crew. Similarly the discharge tunnel, which primarily runs through rock, has partial lining of concrete and was designed to be large enough to allow easy access to the pipe it protected.

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PROJECT INFORMATION

See main report for Ku Tree Reservoir, HAER No. HI-81.

Figure 1: Elevation and Section, Valve Tower, Ku Tree Reservoir. Job No. S3603, Sheet 11, dated Sept. 3, 1924.

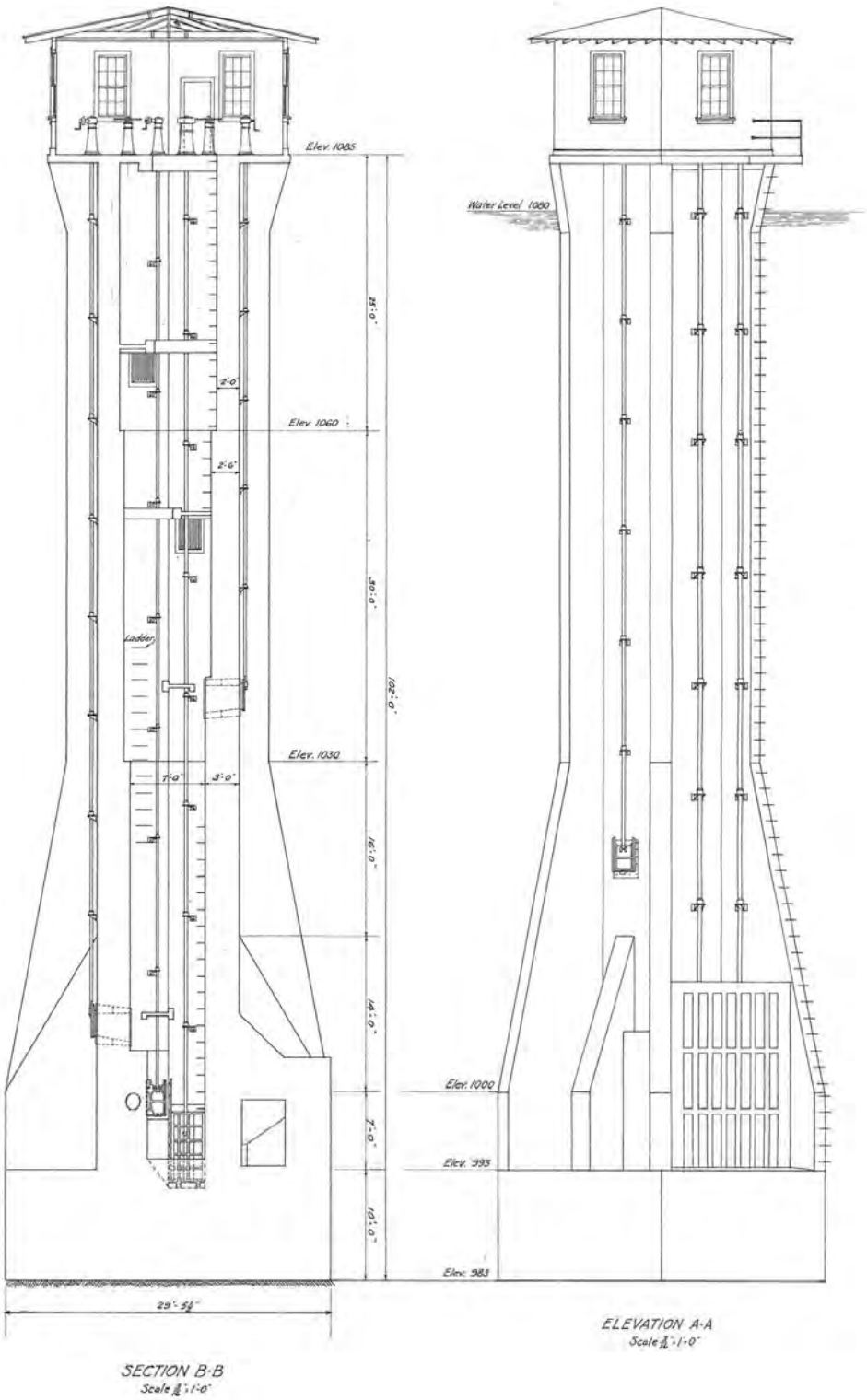
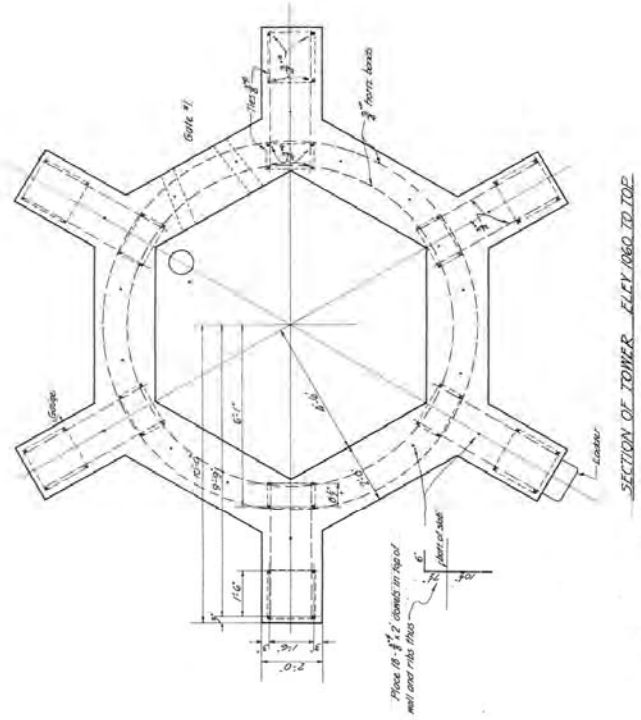


Figure 2: Valve Tower Details. Job No. S3603, Sheet 16, dated April 18, 1924.



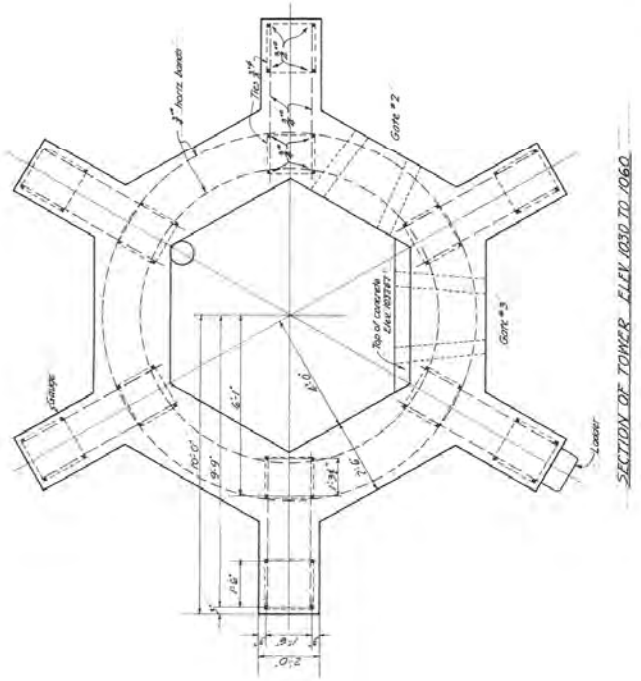


Figure 3: Gates for Valve Tower, Ku Tree Reservoir. Job No. S3603, Sheet 28, dated Dec. 1, 1923.

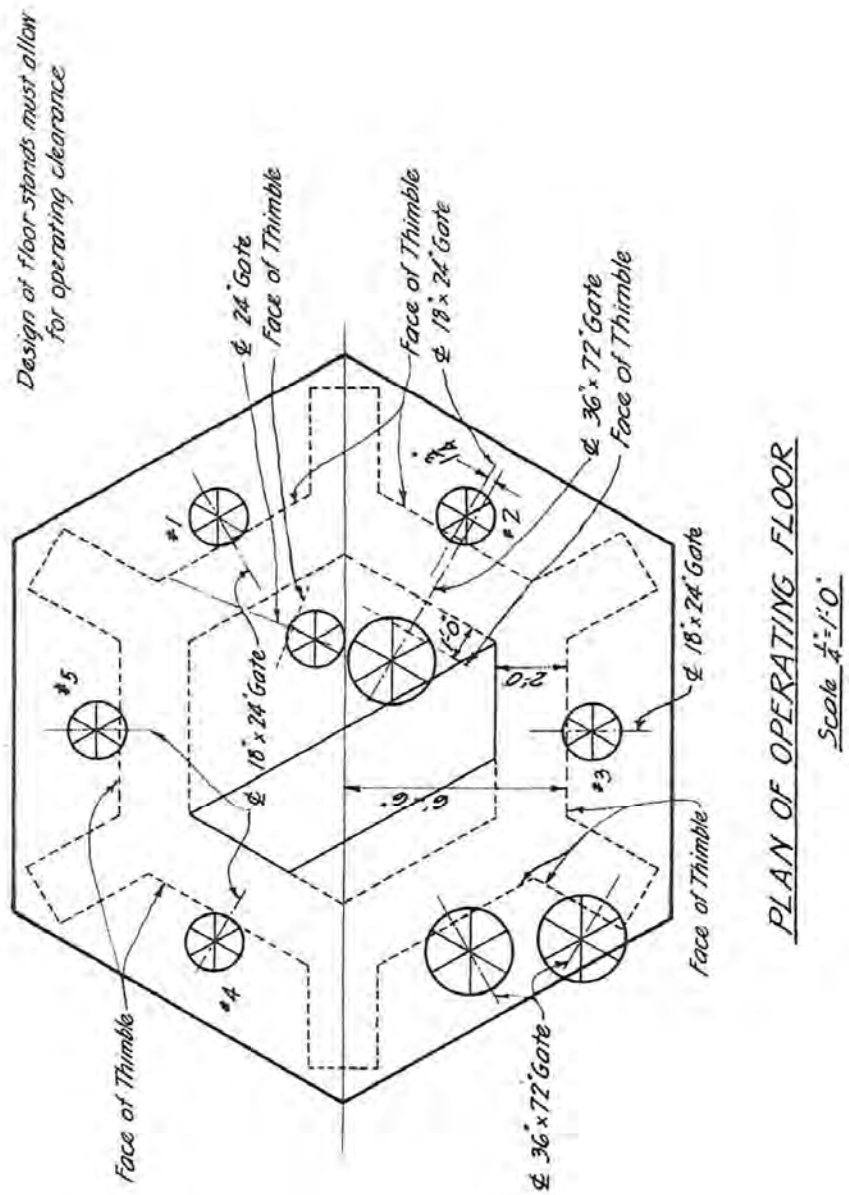


Figure 4: Valve tower, Ku Tree Dam, November 12, 1924. (Tropic Lightning Museum, Schofield Barracks, Hawaii, Historical photograph 87.76.01-27)

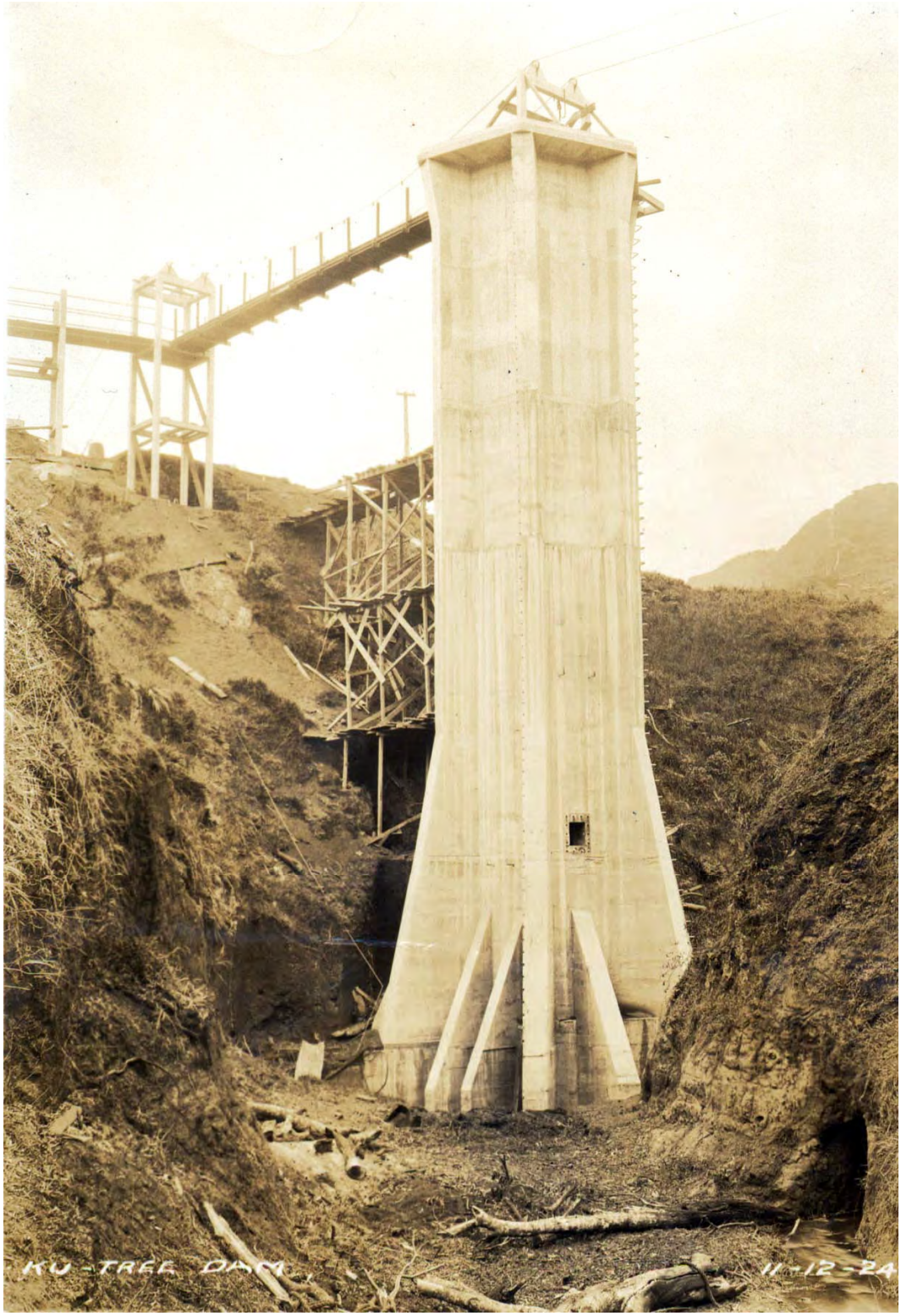


Figure 5: Enclosed valve house on tower with water in reservoir. (Tropic Lightning Museum, Schofield Barrracks, Hawaii, Historical photograph 87.76.01-8)

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KU TREE RESERVOIR, VALVE TOWER
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

David Franzen, Photographer April 17 and May 1, 2008

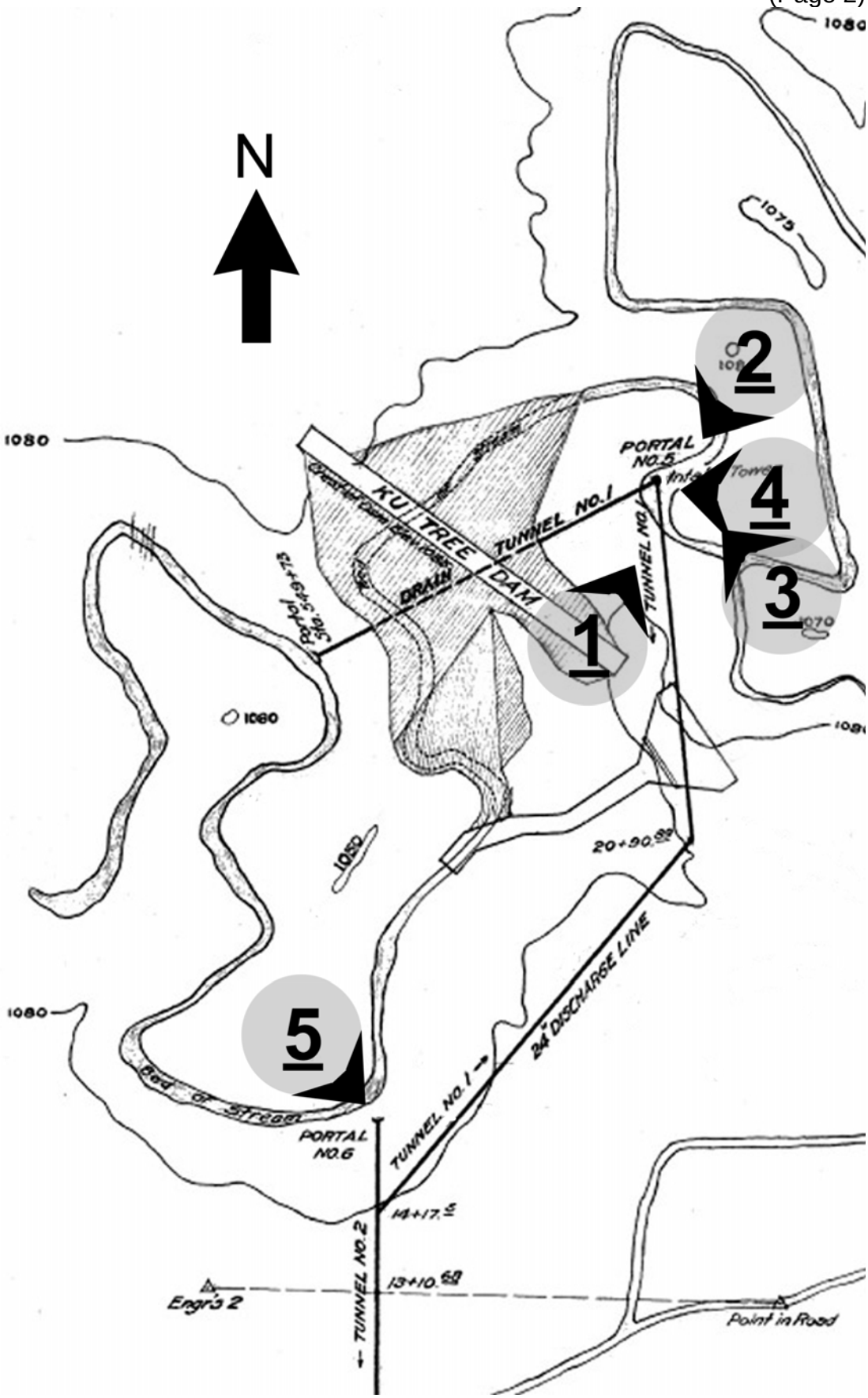
HI-81-B-1 VALVE TOWER FROM HIGH GROUND NEAR APPROACH BRIDGE. VIEW FACING NORTHEAST.

HI-81-B-2 OVERVIEW OF VALVE TOWER FROM NORTHERN SIDE OF BASIN. VIEW FACING SOUTHWEST.

HI-81-B-3 OVERVIEW OF VALVE TOWER FROM EASTERN SIDE OF BASIN SHOWING BRIDGE SUPPORTS ON HILLTOP. VIEW FACING WEST.

HI-81-B-4 DETAIL OF VALVE TOWER SHOWING SLUICE GATE ON EAST SIDE OF TOWER. VIEW FACING WEST.

HI-81-B-5 PORTAL NO. 6. VIEW FACING SOUTHEAST.


N
1080
1075
1070
1060
1050
2
4
3
1
5
PORTAL NO.5
KU TREE DAM
TUNNEL NO.1
DRAIN
TUNNEL NO.1
20+90.92
24" DISCHARGE LINE
Bed of Stream
PORTAL NO.6
TUNNEL NO.1
14+17.5
TUNNEL NO.2
13+10.68
Engr's 2
Point in Road

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SCHOFIELD BARRACKS MILITARY RESERVATION, **HAER No. HI-81-C**
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SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR, VALVE TOWER FOOT BRIDGE

HAER No. HI-81-C

Location:	Kalakoa Stream (Tributary to the South Fork of Kaukonahua Stream) Approximately 3 miles east of Wahiawa East Range, Schofield Barracks Military Reservation City and County of Honolulu Hawaii USGS 7.5 minute series topographic map, Waipahu, HI 1998 Universal Transverse Mercator (UTM) coordinates: 04.605690.2377500.
Date of Construction:	1922-1925
Engineers & Builders:	Office of the Quartermaster General and Office of Chief of the Fourth Construction District
Present Owner:	U.S. Army
Present Occupant:	U.S. Army (training area)
Present Use:	Unusable, only concrete and metal elements remain.
Significance:	The valve tower pedestrian bridge is significant as an element of the Ku Tree Reservoir and as a good example of a valve tower bridge constructed in Hawaii in the 1920s. It is a rare example of a foot bridge with a suspension bridge portion constructed in Hawaii during the early twentieth century. The Ku Tree Reservoir foot bridge's concrete towers made its pedestrian suspension bridge one of the more imposing of this type constructed in Hawaii.
Report Prepared by:	Don J. Hibbard, Ph.D., Architectural Historian as subcontractor to and with assistance from Mason Architects, Inc. 119 Merchant Street, Suite 501 Honolulu, HI 96813
Date:	June 2008

For additional information see the main report on the Ku Tree Reservoir (HAER No. HI-81), as well as the individual reports on the other related structures in this complex (HAER Nos. HI-81-A, HI-81-B, and HI-81-D).

DESCRIPTION

The foot bridge that accessed the Ku Tree Reservoir's valve tower now stands in ruin. It was comprised of two portions, an eight-span approach bridge about 80' in length, and a suspension bridge approximately 73' long, including the platform with the cable supports. These portions are no longer passable, as the deck of the approach bridge is not extant and only reinforced-concrete elements associated with the cable assembly remain of the suspension bridge.

The southern end of the elevated approach bridge portion was constructed on a knoll to the east of the dam. The approach bridge originally had a wood deck, supported by 6" steel channels bolted to 8"-square reinforced-concrete posts spaced 10'-0" on center. The deck and supporting channels no longer exist, but the eight pairs of concrete posts remain, with each pair joined near the bottom by an 8"-square reinforced-concrete beam. Originally the deck was made of 2 x 6s, approximately 4' in length, placed across the supporting channels and spaced 6½" on center. The concrete posts sit on 2'-0"-square spread footings and vary in height in accordance with the terrain, and most were partially submerged when the reservoir was near capacity. The posts rise 4'-6" above the level of the deck, and a pair of 1½"-diameter pipes, set 2'-0" apart, serve as railings. The upper railing is 4'-0" above the deck. These pipes still remain, running through holes in the concrete posts. The posts are eroded where the waterline fluctuated frequently. Sheet 30 notes that the maximum load for the bridge was 1,000 pounds.

The approach portion terminates at a platform whose tower supported the suspension bridge cables. The platform is 10'-2" beyond the approach bridge portion's last set of posts and set at about a 105-degree angle to the approach bridge. The 8'-0" x 6'-4" platform is framed by 8"-square reinforced-concrete posts tied together by similarly sized concrete beams located at three elevations: the tower's top, the platform floor, and 9'-0" below the platform's floor. There are also two diagonal braces of concrete, not shown on the 1924 drawings, on the north and south sides of the tower, between the west corners at the platform beams to the east corners of the ones below. The platform's wooden deck was made of 2 x 6s, spaced the same as on the approach bridge's deck. The platform's tower rises about 10' above the platform floor, with each of its four posts capped by 18" sheaves (mounted in journal boxes) through which the suspension cables ran. A similar sheave assembly, 66'-7" from the platform tower, sat on top of the valve tower, inside the operating room. This sheave support tower, on top of the valve tower, had only two concrete posts. The suspension bridge had a pair of 1"-diameter steel cables which ran through the sheaves and were secured at their ends to concrete anchor pads with turnbuckles and eyebolts.

The west anchor block is level with the ground and measures 8'-0" in length and 7'-0" wide; the original drawings show its stepped base extends, at the deepest part, 5'-0" into the earth. The east anchor block is 7'-0" square and its depth is 5'-6"; a portion of the block's top extends above the ground, due to the manner in which the cable entered this anchor. It is located approximately 148' from the tower on the top of a hill, which became an island when the reservoir contained water. The west anchor block is situated about 28' behind the platform. All structural portions (cable supports and anchor blocks) of the suspension bridge are aligned along a single axis. The anchor blocks still remain, along with the rusted remains of their turnbuckles and eyebolts, and sections of "wire rope" or cable.

The suspension bridge ran from the platform above the reservoir waters to the valve tower. Parallel steel cables ran from the anchor blocks up to the sheaves mounted on the platform and valve tower, and hung over the reservoir water in a curve with a 6'-8" sag at its low point. The cables supported the suspension bridge, using ½"-diameter rods as hangers spaced 5'-0" on center. The bridge had eleven sets of cable hangers (varying in height from 4'-7" to 11'-0") connected to 6" steel channels, each measuring 5'-4" and set perpendicular to the axis of the bridge. These supported longitudinal 6" channels, and both channels were bolted to vertical 3" angles. The deck and the railings were 2 x 6 boards. Diagonal cross-bracing provided additional stability below every other section near the center of the suspension bridge. The design allowed for a 4" camber in the bridge.

The foot bridge was already deteriorated and the deck of the suspension portion gone by 1978, when the first inspection report on the dam was prepared. (C-E Maguire, Inc. 1978: 13 and photo 7). By the time the reservoir was drawn down in 1983, the suspension cables had broken (Walter Lum & Associates, 1983: 38).

The valve tower bridge has lost much of its integrity with the bridge decks no longer extant and the suspension bridge's cables no longer in place. However, the bridges' concrete members and some metal elements remain intact, and from their presence the bridges' original design can be conceived by the trained eye.

HISTORICAL CONTEXT

The suspension bridge is one of the oldest types of bridge to be found in human history. With the development of wire cables in the nineteenth century the modern version of this ancient form became increasingly used by engineers in Europe and the United States for both pedestrian and larger vehicular bridges. In all likelihood it was selected for use as the Ku Tree Reservoir's valve tower bridge because it required fewer materials in its construction than other types of bridges. It may have also been chosen

for its ease of construction, considering it spanned the almost 100' deep valley between the dam abutment and the valve tower.

The 1919 conceptual plans (Sheet 3) for the reservoir called for a concrete foot bridge to the valve tower, rather than the bridge with a suspension portion that was erected. Most likely, ease of construction plus lower cost and materials were factors which led to the selection of the suspension bridge as a suitable alternative. The final plans (Sheets 29-31) for the valve tower's foot bridge, with approach and suspension portions, were drawn and traced by W.F.J. in June and July 1924. The "Erection Diagram and Steel Details" (Sheet 32) for the suspension bridge portion were drawn by G.N. in July 1924.

The only two other known extant examples of pedestrian suspension bridges in Hawaii are the Hanapepe Swinging Bridge (1911, rebuilt 1992) crossing the Hanapepe River, and the Waimea Swinging Bridge (rebuilt 1996) crossing the Waimea River, both on Kauai. These two extant Kauai bridges are more modest in their design than the Ku Tree bridge, and their structural elements are made of wood.

This foot bridge is typical of its period in its use of materials, method of construction, craftsmanship, and design. The design of the bridge and its method of construction for the suspension portion followed a standard approach, first published by James Finley of Pennsylvania in 1796, with anchor blocks, towers, catenary system, and a level deck supported by hangers (Burr and Falk, 1905: 26). Its towers supported the vertical load, or compression, of the bridge, and the concrete anchor blocks maintained the tension in the cables. The bridge's use of reinforced concrete for its structural supports was uncommon in Hawaii, but more widely used in the mainland United States, having become a popular building material during the opening decades of the twentieth century. The bridge's now rusted "wire rope" was typical of the period by not being pre-stressed. They were some of the last such cables used in a suspension bridge, as in 1928 Roebling Company developed pre-stressed cable for suspension bridges, and the material quickly became the norm in bridge construction from that point forward as it assured more reliable load calculations.

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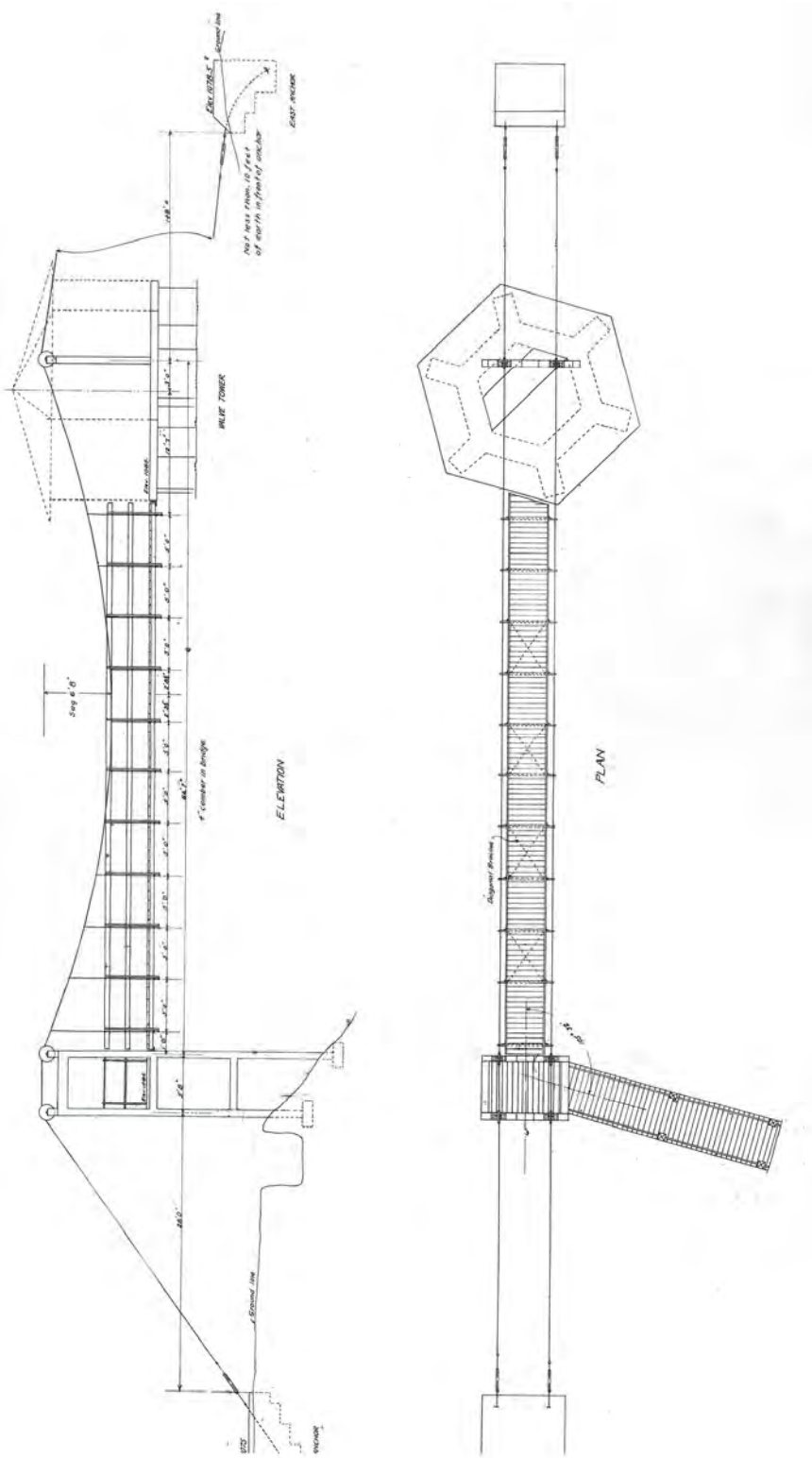
PROJECT INFORMATION

See main report for Ku Tree Reservoir, HAER No. HI-81.

Figure 1: Suspension Bridge to Valve Tower, Ku Tree Reservoir. Job S3603, Sheet 29, dated June 1924.



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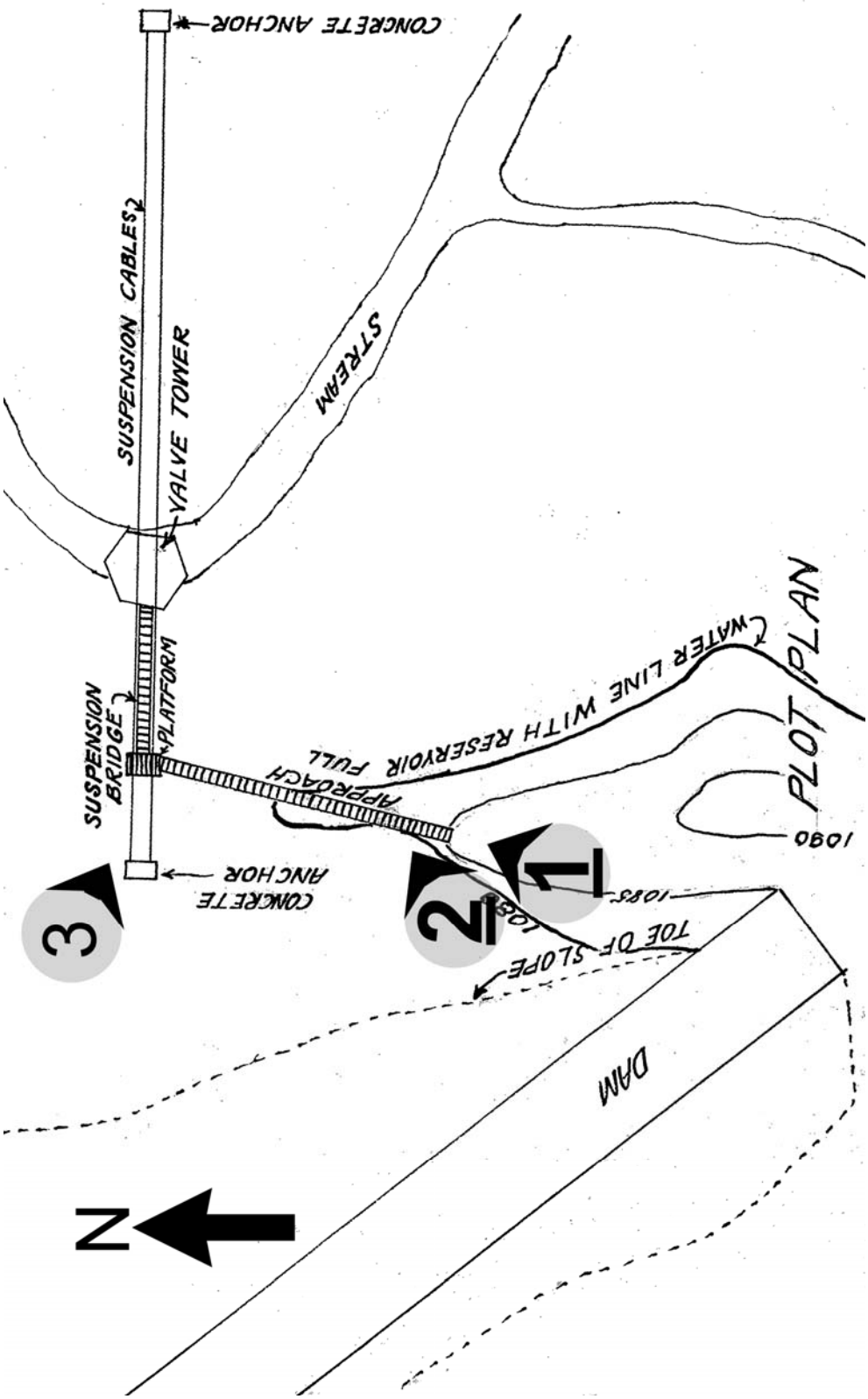
Hawaii

David Franzen, Photographer April 17 and May 1, 2008

HI-81-C-1 APPROACH BRIDGE PORTION OF VALVE TOWER FOOT BRIDGE, AS SEEN FROM ENTRY. VIEW FACING NORTHWEST.

HI-81-C-2 APPROACH BRIDGE PORTION OF VALVE TOWER FOOT BRIDGE, AS SEEN FROM BELOW, SHOWING VALVE TOWER TO RIGHT. VIEW FACING NORTH.

HI-81-C-3 CONCRETE PAD AND SUSPENSION BRIDGE TOWERS FOR CABLES FORMERLY SUPPORTING THE SUSPENSION BRIDGE PORTION OF VALVE TOWER FOOT BRIDGE. VIEW FACING NORTHEAST.


CONCRETE ANCHOR
SUSPENSION CABLES
VALVE TOWER
STREAM
SUSPENSION BRIDGE
PLATFORM
APPROACH
WATER LINE WITH RESERVOIR FULL
PLOT PLAN
1090
1085
TOE OF SLOPE
CONCRETE ANCHOR
DAM
N
1
2
3

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HAER No. HI-81-C-3

SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR, SPILLWAY
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

HAER No. HI-81-D

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Washington, D.C.

HISTORIC AMERICAN ENGINEERING RECORD

SCHOFIELD BARRACKS MILITARY RESERVATION, KU TREE RESERVOIR, SPILLWAY

HAER No. HI-81-D

Location:	Kalakoa Stream (Tributary to the South Fork of Kaukonahua Stream) Approximately 3 miles east of Wahiawa East Range, Schofield Barracks City and County of Honolulu Hawaii USGS 7.5 minute series topographic map, Waipahu, HI 1998 Universal Transverse Mercator (UTM) coordinates: 04.605640.2377530
Date of Construction:	1922-1925
Engineers & Builders:	Office of the Quartermaster General and Office of Chief of the Fourth Construction District
Present Owner:	U.S. Army
Present Occupant:	U.S. Army (training area)
Present Use:	Reservoir drained, spillway not in use.
Significance:	The spillway is significant as an element of the Ku Tree Reservoir and as a good example of a spillway constructed for an earth-fill dam in Hawaii in the 1920s. The spillway embodies the distinctive characteristics of its type, period, and method of construction, while possessing high integrity. While the individual elements of the design are typical, such as the utilitarian pedestrian bridge, overall it is a notable example of this type of engineering structure in Hawaii. Because of Ku Tree Reservoir's capacity and the size of its watershed, its spillway, with a length of 460' and 68 percent slope, is one of the more impressive spillways in the state.
Report Prepared by:	Don J. Hibbard, Ph.D., Architectural Historian as subcontractor to and with assistance from Mason Architects, Inc. 119 Merchant Street, Suite 501 Honolulu, HI 96813
Date:	June 2008

For additional information see the main report on the Ku Tree Reservoir (HAER No. HI-81), as well as the individual reports on the other related structures in this complex (HAER Nos. HI-81-A, HI-81-B, and HI-81-C).

DESCRIPTION

The Ku Tree Reservoir's reinforced-concrete spillway is a fixed-crest type with no control structures. It is situated on the east abutment of the dam, approximately 140' from the eastern edge of the dam's crest. The axis of the spillway's crest is slightly skewed, about 20 degrees, from the centerline of the dam. Traversing a natural hillside, it is a chute spillway with a large drop in elevation. Starting at an elevation of 1,080'-0", the spillway floor drops to an elevation of approximately 987' over a horizontal distance of approximately 410'. At the top, on the reservoir side of the crest, there is a concrete apron approximately 160' wide and 20' deep; this flat, rectangular area is about a foot lower than the spillway crest. From the crest elevation of 1080' there is an 8'-0" ogee-curved drop in the spillway. The concrete side walls at the base of this drop are about 13' high. The year "1924" is incised in the concrete of the west side wall, not far from the spillway's crest (although a 1925 completion date was reported in the February 21, 1925 *Honolulu Advertiser*). The large flat area near the top of the spillway is funnel shaped, and its walls converge from the 160' width at the foot of the first drop to a 30' wide chute. From this point the spillway drops into a stilling basin approximately 100' lower than the spillway crest.

In the initial 120' (of horizontal distance from the funnel-shaped flat area) the spillway continues the axis of the funnel, but drops steeply at a 68 percent slope. About halfway down this steep section, on the east wall, a surface drain pipe empties into the chute. The next two sections of the chute are less steep and are curved in a gentle S shape. After its initial precipitous drop the spillway curves to the right approximately thirty degrees and assumes a gentle slope of about five percent for 90 feet, before bending to the left approximately 16 degrees. After that bend, part of the section has a slope of less than four percent for approximately 40', and the other part is a level stilling basin, about 50' in length. This basin is created by another ogee-shaped weir, projecting about 3' in height above the spillway floor here. The final section of the spillway, also essentially level, has its axis at a 30-degree angle from the stilling basin; water in the spillway travels this final 40' before emptying into a stream.

The side wall heights of the spillway vary quite a bit. At the apron, they are about 6' tall, but at the first ogee-shaped drop, the walls are about 13' high. These walls step down to about 8' as the flat, funnel-shaped area narrows towards the chute. There are metal rungs imbedded in the concrete of these side walls, providing ladders to access this part of the spillway. In the chute part of the spillway, the side walls are 5'-0" tall along the steep section, but become 7'-0" high in the curving sections, and then are about 9' in height at the stilling basin end. Ladder rungs are also set in the walls of the stilling basin, just upstream of the ogee weir. Wing walls, set at 90 degrees from the chute

walls, terminate the spillway structure; these anchor it into the natural hillside, penetrating the hill to a depth of several feet. The spillway was designed to accommodate a peak flood discharge of 8,100 cubic feet per second.

The spillway's floor thickness is generally 8", but at several points, i.e., the ogee weirs and where the slope changes abruptly from 68 to about 6 percent, the concrete base is more complicated in design and much thicker. The portions of the spillway floor just before and after the second ogee weir are 12" thick. The reinforcing used in the spillway floor is labeled as "Clinton mesh."

Approximately 86' from the spillway crest, at the funnel part near the steep chute section, a reinforced-concrete spillway footbridge crosses over the spillway. It allows people to access the top of the Ku Tree Reservoir dam and the former bridge to the valve tower. The bridge is a straightforward, three-span, reinforced-concrete structure. It measures approximately 79' in length and 3'-6" in width. It is supported by the spillway walls at the abutments and by two 10"-square concrete columns. Diversion ribs on the upstream side protect the columns from the current and debris in the spillway waters. The reinforced-concrete diversion ribs are 1'-6" high, and 1'-2" inches wide, and angle out 45' from the columns towards the top of the spillway. The bridge deck is 4" thick and in section is a single web T with the beam below the bridge deck measuring 10" wide and 8" deep. The handrails are 3'-0" high and originally made of 1½"-diameter steel pipes. However, the original pipe handrails were replaced in the past twenty-five years. The new rail is made of 2"- and 3"-diameter pipes.

The spillway retains its integrity, and there have been no alterations or additions made to it, other than the replacement of the spillway bridge's pipe handrail. Because of disuse, especially since the 1983 drawdown of the reservoir, dense vegetation grew over most of the spillway's floor. Vegetation clearing was done in April 2008 to allow photographic documentation of the spillway.

HISTORY

The spillway was designed and constructed as an integral part of the Ku Tree Reservoir. A spillway is an essential part of an earth-fill dam, as the principal disadvantage of this type of dam is that it will be damaged or even destroyed if overtopped by flood waters. Spillways serve to release excess flood waters which cannot be contained in the reservoir. An inadequately sized spillway is the major cause of failure in earth-fill dams. Therefore, a spillway with sufficient capacity is critical for the safe operation of this type of dam. The spillway needs to be located at a sufficient distance from the dam to prevent dam erosion and must be sited so that its discharge will not erode or undermine the downstream toe of the dam. In addition, the spillway needs to be erosion-resistant and able to withstand high scouring velocities that result from the drop between the reservoir surface and the bottom elevation. When located on soil or deeply weathered rock, the entire length of a spillway is always of concrete. A

stilling basin is designed at the terminal end of a spillway to prevent erosion where the overflow empties into the original stream.

Planning for the Ku Tree Reservoir began in 1919 when a site visit was made by representatives of the construction service, attached to the Quartermaster General in Washington D. C., and some drawings were prepared. A spillway was included in these 1919 plans. The designer of the spillway is not known, as there are only initials on the original drawings. The sheets (6 and 8) for the spillway were drawn by G. N. in June 1924, and traced by him in November 1924.

Other spillways in Hawaii of comparable or grander scale with precipitous drops include Lake Wilson on Oahu, Keaiwa Reservoir on the island of Hawaii, and Alexander Reservoir on Kauai. The latter is the most spectacular spillway in the islands.

As is typical for spillways in earth-fill dams, this element of the Ku Tree Reservoir is isolated from the dam, traversing the natural abutment outside the limits of the dam. Its crest is at an elevation 5'-0" below the crest of the dam. This is the minimum variance in elevation recommended in a 1907 engineering book, *Design and Construction of Dams*, which suggested the spillway should be 5' to 25' below the top of the dam (Wegmann, 1907: 225).

The chute-type spillway, because of its simplicity of design and construction, was the most common form to be employed for earth-fill dams. Spillways could incorporate a control device to regulate the outflow of water, or be a fixed system, which simply allows the water to overflow the crest. The latter is the case at Ku Tree Reservoir. As is typical in fixed-system design, an ogee weir at the crest softens the fall of the floodwater's or released excess water's overflow and reduces erosion at the base of the weir. Usually chute-type spillways are straight runs; however, the Ku Tree spillway has four different axes as it descends the hillside. These shifts in the chute's alignment allow the spillway to follow the natural contour of the knoll which it traverses and to have a straight discharge into the original streambed. The stilling basin and its ogee weir at the lower end of the spillway were also standard elements in chute spillways of the period. These devices were used to dissipate the velocity of the flood waters before they entered the stream channel, thereby minimizing stream bed erosion.

The spillway's use of reinforced concrete as its construction material was typical for its period. Since at least the turn of century, it was common practice to construct masonry spillways in order to reduce any chances of erosion. A concrete spillway also better withstood scouring and eliminated the opportunity for overflowing waters to percolate into the ground and compromise the integrity of the earth-filled dam. It certainly must have been a great effort to bring and pour the concrete for this spillway in the 1920s, since the difficulty of transporting concrete into this remote site was noted in a 1983 report (Walter Lum Associates, Inc. 1983: 21).

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Figure 1: General Plan, Spillway, Ku Tree Reservoir. Job No. S3603, Sheet 6, dated June 14, 1924.

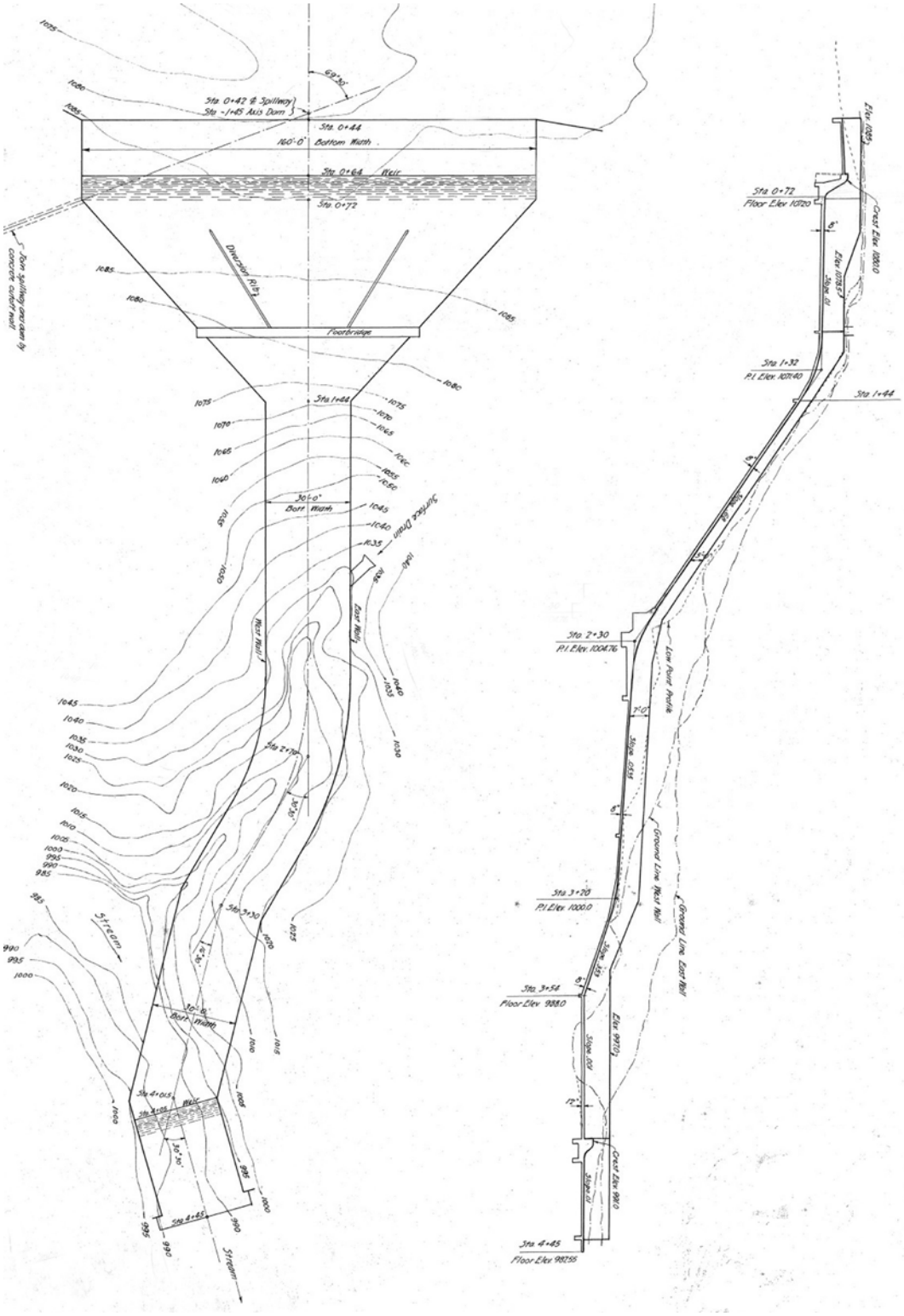


Figure 2: Plan and Section, Lower Half of Spillway, Ku Tree Reservoir. Job No. S3603, Sheet 8, dated June 14, 1924.

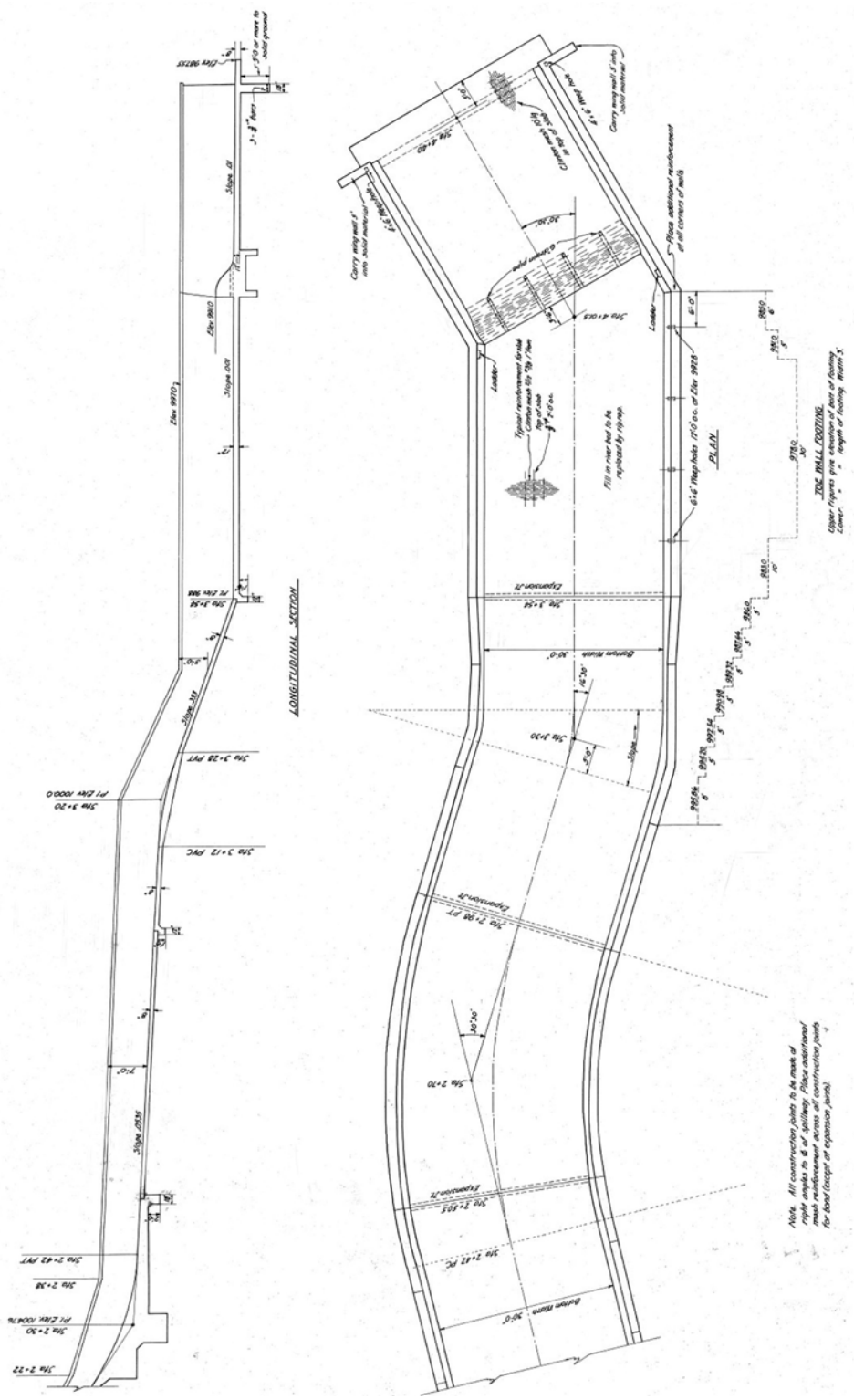


Figure 3: View in 1925 with stilling pond in foreground. (Tropic Lightning Museum, Schofield Barracks, Hawaii, Historical photograph 87.76.01-28)

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

SCHOFIELD BARRACKS MILITARY RESERVATION, HAER No. HI-81-D
KU TREE RESERVOIR, SPILLWAY
Kalakoa Stream
East Range
Wahiawa Vicinity
Honolulu County
Hawaii

David Franzen, Photographer April 17 and May 1, 2008

HI-81-D-1 LOOKING DOWN ON OGEE WEIR OF UPPER SPILLWAY. VIEW FACING SOUTHEAST.

HI-81-D-2 DIVERSION RIB IN UPPER SPILLWAY. VIEW FACING SOUTHWEST.

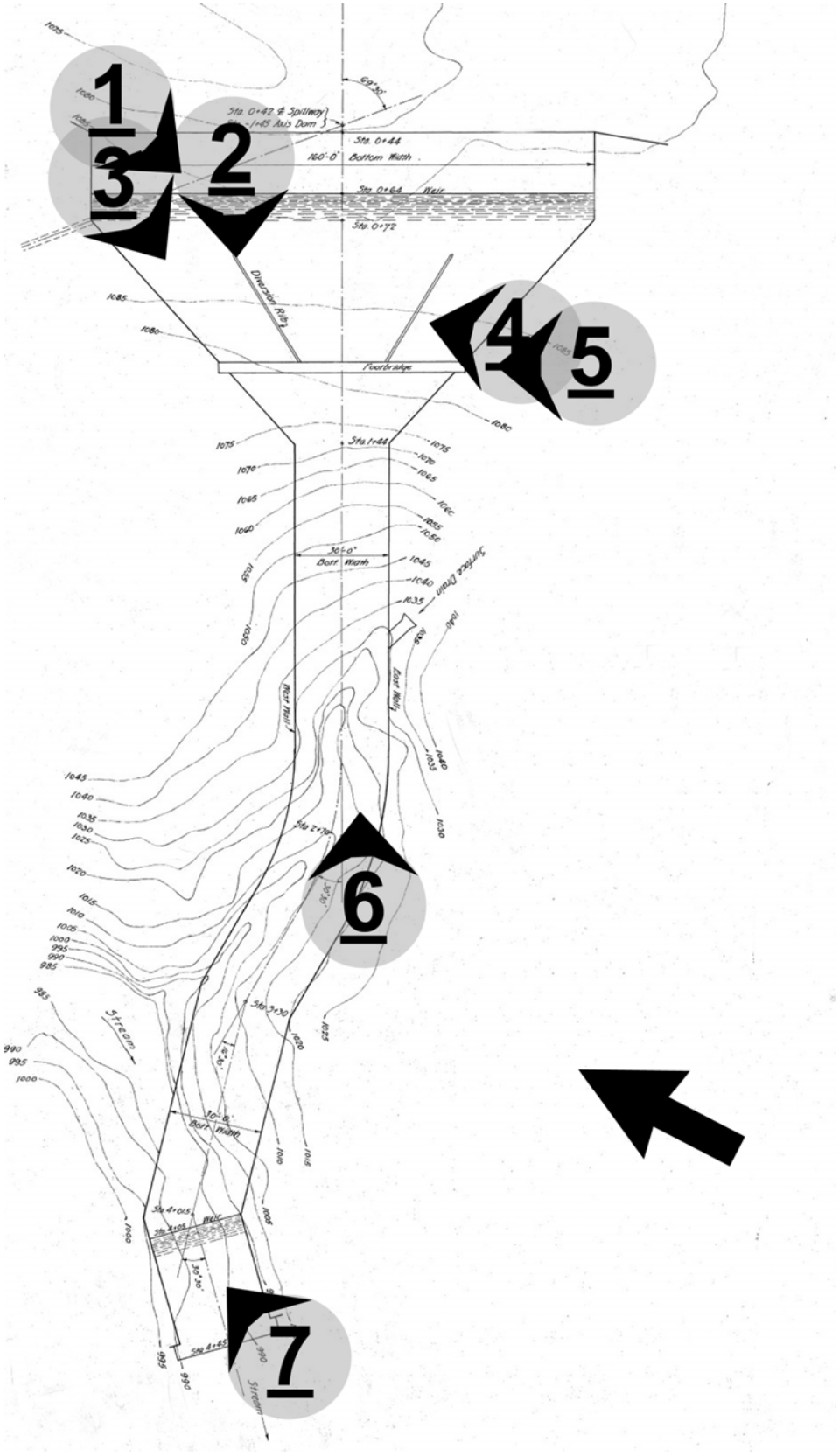
HI-81-D-3 UPPER SPILLWAY FROM APRON LOOKING TOWARDS SPILLWAY BRIDGE. VIEW FACING SOUTHWEST.

HI-81-D-4 VIEW OF UPPER SPILLWAY FROM UNDER SPILLWAY BRIDGE LOOKING TOWARDS APRON. VIEW FACING NORTHWEST.

HI-81-D-5 VIEW FROM SPILLWAY BRIDGE SHOWING SPILLWAY DROP ON LEFT. VIEW FACING NORTHWEST.

HI-81-D-6 VIEW FROM THE BOTTOM OF FIRST SPILLWAY DROP LOOKING UP TO THE SPILLWAY BRIDGE. VIEW FACING NORTHEAST.

HI-81-D-7 SPILL BASIN WEIR AT THE END OF THE SPILLWAY. VIEW FACING NORTH NORTHEAST.


1
2
3
4
5
6
7
Sta. 0+44
160'-0" Bottom Width
Sta. 0+64 Weir
Sta. 0+72
Diversion Ditch
Footbridge
Sta. 1+44
30'-0" Bott Width
Surface Drain
West Wall
East Wall
Sta. 2+70
Stream
Sta. 3+30
30'-0" Bott Width
Sta. 4+05 Weir
Sta. 4+45
Stream

HISTORIC AMERICAN ENGINEERING RECORD
SEE INDEX TO PHOTOGRAPHS FOR CAPTION

HAER No. HI-81-D-1

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HAER No. HI-81-D-2

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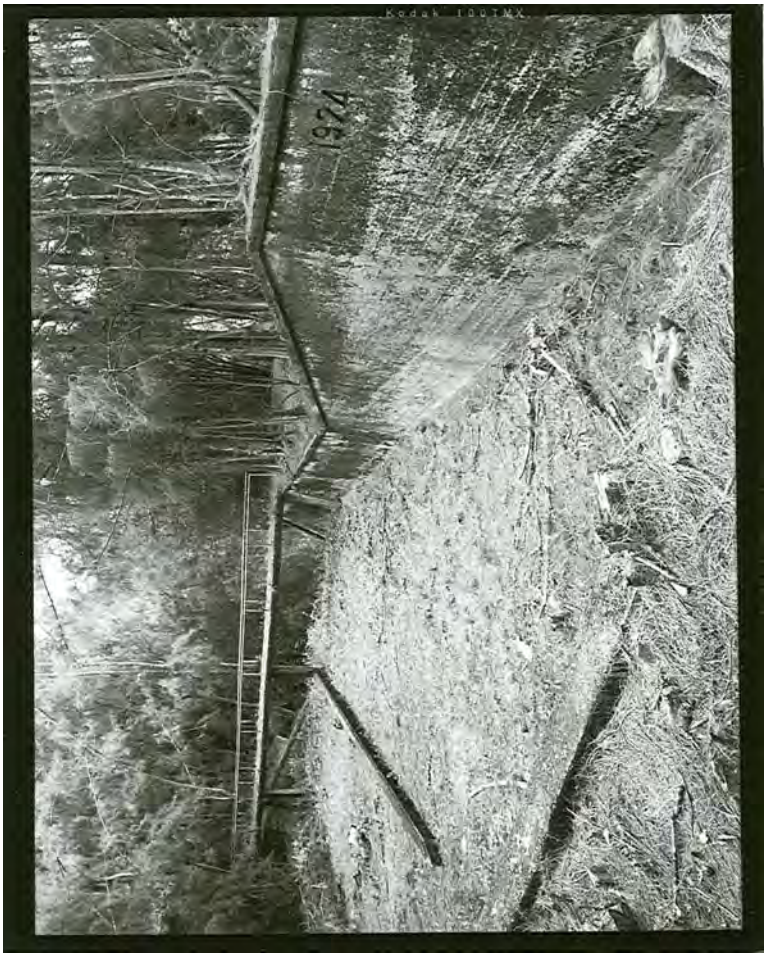
HAER No. HI-81-D-3



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HAER No. HI-81-D-4

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HAER No. HI-81-D-7

ENCLOSURE 4
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Waianae Ahupuaʻa, Waianae Moku, Oʻahu (TMK: 7-6-001:001)

Distribution List

Mr. William J. Aila, Jr. and Mrs. Melva N.Aila Hui Mālama O Mākua	Mr. Norman Mana Kaleilani Cáceres ʻOhana Huihui
Dr. Alan Downer State Historic Preservation Division Department of Land and Natural Resources	Dr. Sylvia Hussey Office of Hawaiian Affairs
Ms. Kiersten Faulkner Historic Hawaii Foundation	Mr. William Aweau Hoʻohuli ʻOhana Hoʻohuli
Mr. Hanalē K. Hopfe Koʻa Mana Kupukaʻāina O Waiʻanae Moku, Oʻahu	Ms. Paulette Kaʻanohiokalani Kaleikini ʻOhana Keaweamahi
Mr. Tom Lenchanko Kahuakai Ola Ko Laila Waha Olelo ʻAha Kūkaniloko Koʻa Mana Mea Ola Kanaka Mauli Hoalii Iku Pau	Ms. Leimaile Quitevis ʻOhana Quitevis
Mr. Alika Poe Silva Koʻa Mana Kupukaʻāina O Waiʻanae Moku, Oʻahu	Ms. Kēhaulani Souza
Mr. Harry Wasson Hui Malama ʻAina ʻO Laʻie	Ms. Kilinahe Keliinoi ʻOhana Kahekilinuiahumanu
Mr. Hailama Farden Association of Hawaiian Civic Clubs	Aliʻi Sir Nathan Grace Royal Order of Kamehameha I Moku ʻo Kōhala
Dr. Haʻaheo Guanson Pacific Justice and Reconciliation Center Native Hawaiian Church	Mr. Shad Kane Preservation of Historic Sites & Cultural Properties Committee Oʻahu Council of Hawaiian Civic Clubs
Mr. Shad Kane ʻOhana Kaleiopuʻu	Mr. Kyle Kajihiro and Ms. Terrilee Kekoʻolani Hawaiʻi Peace and Justice
Ms. Keona Mark Mahu ʻOhana	Mr. Melvin K. Soong The IʻMua Group
Ms. Noelani DeVincent Hawaiian Civic Club of Wahiwa-Kūkaniloko	Dr. Kahu Kaleo Patterson Pacific Justice and Reconciliation Center
Mr. Christophor Oliveira Marae Ha'akoa	

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

May 11, 2020

IN REPLY REFER TO:
Log No.: 2020.00828
Doc. No.: 2005SH08
Archaeology
Architecture
History and Culture

Kent K. Watase
Director of Public Works
Department of the Army
Headquarters, United States Army Garrison, Hawai'i
Directorate of Public Works
947 Wright Avenue, Wheeler Army Airfield
Schofield Barracks, Hawai'i 96857-5013
Email Reply to: richard.d.davis154.civ@mail.mil

Dear Kent Watase:

SUBJECT: **National Historic Preservation Act (NHPA) Section 106 Review – Initiation of Consultation, Determination of Eligibility, and Request for Concurrence with the Effect Determination**
Ku Tree Dam Breach Project on Schofield Barracks East Range
Project No. CRS-19-013
Waianae Ahupua'a, Waianae District, Island of O'ahu
TMK: (1) 7-6-001:001

The State Historic Preservation Division (SHPD) received a letter dated April 9, 2020 from the Department of the Army, U.S. Army Garrison, Hawai'i (USAG-HI) to initiate the Section 106 process, provide their determination of eligibility for the Ku Tree Dam, and request the State Historic Preservation Officer's (SHPO's) concurrence with the effect determination for the Ku Tree Dam Breach project on the island of O'ahu. Accompanying the USAG-HI's letter is the 2008 Historic American Engineering Record for the Ku Tree Dam. The SHPD received this submittal on April 13, 2020.

The proposed project will be carried out on federal land by the USAG-HI, therefore the USAG-HI has determined the proposed project is a federal undertaking as defined in 36 CFR 800.16(y).

According to the USAG-HI's letter, the Ku Tree Dam is located approximately three miles east of Wheeler Army Airfield on Schofield Barracks East Range Training Area in central O'ahu. The earthen dam was constructed in 1925 to provide potable water to Schofield Barracks. Supply problems limited the dam's utility and, after the Army drilled deep wells in 1938, Ku Tree Dam was no longer needed. The reservoir continued to provide irrigation water though the 1970s until it was emptied in 1983 to conduct a safety inspection. The components were found to be severely deteriorated; the dam was determined to be unsafe, and the reservoir was never refilled. Subsequent safety inspections by the State of Hawaii in 2014 and the U.S. Army in 2017 identified the potential hazards of catastrophic dam failure.

In order to eliminate the threats to life and property that could occur as a result of dam failure, USAG-HI proposes to create a permanent breach in the dam by removing the spillway and other concrete components and excavating a channel down to the natural stream bed elevation. The USAG-HI has defined the APE as a 28.5-acre area to include the footprint of all demolition and construction activities, the access route from the East Range road, and sufficient space for storing equipment and material during the project, as illustrated on Enclosure 1 of the subject letter.

The proposed undertaking involves breaching Ku Tree Dam and restoring the natural flow of Kalakoa Stream by demolishing the concrete spillway and excavating a 500-foot-long channel through the hillside that supports the spillway. The channel excavation will be 80-90 feet deep to match the elevation of the existing stream bed. The channel bottom will be 50 feet wide with a natural stream bed. Benched side-slopes will be constructed on both sides of the new channel to minimize erosion and establish vegetation. The excavated channel will end at a constructed riprap basin to reduce water flow speed. Except for the spillway, the dam structure will remain in place. The drain tunnels will be plugged. The concrete valve tower, spillway and footbridge will be demolished and used with the excess excavation material as fill on the upstream side of the dam to redirect water into the newly excavated channel. Vegetation will be removed from the working areas. The access route from the main road will be improved as necessary to accommodate the heavy equipment.

The USAG-HI's efforts to identify historic properties include intensive survey, archival research, field reconnaissance, architectural analysis, and previous consultation with the State Historic Preservation Division, Native Hawaiian Organizations, and interested parties.

Ku Tree Dam is the only property that was identified within the APE, no other buildings, structures, sites, or districts are present. According to USAG-HI, Ku Tree Dam is an engineered structure consisting of four associated components: an earthen dam, a concrete tower, a concrete spillway, and a concrete footbridge. Constructed in 1925 with the intent of providing potable water to Schofield Barracks, Ku Tree Dam is associated with the context of U.S. Military development on O'ahu during the inter-war years of the early 20th Century.

The USAG-HI states the Ku Tree Dam is not associated with a specific event and does not contribute to broad patterns of our history (National Register of Historic Places [NHPA] Criterion A) and is not associated with any particular individual whose specific contributions to history can be identified and documented (NHPA Criterion B). According to the HAER documentation, the design and construction of the earthen dam and its reinforced concrete components was typical for its time in Hawai'i and throughout the nation. Ku Tree Dam is an average example of earthen dams built in Hawai'i in the early 20th Century; it is one of 125 similar earthen dams in Hawaii, the majority of which were constructed between 1885 and 1940. The Ku Tree Dam components are common features found at other dams and there are no specific characteristics that distinguish it from other similar dams in Hawai'i or the United States as a whole. It does not embody a distinctive type, period, or method of construction, represent the work of a master, or possess high artistic value (NHPA Criterion C). Lastly, the Ku Tree Dam does not have the potential to provide important information or answer research question about human history (NHPA Criterion D). However, Ku Tree Dam exists where it was constructed and most of the original construction materials remain; accordingly, it retains integrity of location and material.

USAG-HI states that as a result of archival research and consultation with the State Historic Preservation Division in 2004, 2008, and 2019, USAG-HI has determined that Ku Tree Dam, does not meet any of the National Register criteria, lacks a majority of the aspects of integrity, and is not a historic property for the purposes of Section 106 of the National Historic Preservation Act.

The USAG-HI finds that the proposed Ku Tree Dam Breach Project will result in *no historic properties affected* because no historic properties are present in the APE.

The SHPD notes that according to the USAG-HI's submittal, consultation with Native Hawaiian Organizations and consulting parties last occurred in 2004, prior to the change in the project scope and expanded APE. **The SHPO requests** the USAG-HI consult, at minimum with the parties previously consulted for this project, to address any concerns with the newly designed project. The SHPD recommends consultation be extended to include the Historic Hawai'i Foundation.

The USAG-HI is the office of record for this undertaking. Please maintain a copy of this letter with your environmental review record for this undertaking.

Please contact Ka'ahiki Solis, Cultural Historian, at Sheleigh.Solis@hawaii.gov or at (808) 692-8030 for matters regarding history and culture. Please contact Stephanie Hacker, Historic Preservation Archaeologist IV, at Stephanie.Hacker@hawaii.gov or at (808) 692-8046 for matters regarding archaeological resources or this letter.

Aloha,
Alan Downer

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

cc: Kiersten Faulkner, Historic Hawai'i Foundation (kiersten@historichawaii.org)

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
DIRECTORATE OF PUBLIC WORKS
947 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5013

May 29, 2020

SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Waianae Ahupuaʻa, Waianae Moku, Oʻahu (TMK: 7-6-001:001), Architecture Review

Dr. Alan Downer
Deputy State Historic Preservation Officer
State Historic Preservation Division
Department of Land and Natural Resources
Kakuhihewa Building, Room 555
601 Kamōkila Boulevard
Kapolei, Hawaiʻi 96707

Dear Dr. Downer:

The U.S. Army Garrison, Hawaii (USAG-HI) received comments from the State Historic Preservation Division (SHPD) regarding Section 106 consultation for the undertaking to breach Ku Tree Dam in a letter delivered by email on May 14, 2020.

The letter from SHPD acknowledges the USAG-HI determination that Ku Tree Dam is not eligible for inclusion on the National Register of Historic Places, and the USAG-HI finding of no historic properties affected for the undertaking. In the letter, SHPD requests that USAG-HI consult with the parties previously consulted for this project and recommends that consultation be extended to include the Historic Hawaii Foundation.

The State Historic Preservation Division received the consultation documentation from USAG-HI on April 13, 2020. With the documentation, USAG-HI provided a list of all parties invited to consult on this undertaking (enclosed). The parties with whom USAG-HI previously consulted for the Ku Tree Dam Breach project are on that list, including the Historic Hawaii Foundation, along with 21 additional consulting parties who have since expressed a general interest in undertakings at Schofield Barracks East Range.

Mr. Tom Lenchanko of the Hawaiian Civic Club of Wahiawā-Kūkaniloko attended the Ku Tree Dam project tour with SHPD and USAG-HI in 2004, and he has retained an interest in this undertaking. Mr. Lenchanko was informed about the project revival after USAG-HI met with SHPD in November 2019 to resume consultation on this project. He subsequently requested a consultation visit to the project area for members of the Hawaiian Civic Club of Wahiawā-Kūkaniloko.

USAG-HI staff escorted four members of the Civic Club to the project location on March 15, 2020 to review information, see the area of potential effects, discuss the undertaking, and hear their concerns. Members of the group had questions about native plants in the area, revegetation, and restoration of the original stream channel. There were no concerns about historic properties, including properties which may be of religious or cultural significance, or the potential effects of the undertaking on historic properties.

The 30-day review period is now expired. Noting no objection from SHPD to the adequately documented determination of eligibility and the finding of no historic properties affected for the proposed Ku Tree Dam Breach Project, USAG-HI has fulfilled the responsibilities under Section 106 of the National Historic Preservation Act pursuant to 36 CFR §800.4(d)(1)(i). USAG-HI will now proceed with the undertaking as described.

Should you have any questions, please contact Mr. Richard Davis, Cultural Resources Manager in the USAG-HI Directorate of Public Works, Environmental Division. He can be reached at (808) 655-9709 or richard.d.davis154.civ@mail.mil.

Sincerely,

WATASE.KENT.K.1232027033 Digitally signed by WATASE.KENT.K.1232027033 Date: 2020.05.26 17:11:12 -10'00'

Kent K. Watase, PE
Director of Public Works

Enclosure

ENCLOSURE
SUBJECT: National Historic Preservation Act Section 106 Compliance for Project# CRS-19-013: Ku Tree Dam Breach Project on Schofield Barracks East Range, Waianae Ahupuaʻa, Waianae Moku, Oʻahu (TMK: 7-6-001:001), Architecture Review

List of Parties Invited to Participate in Section 106 Consultation:

Mr. William J. Aila, Jr. and Mrs. Melva N.Aila Hui Mālama O Mākua	Mr. Norman Mana Kaleilani Cáceres ʻOhana Huihui
Dr. Alan Downer State Historic Preservation Division Department of Land and Natural Resources	Dr. Sylvia Hussey Office of Hawaiian Affairs
Ms. Kiersten Faulkner Historic Hawaii Foundation	Mr. William Aweau Hoʻohuli ʻOhana Hoʻohuli
Mr. Hanalē K. Hopfe Koʻa Mana Kupukaʻāina O Waiʻanae Moku, Oʻahu	Ms. Paulette Kaʻanohiokalani Kaleikini ʻOhana Keaweamahi
Mr. Tom Lenchanko Kahuakai Ola Ko Laila Waha Olelo ʻAha Kūkaniloko Koʻa Mana Mea Ola Kanaka Mauli Hoalii Iku Pau	Ms. Leimaile Quitevis ʻOhana Quitevis
Mr. Alika Poe Silva Koʻa Mana Kupukaʻāina O Waiʻanae Moku, Oʻahu	Ms. Kēhaulani Souza
Mr. Harry Wasson Hui Malama ʻAina ʻO Laʻie	Ms. Kilinahe Keliinoi ʻOhana Kahekilinuiahumanu
Mr. Hailama Farden Association of Hawaiian Civic Clubs	Aliʻi Sir Nathan Grace Royal Order of Kamehameha I Moku ʻo Kōhala
Dr. Haʻaheo Guanson Pacific Justice and Reconciliation Center Native Hawaiian Church	Mr. Shad Kane Preservation of Historic Sites & Cultural Properties Committee Oʻahu Council of Hawaiian Civic Clubs
Mr. Shad Kane ʻOhana Kaleiopuʻu	Mr. Kyle Kajihiro and Ms. Terrilee Kekoʻolani Hawaiʻi Peace and Justice
Ms. Keona Mark Mahu ʻOhana	Mr. Melvin K. Soong The Iʻ Mua Group
Ms. Noelani DeVincent Hawaiian Civic Club of Wahiwa-Kūkaniloko	Dr. Kahu Kaleo Patterson Pacific Justice and Reconciliation Center
Mr. Christophor Oliveira Marae Ha'akoa	

Appendix F:
U.S. Fish and Wildlife Coordination Act Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 Ala Moana Boulevard, Rm. 3-122
Honolulu, Hawai‘i 96850

31 March 2020

In Reply Refer To:
PN-04-102

Thomas K. Barrett
Colonel, U. S. Army, Commanding
Headquarters, United States Army Garrison, Hawaii
Directorate of Public Works
947 Wright Ave, Wheeler Army Airfield
Schofield Barracks, HI 96857-5013

Dear sir:

In coordination with your staff, the U.S. Fish and Wildlife Service (Service) is providing this Draft Fish and Wildlife Coordination Act Planning Aid Report for the proposed breaching of the Ku Tree Dam, in the Schofield Barracks East Range. The Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended (FWCA), was established to provide a basic procedural framework for the orderly consideration of fish and wildlife conservation measures to be incorporated into Federal water resources development projects. This report has been prepared under the authority of and in accordance with provisions of the FWCA, the Federal Clean Water Act of 1977 [33 U.S.C. 1251 et seq.; 62 stat. 1155], as amended (CWA), and the Endangered Species Act [16 U.S.C 1531 et seq.], as amended (ESA). These comments are also consistent with the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended, and other authorities mandating the Service's review of projects and provision of technical assistance to conserve trust resources.

This report was prepared by the Service in coordination with the State of Hawaii's Department of Land and Natural Resources. We have also solicited comments from the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), and U.S. Environmental Protection Agency (EPA).

We appreciate the opportunity to provide input on the proposed project. If you have questions regarding the report, please contact Fish and Wildlife Biologist Dan Polhemus (dan_polhemus@fws.gov or 808-792-9415).

Sincerely,

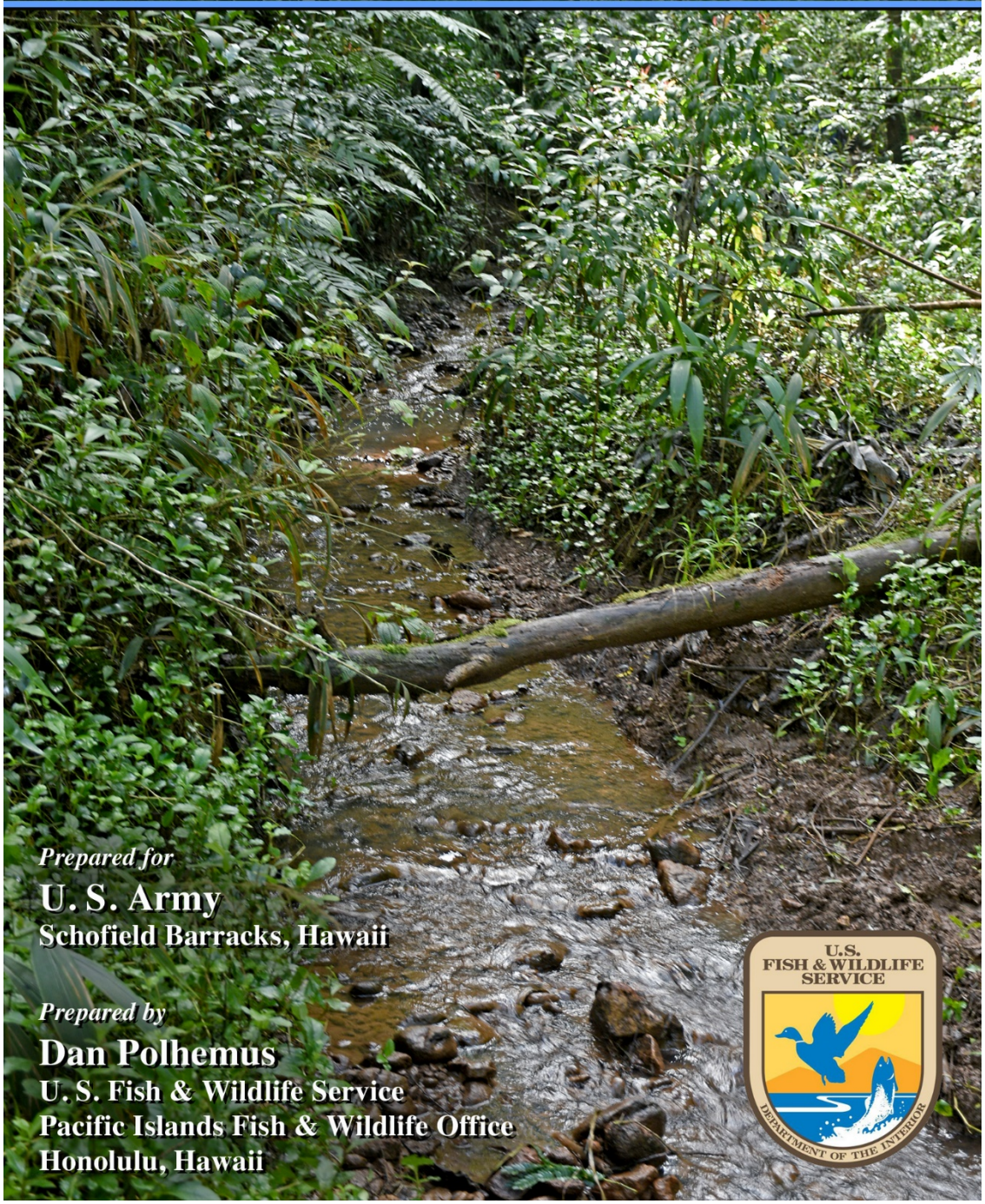
Gregory Koob
Deputy Field Supervisor

Phase 1 Aquatic Resources Habitat Characterization

Ku Tree Dam Removal, Kaukonahua Stream, Oahu Island, Hawaii

Planning Aid Report - Fish & Wildlife Coordination Act

DRAFT REPORT **March 2020**



Prepared for

U. S. Army
Schofield Barracks, Hawaii

Prepared by

Dan Polhemus
U. S. Fish & Wildlife Service
Pacific Islands Fish & Wildlife Office
Honolulu, Hawaii

Polhemus, D. A. 2020.

Phase 1 Aquatic Resources Habitat Characterization: Ku Tree Dam Removal, Oahu Island, Hawaii.

U. S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office

Fish and Wildlife Coordination Act Planning Aid Report

26 March 2020

All photographs by Dan A. Polhemus unless otherwise noted.

Cover: A small tributary to the South Fork of Kaukonahua Stream in the former reservoir pool area of the Ku Tree Dam (Station 1a).

DRAFT

FISH AND WILDLIFE COORDINATION ACT
PLANNING AID REPORT

KU TREE DAM REMOVAL SCHOFIELD BARRACKS, OAHU ISLAND, HAWAII

Prepared by:

DAN A. POLHEMUS

U.S. Department of the Interior
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

Prepared for:

U.S. Army Garrison Hawaii
Schofield Barracks, HI

26 March 2020

TABLE OF CONTENTS

INTRODUCTION

Authority, Purpose and Scope

The current document constitutes the U.S. Fish and Wildlife Service's (Service) draft Planning Aid Report on plans developed by the U.S. Army Garrison Hawaii (USAG-HI) for breaching the Ku Tree Dam, located along the south fork of Kaukonahua Stream in the Schofield Barracks West Range, on the island of Oahu, State of Hawaii (Figure 1). This report has been prepared under the authority of the Fish and Wildlife Coordination Act of 1934 (FWCA) [16 U.S.C. 661 *et seq.*; 48 Stat. 401], as amended, and other authorities mandating Department of the Interior (DOI) coordination to minimize impacts from federal projects. This report is also consistent with the National Environmental Policy Act of 1969 (NEPA) [42 U.S.C. 4321 *et seq.*; 83 Stat. 852], as amended and the Endangered Species Act of 1973 [16 U.S.C. 1531 *et. seq*.; 87 Stat. 884] (ESA), as amended (ESA). The purpose of this report is to document existing fish and wildlife resources at the proposed project sites and to ensure that fish and wildlife conservation receives equal consideration with other proposed project objectives as required under the FWCA. The report includes an assessment of conspicuous diurnal fish and wildlife resources at the proposed project sites, an evaluation of potential impacts associated with the proposed alternative actions, and recommendations for fish and wildlife mitigation measures.

The overall purpose of the project is to eliminate hazards of downstream flooding associated with potential unanticipated re-filling of the Ku Tree Reservoir and consequent failure of the currently un-maintained Ku Tree Dam. The dam is a hydraulic earth-filled dam, approximately 80 feet tall, and was constructed in 1925 to serve as a domestic water supply reservoir for Schofield Barracks (Fig. 1). At its maximum pool, the reservoir behind it was 32 acres in size and held 239 million gallons of water. The development of alternative water supplies in the 1950s eliminated the need for the reservoir, and the pool behind the dam was progressively drawn down, with complete drainage by 1983. Since that time, the flow of the stream feeding the reservoir has been conveyed into an opening at the base of the valve tower, then under the dam via a drain tunnel that emerges about 1,500 feet downstream of the dam Figures (3–6). In the absence of maintenance, debris accumulation in the outlet structure, or collapse or blockage of the drain tunnel, could lead to accidental re-filling of the reservoir. Such unanticipated impoundment is considered hazardous given the degraded structural integrity of the dam; unknown condition of the drain tunnel; and overgrown, inadequate condition of the dam spillway. Were the dam to fail, the resulting surge of water could imperil the integrity of the Wahiawa Dam and Reservoir, lying several miles downstream. A recent inspection of the Ku Tree Dam in July 2017 concluded that it was in critical condition and should receive immediate attention to minimize the risk of structural failure.

Based on these concerns, USAG-HI is conducting an integrated Feasibility Study/Environmental Assessment to assess the technical, environmental, and economic feasibility of permanently breaching the Ku Tree Dam. An initial study in 2004 included evaluation of several alternatives, ranging from notching the dam to complete dam removal and site restoration. On 3 January 2020, USAG-HI indicated to the Service that a Preferred Alternative had been selected, involving the excavation of an approximately 500-foot long channel through the natural hillside that supports the spillway at the south end of the dam. The excavated material would be used to block the upstream inlet to the drain tunnel that currently conveys stream waters under the dam, and the valve tower and associated walkways would be demolished. The remainder of the Ku

Tree Dam would stay in place. Evaluation of this revised Preferred Alternative forms the basis for the current report and evaluation.

Service biologists discussed the proposed project with staff of the National Marine Fisheries Service (NMFS), and fieldwork was conducted jointly with the Hawaii Department of Land and Natural Resources, Division of Aquatic Resources (DAR). The separate comments submitted by DAR to USAG-HI are included in this report (see Appendix A) as per the legal requirements of FWCA. Copies of this report will be provided to the NMFS, DAR, and the U.S. Environmental Protection Agency (EPA).

Prior Fish and Wildlife Service Studies and Reports

The USAG-HI originally initiated a Draft Environmental Assessment (EA) for a proposed breach of the Ku Tree Dam in 2004. This document proposed two alternatives, both of which involved routing the stream into concrete channels with differing alignments. The Service reviewed this EA under the authority of FWCA and issued a letter of response indicating concerns with the loss of natural stream channel that would result from implementation of either alternative, and also with the survey methodology proposed. The Service suggested that additional alternatives should be considered, including full or partial dam removal and more natural channel restoration. The DEA was subsequently put on hold and action on it was not resumed until 2011; after some additional revision, the DEA was eventually shelved and never published for public review or comment. In 2018, USAG-HI resumed work on a Revised Preliminary Draft EA, which addressed the concerns raised by the USFWS in 2004. The new EA included a revised project scope and a new preferred alternative as described previously.

In order to assess the current status of aquatic and terrestrial resources at the proposed project site, a site visit was conducted on 13 February 2020. Participants in this visit included USFWS biologists Dan Polhemus and Jeremy Raynal, as well as staff from both USAG-HI and the State of Hawaii's Division of Forestry and Wildlife (DOFAW), and the state's Division of Aquatic Resources (DAR). The information gathered during this site visit forms the basis for the subsequent evaluation of project impacts provided below.

DESCRIPTION OF THE PROJECT AREA

Kaukonahua Stream Catchment

The Ku Tree Dam is located at an elevation of approximately 1,080 feet on an un-named tributary to the South Fork of Kaukonahua Stream in hilly, heavily-forested terrain about 3 miles east of the town of Wahiawa, in central Oahu (Fig. 2). The Kaukonahua Stream catchment is one of the largest on Oahu, draining an extensive section of the leeward Koolau Mountains. The stream's headwaters lie at elevations near 2,350 ft. with two major branches, the North Fork and South Fork, each approximately 8 miles in length. They join at Wahiawa where they are impounded in Lake Wilson reservoir by the Wahiawa Dam that lies just downstream of the confluence. Below the Wahiawa Dam, the stream flows for another 7.5 miles to a seaward terminus at Hiiaka Bay. Throughout this lower reach the stream follows the northward-dipping dihedral topographic groove created by the convergence of sloping volcanic shields from the Waianae Mountains to the west and the Koolau Mountains to the east. A large number of

tributaries, many intermittent, join with the main stem Kaukonahua below Wahiawa from the slopes of the Waianae Mountains. On the east bank, there are no confluencing tributaries until just before Hiiaka Bay, where the stream is essentially coterminous with other long Koolau Mountain catchments that also converge on the dihedral, including the Poamoho, Helemano, and Opaeula.

The headwater reaches of the Kaukonahua catchment are covered in predominantly native upland rain forest, which intergrades downstream into wet and then mesic forests dominated by a progressively larger proportion of non-native plant species. The lower mid-reach of the stream below Wahiawa Dam flows in a deep canyon, bordered by predominantly non-native dry to mesic forests and shrublands on the west, and agricultural fields on the east. In the proposed project area, the dominant vegetation is a tall, non-native forest dominated by various *Eucalyptus* species. No native plants were seen in this area during the site visit in February 2020 except for the native, mat-forming *uluhe* fern, *Dicranopteris linearis*. In addition, the presence of the Wahiawa Dam and Lake Wilson creates a barrier that prevents native diadromous aquatic species from reaching the upper portion of the Kaukonahua catchment at this time.

FISH AND WILDLIFE RESOURCE CONCERNS AND PLANNING OBJECTIVES

The Service's primary concerns with the proposed project were to determine any potential impacts to endangered species and any other fish and wildlife trust resources and their habitats from planned construction activities in the stream channels and adjacent riparian habitats. Specific Service planning objectives were to maintain and enhance any existing significant habitat values at the proposed project site by (1) obtaining basic biological data for the proposed project site, (2) evaluating and analyzing the impacts of proposed project alternatives on fish and wildlife resources and their habitats, (3) identifying the proposed-project alternatives least damaging to fish and wildlife resources, and (4) recommending mitigation for unavoidable project-related habitat losses consistent with the FWCA and the Service's Mitigation Policy.

Under the authority of the ESA, the Department of the Interior and the Department of Commerce share responsibility for the conservation, protection, and recovery of federally listed endangered and threatened species. Authority to conduct consultations has been delegated by the Secretary of the Interior to the Director of the Service and by the Secretary of Commerce to the Assistant Administrator for Fisheries of the National Oceanic Atmospheric Administration (NOAA). Section 7(a)(2) of the ESA requires federal agencies, in consultation with and with the assistance of the Service or NMFS, to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitats. The Biological Opinion is the document that states the opinion of the Service or NMFS as to whether the federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

The Service's Mitigation Policy (Service, 1981) outlines internal guidance for evaluating project impacts affecting fish and wildlife resources. The Mitigation Policy complements the Service's participation under NEPA and the FWCA. The Service's Mitigation Policy was formulated with the intent of protecting and conserving the most important fish and wildlife resources while facilitating balanced development of the nation's natural resources. The policy focuses primarily

on habitat values and identifies four resource categories and mitigation guidelines. The resource categories are the following:

a) Resource Category 1: Habitat to be impacted is of high value for the evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section.

b) Resource Category 2: Habitat to be impacted is of high value for the evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section.

c) Resource Category 3: Habitat to be impacted is of high to medium value for the evaluation species and is relatively abundant on a national basis.

d) Resource Category 4: Habitat to be impacted is of medium to low value for the evaluation species.

The Service notes that riffle and pool habitat is currently present in the proposed project footprint. However, the disturbed nature of the stream channels examined during the site visit, which formerly lay under the reservoir pool, coupled with the current diversion of the stream waters into the drain tunnel for an extensive distance, and the presence of invasive fishes, leads the Service to consider the habitat to be impacted in this area as representing Category 4.

EVALUATION METHODOLOGY

Stream Channel Assessments

On February 13, 2020, Service biologists Dan Polhemus and Jeremy Raynal made a one-day visit to the proposed project site along a tributary to the South Fork of Kaukonahua Stream. This visit, conducted in the company of staff from USAG-HI, DOFAW, and DAR allowed photographs and visual observations to be made of the various stream channels and adjacent riparian areas that might be subject to modification. Biologists walked along approximately 100 feet of stream channel in an upstream direction at each site, making observations both visually and with the use of a pole-mounted underwater video camera.

Two individual sites were evaluated concerning the presence of freshwater fishes, crustaceans, mollusks, and insects (Fig. 1). The presence of all such species, both native and introduced, breeding in the stream for all or a portion of their life cycle were recorded. Photographs of these sampling stations are provided in Figures 1–6, and summary data on station locations, elevations, presence or absence of surface flow, and faunal observations are provided in Table 1.

DESCRIPTION OF FISH AND WILDLIFE RESOURCES

Stream Channel Assessments

The results of the February 13, 2020, site visit are summarized in Table 1 below. The Kaukonahua Stream tributary above the dam was reached by walking along the top of the old spillway, then descending a steep trail down the former inner face of the dam to a point near the valve tower (Fig. 3). It was confirmed that the stream waters were being collected at the base of the valve tower and being conveyed into the old drain tunnel (Fig. 4). Visual and underwater

camera surveys were made upstream from this point along the main flowing stream channel (Station 1, see Fig. 5), and along a smaller, shallower tributary that entered from the right when looking upstream (Station 1a, and see cover photo). The stream reaches examined were slightly turbid due to recent heavy rains, varying from 3–18 inches in depth. No native freshwater fishes, crustaceans, mollusks, or insects were observed along either of these stream reaches. By contrast, non-native green swordtails (*Xiphophorus helleri*), mosquitofish (*Gambusia affinis*), guppies (*Poecilia reticulata*), and red swamp crayfish (*Procambarus clarkii*) were all observed.

A brief visit was also made to the stream reach lying below the dam and the outlet of the drain tunnel, at a point where it is bridged by a road (Station 2, see Fig. 6). The stream had notably higher volume here than above the dam, indicating confluence with another undermined tributary somewhere between the dam and the bridge. Once again, no native freshwater fishes, crustaceans, mollusks, or insects were observed at this site.

Although the ESA-listed native damselfly species *Megalagrion nigrohamatum nigrolineatum* has been recorded from the North Fork of Kaukonahua Stream at 1,500 ft elevation as recently as 1996, no sign of this species was detected in the proposed project area along a tributary to the South Fork of the Kaukonahua.

TABLE 1. Summary of results from a site visit to the proposed project area conducted from 09:30–11:30 hrs. on February 13, 2020, by Service biologists D. A. Polhemus and J. Reynal. Site numbers correspond to those referenced in Figures 5 and 6.

Site #	**Location**	**Elev.** (ft)	**Latitude** (Lat) & **Longitude** (Long)	**Flow**	**Pools**	**Native Fish**	**Native Aq. Ins.**	Hydrological Comments	Biological Comments
1	Tributary to South Fork Kaukonahua Stream above Ku Tree Dam	1080	Lat: 21.497384 Long: -157.979475	Y	Y	N	N	Flowing water with riffle and pool habitat present	Non-native fishes and crayfish observed.
2	Tributary to South Fork Kaukonahua Stream below Ku Tree Dam	980	Lat: 21.490692 Long: -157.995198	Y	Y	N	N	Flowing water with riffle and pool habitat present	No aquatic species observed

DESCRIPTION OF ALTERNATIVES EVALUATED

Alternative 1 (Preferred): Dam Removal

As set forth in a letter from USAG-HI to the Service and DLNR dated January 3, 2020, which outlined a revised scope for this project, only a single Preferred Alternative is now being proposed. This involves the excavation of an approximately 500-foot long natural channel through the natural hillside that supports the spillway at the south end of the dam. The excavation of the hillside would match the elevation of the existing streambed, with a bottom width of 50 feet and 1 vertical to 1 horizontal side slopes, stepped with benches every 20 feet to reduce erosion. Turf reinforcement mats made of polypropylene would provide additional erosion control while allowing for eventual growth of mature plants along the margins of the newly excavated channel. The excavated material would be used to block the upstream inlet to the drain tunnel that currently conveys stream waters under the dam, and the valve tower and associated walkways would be demolished, while the remainder of the Ku Tree Dam would stay in place.

Alternative 2: No Action

The only other alternative being considered is No Action, which would result in no changes to the current configuration of the stream channel and its immediate surroundings.

PROJECT IMPACTS

The Service commends USAG-HI on their willingness to consider suggestions provided by our agency in 2004 for restoration of a natural channel rather than a concrete-lined ditch. The Service notes that the Preferred Alternative also allows reconnection of formerly severed stream channels and floodplains. The preferred alternative will serve to improve stream ecological and hydrological functions, such as flood plain water storage and detention, and ground water recharge. Overall, current native wildlife habitat functions and values along this tributary to Kaukonahua Stream appear to be extremely limited. As such, it is the Service's conclusion that breaching the Ku Tree Dam as proposed would have minimal impact to aquatic trust resources, and would in fact potentially enhance aquatic habitat values.

FISH AND WILDLIFE SERVICE RECOMMENDATIONS

The Service recommends that the following best management practices be applied to all activities pertaining to construction and maintenance activities for this project, in order to to prevent construction impacts to riparian or marine ecosystems lying downstream.

Best Management Practices

(1) The permittee should make every effort to develop and implement a plan for conducting all anticipated work involving stream channels during the summer dry season. Work should be ceased and re-scheduled in the event of an out-of-season heavy rainfall;

(2) Avoid conducting construction or subsequent maintenance activities that will lead to mid- and long-term destabilization and exposure of bare sediment along the stream banks or in the stream bed;

(3) No debris, petroleum projects, or deleterious materials or wastes shall be allowed to fall, flow, leach, or otherwise enter any waters of the United States;

(4) All authorized activities shall be done in a manner to confine and isolate the construction activity and to control and minimize any turbidity that may result from in-water work. Silt curtains or other appropriate and effective silt containment devices approved by the USACE shall be used to minimize turbidity and shall be properly maintained throughout the entire period of any in-water work to prevent the discharge of any material to the downstream aquatic habitat. All sediment control devices installed as BMPs (i.e., fabric sandbags, silt curtains/screens, etc.) downstream or makai of the authorized work shall remain in place until the in-water work is completed and will be removed in their entirety and disposed of at an appropriate upland location once the water quality of the affected area has returned to its pre-construction condition;

(5) Return flow or runoff from upland dewatering site(s)/disposal site(s) shall be contained on land and shall not be allowed to discharge and/or re-enter any waters of the United States;

(6) No sidecasting or stockpiling of excavated materials in the aquatic environment is authorized. All excavated materials shall be placed above the ordinary high water mark of any designated waters of the United States, or disposed of in an upland location. The permittee shall demonstrate that there is no reasonable expectation that disposal locations adjacent to high tide lines on the ocean, or in floodplains adjacent to other rivers or streams, would result in the material being eroded into the nearby waterbody by high tides and/or flood events;

(7) Warning signs shall be properly deployed and maintained until the portion of the in-water work is completed and the affected area water quality has returned to its preconstruction condition and turbidity control devices have been removed from the waterway;

(8) Fueling, repair, and other activities with any potential to release pollutants will occur in a location where there is no potential for spills to have an impact on waters of the United States; and

(9) When the USACE is notified that an authorized activity is detrimental to fish and wildlife resources, the USACE will issue a suspension order until all pertinent issues have been satisfactorily resolved. The permittee shall comply with any USACE-directed remedial measures deemed necessary to mitigate or eliminate the adverse effect.

SUMMARY AND FISH AND WILDLIFE SERVICE POSITION

Given the disturbed nature of the stream channels examined during the site visit, which formerly lay under a reservoir pool; the current diversion of the stream waters into a drain tunnel for an extensive distance under the Ku Tree Dam; the presence of invasive, non-native aquatic biota; the apparent absence of diadromous aquatic macrofauna or ESA-listed native damselfly species in the project footprint; and the overwhelmingly non-native composition of the flora and fauna in at the proposed project construction site, the Service does not consider that the Preferred Alternative, consisting of breaching the Ku Tree Dam and restoring a natural channel, will have

any significant or deleterious impacts to trust resources. Therefore, the Service concurs with the Preferred Alternative, provided management practices are implemented during construction.

The current FWCA Planning Aid Report is sufficient to cover the current planning phase of the proposed project. As the project progresses to design and eventual construction, USAG-HI should continue keep the Service informed of progress, in order to avoid or minimize any potential environmental effects. The Service also notes that any significant changes to the proposed project plan will require additional coordination with the Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii.

APPENDIX 1: State of Hawaii Comment Letter

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
JAN 28 2020
Division of Aquatic Resources
DAR 6082

January 24, 2020

LD 99-0122

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**
LOCATION: Schofield Barracks, Island of Oahu
TMK: (1) 7-6-001:001
APPLICANT: **Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works**

Transmitted for your review and comment is information on the above subject matter. If any reviewer is interested in an optional site visit being planned for USFWS & DLNR staff, please contact Kapua Kawelo (USAG-HI) before January 31, 2020 at (808) 655-9189 or via email at hilary.k.kawelo.civ@mail.mil.

Please submit any comments to Land Division by **February 19, 2020.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed:
Print Name: Brian J. Neilson
Date: Feb 28, 2020

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF
HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

Date: Feb. 26, 2020
DAR # 6082

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Glenn Higashi GH, Aquatic Biologist

SUBJECT: Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam

Request Submitted by: Russell Y. Tsuji, Land Administrator

Location of Project: Schofield Barracks, Island of Oahu TMK: (I) 7-6-001:001

Brief Description of Project:

Fish and Wildlife Coordination Act (FWCA) consultation with the U.S. Fish and Wildlife Service (USFWS) and State of Hawai'i Department of Land and Natural Resources (DLNR) concerning the proposed breaching of the Ku Tree Dam. The dam is located along the eastern periphery of the Schofield Plateau, Schofield Barracks East Range (SBE), on the Island of O'ahu, Hawai'i (Enclosures 1 and 2). The proposed federal action attempts to control or modify the upper reach of Kaukonahua Stream at the Ku Tree Dam. This proposed activity triggers requirement to consult with the USFWS and the DLNR in accordance with the provisions of the FWCA of 1934 (16 United States Code [USC]§ 661 et seq.; 48 Stat. 401) regarding conservation of wildlife resources in connection with

Comments:

☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: [signature] Date: Feb 28, 2020
Brian J. Neilson
DAR Administrator

DAR# 6082

Brief Description of Project

the proposed water resource project.

The proposed project area is approximately 29.56 acres and includes the Ku Tree Reservoir and associated components (earthen dam, tower, footbridge, and concrete spillway). In 2004, The Army identified a larger circular-shaped approximately 221-acre project area. The current project description refines and narrows the project area to a smaller footprint entirely within the previously proposed project area.

The proposed project involves breaching Ku Tree Dam by excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway. The excavation of the hillside matches the elevation of the existing streambed. The natural channel has a bottom width of approximately 50 feet with 1 vertical to 1 horizontal (1V:IH) side slopes and benches every 20 feet to minimize erosion. Included provisions ensure slope stability and establishment of vegetation. Proposed use of turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, provides erosion control while allowing for mature plant growth at the up- and down stream ends of the newly excavated natural channel. The proposed channel returns the site to a more natural condition (i.e., natural water flows and transport of sediment and nutrients, etc.) and provides a more favorable environment to native species returning to the area. Ku Tree Dam remains in place. Excess excavated material blocks water flow from entering the upstream dam passageway.

The proposed project includes demolition of the spillway and footbridges. A portion of the valve tower is demolished and the remainder plugged/abandoned. Demolished concrete is used as fill at an upstream and secondary fill location. Rebar/metal is disposed of off-site. The drain tunnel and drain discharge tunnel are permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower remains in-place.

The proposed project provides a 1% annual chance of exceedance (ACE) 24-hour storm flood protection. Breaching the dam with a natural channel through the spillway also meets the 5-foot depth requirement upstream of the natural channel and the depths further upstream are reasonable for a 1% ACE flood event (100-year, 24-hour storm event) (USACE, 2016).

Additionally, breaching of the dam removes any significant storage capacity of the reservoir, and eliminates the risk of catastrophic failure of the dam and resultant impacts on property and human safety. The estimated cost to implement the proposed action is $25,000,000.

DAR# 6082

Brief Description of Project

The Revised Preliminary Draft EA examines the environmental impacts, environmental benefits, technical feasibility, and relative costs of the Proposed Action and three alternative actions. A summary of the three alternative actions evaluated in the Revised Preliminary Draft EA is provided below. A number of alternatives were also considered but eliminated from further detailed evaluation in the Revised Preliminary Draft EA as they did not sufficiently satisfy the minimum project objectives and screening criteria.

Alternative A: No Action — The No Action alternative leaves the dam in place with no changes. Under this alternative, the Army conducts no improvements and/or maintenance, and the dam and its appurtenant structures continue to deteriorate. The reservoir remains in a drawn down, dewatered state and no water is intentionally impounded. In the absence of maintenance, debris is expected to accumulate in the outlet structure, which could lead to the refilling of the reservoir. Further, if the existing drain tunnel collapses or otherwise becomes inoperable, this may also lead to the refilling of the reservoir. Unintentional impounding of the water could tax the degraded structural integrity of the dam, potentially resulting in release of a large uncontrolled flow with adverse downstream impacts. Lack of maintenance, the unknown condition of the drain tunnel, inadequate spillway capacity, the potential for overtopping, and downstream slope seepage problems all contribute to possible dam failure. The cost of the No Action alternative is $0.

Alternative B: Notching the Dam — Alternative B cuts a notch in the dam to allow water to flow along its original flow path. This alternative cuts a trapezoidal-shaped notch to the existing streambed. The notch is 50-feet wide at its base with 1V:2H side slopes, and benched every 20 feet to minimize erosion. Included provisions ensure slope stability and the establishment of vegetation. This alternative includes demolition of the valve tower, spillway, and footbridges which may be used as onsite backfill or disposed of offsite. The valve tower intake is permanently plugged at or near the base of the tower. The drain tunnel and drain discharge tunnel are also permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. Under this alternative, the dam and reservoir retain no storage capacity and catastrophic failure of the dam is averted because the dam is permanently breached. The estimated cost to implement Alternative B is $60,500,000.

Alternative C: Dam Removal and Site Restoration — Alternative C involves the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions ("natural" conditions). This alternative accomplishes stream channel restoration by grading the hillside to complement the adjacent grades and by

DAR# 6082

Brief Description of Project

removing dam facilities so that natural passage of stream flow returns to pre-dam conditions. Under this alternative, reconnection of the natural stream channel above and below the dam restores 442 meters or 1,450 feet of aquatic and riparian habitat. Additionally, discontinued use of the drain tunnel re-waters a currently dry 1,640-foot reach below the dam. The estimated cost to implement Alternative C is $49,000,000.

The intent of this project is to breach the Ku Tree Dam, thereby eliminating the existing impoundment and allowing the stream to flow free of diversion, restoring channel connectivity throughout the project site. The Army redesigned the proposed project to incorporate recommendations provided by USFWS in prior consultations aimed at minimizing impacts to wildlife resources. Based on the new project scope, analysis, site observations, EA revisions, and prior consultation with the USFWS, we have determined that impacts to wildlife resources have been adequately considered in the development of this project.

DAR# 6082

Comments

DAR aquatic biologist attended the site visit (2/13/20) to the Ku Tree Dam in Schofield Barracks East Range. Unfortunately, the project consultant, R.M. Towill Corporation wasn't there to answer questions about this project. An underwater video camera was taken to capture aquatic stream biota. Because of previous rains the water was murky so visibility was poor. Recorded on the underwater video camera were green swordtails (Xiphophorus helleri), mosquito fishes (Gambusia affinis), guppies (Poecilia reticulata), and crayfish (Procambarus clarkii). The population of all fish contained both sexes and juveniles. Stream channel bottom was natural consisting of boulder, cobble, gravel, and sand and covered with silt.

DAR agrees with the USFWS that the Hawai'i Stream Bio-assessment Protocol (HSBP) - the protocol used by the Habitat and Biological Assessment of the Ku Tree Reservoir Streams - to evaluate stream fauna within the proposed project area, is inappropriate for evaluating biological conditions in the project area, therefore DAR recommends that a stream biological baseline survey be conducted above and below the Ku Tree Dam site to evaluate the stream fauna that are present in this area. DAR has not conducted any stream surveys in this area.

DAR recommendations:
1) DAR believes that the impact of the complete dam removal may contribute to an increase in sediment load to the Wahiawa Reservoir and therefore does not recommend it. DAR would prefer breaching the dam by notching it allowing stream flows to continue downstream along its original flow path which would avert the dam and reservoir from retaining any storage capacity leading to catastrophic failure of the dam. The dam would also prevent any sediments from going downstream and would act as a siltation basin;
2) maintaining the spillway structure to prevent the migration of introduced/invasive species (smallmouth bass, armored catfish, etc.) from moving upstream, but is not a barrier to native stream species;
3) prior to implementation of this project, DAR requests mapping stream channel habitat areas above and below the dam to provide a model for determining the impacts of the proposed project prior to construction activities.

Thank you for providing us the opportunity to review and comment on the Request for Agency Comments on Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam. Should there be any changes, amendments or modifications to the current plans, DAR requests the opportunity to review and comment on those changes.

FIGURES

Fig. **1**. An aerial photograph of the Ku Tree Dam, taken on 15 February 1932. NationalArchives II, Still Photo Section, photo order #18-AA-51-43.

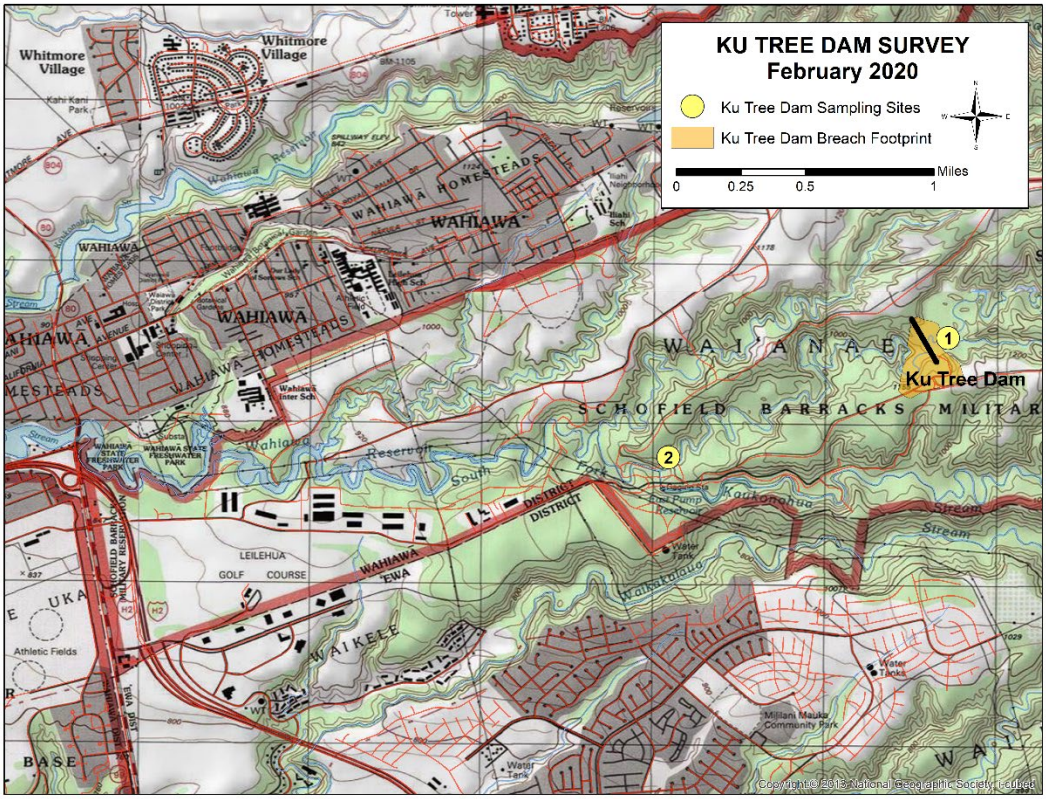


Fig. 2. Map showing the location of the Ku Tree Dam and proposed project impact boundary.

Fig. 3. The valve tower rising from the former reservoir pool area of the Ku Tree Dam.

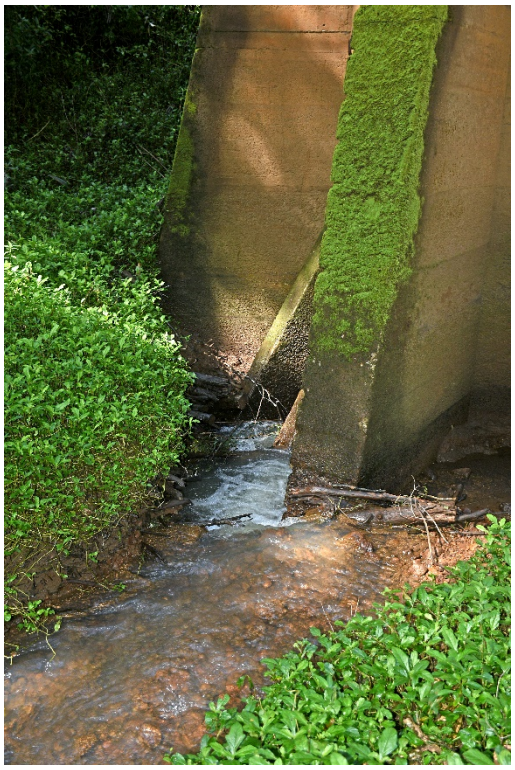


Fig. 4. Water flowing into the inlet to the drain tunnel at the base of the valve tower.

Fig. 5. Station 1, the main channel of the tributary to the South Fork of Kaukonahua Stream above Ku Tree Dam.

Fig. 6. Station 2, the main channel of the tributary to the South Fork of Kaukonahua Stream below Ku Tree Dam.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 28, 2020

LD 99-0122

Thomas J. Barrett, Colonel
Directorate of Public Works
US Army Garrison–Hawaii
947 Wright Avenue, Wheeler Army Airfield
Schofield Barracks, HI 96857-5013

via email: hilary.k.kawelo.civ@mail.mil

Dear Sirs:

SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation, Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**, Schofield Barracks, Island of Oahu, TMK: (1) 7-6-001:001

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to DLNR's various Divisions for their review and comments.

Enclosed are responses from our (a) Division of Aquatic Resources, (b) Engineering Division, (c) Commission on Water Resource Management, (d) Land Division–Oahu District, and (d) State Historic Preservation Division. Should you have any questions about the attached comments, please feel free to contact Barbara Lee at (808) 587-0453 or barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
DIRECTORATE OF PUBLIC WORKS
947 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5013

3 January 2020

Katherine Mullett
Field Supervisor, Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Suzanne Case
Chairperson, Department of Land and Natural Resources
State of Hawaii
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Field Supervisor Mullett and Chairperson Case:

Subject: Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, U.S. Army Garrison – Hawai'i (USAG-HI) Schofield Barracks, Island of O'ahu, Hawai'i Tax Map Key (1) 7-6-001:001

The Department of the Army is writing to continue Fish and Wildlife Coordination Act (FWCA) consultation with the U.S. Fish and Wildlife Service (USFWS) and State of Hawai'i Department of Land and Natural Resources (DLNR) concerning the proposed breaching of the Ku Tree Dam. The dam is located along the eastern periphery of the Schofield Plateau, Schofield Barracks East Range (SBE), on the Island of O'ahu, Hawai'i (Enclosures 1 and 2). The proposed federal action attempts to control or modify the upper reach of Kaukonahua Stream at the Ku Tree Dam. This proposed activity triggers requirement to consult with the USFWS and the DLNR in accordance with the provisions of the FWCA of 1934 (16 United States Code [USC] § 661 et seq.; 48 Stat. 401) regarding conservation of wildlife resources in connection with the proposed water resource project.

The Army first consulted the USFWS in the 2004 timeframe (Enclosure 3). Since that time, the Army refined and narrowed the project area to a smaller footprint and revised the method to breach the dam to better address the project's purpose and need. The Army also revised the content of the Draft Environmental Assessment (EA) to evaluate an expanded range of alternatives, document project changes, and clarify issues raised during prior consultations. The Army will circulate the EA to USFWS/DLNR for agency comment under the National Environmental Policy Act (NEPA), following completion of all applicable federal consultations.

Assessment of the Project Area

Ku Tree Dam is a hydraulic earth-filled dam. The dam and its reservoir are located in rough and heavily vegetated terrain approximately 3 miles east of Wahiawā town on an unnamed tributary to the south fork of Kaukonahua Stream. Ku Tree Dam is located at an elevation of approximately 1,080 feet in the Kaukonahua Watershed of the Ko'olau mountain range of central O'ahu. The Kaukonahua Stream system is formed by two major tributaries (South Fork and North Fork Kaukonahua streams) which join near the town of Wahiawā. The main stem of Kaukonahua Stream flows in a northerly direction through a visually striking valley that forms the abrupt geophysical divide between the residual Wai'anae and Ko'olau volcanoes that form the underlying basalt geology of the island.

Kaukonahua Stream joins Ki'iki'i Stream a short distance upstream of the Ki'iki'i confluence with the sea at Kaiaka Bay on O'ahu's North Shore. Kaukonahua Stream is the longest stream in the State of Hawai'i at 31 kilometers (19.3 miles) from the headwaters to its confluence with the sea. Therefore, it is considered one of the most significant surface water features in the State. The Kaukonahua system is also one of the most extensively altered stream systems in the State. Water development projects for industrial-scale sugarcane and pineapple agriculture, domestic water supply, and wastewater treatment have fundamentally altered the physical, chemical and biological features of the system for well over a hundred years. Alterations include the Wahiawā Dam and Reservoir, irrigation withdrawals with no requirement for in-stream conservation flows associated with licensing, the input of treated domestic wastewater, and input of storm water from impervious streets and structures in the proximity of urban areas of Wahiawā, Schofield Barracks, and Waialua.

Ku Tree Dam is located on an un-named perennial tributary to South Fork Kaukonahua Stream located on the U.S. Army-controlled training area known as SBE. The Army constructed the dam in 1925 to form a domestic water supply reservoir. At maximum capacity, the reservoir pool was 32 acres (13 hectares) in size and provided storage of 900 acre-feet (239 million gallons) of water. Alternative water supplies, developed in the early 1950s to meet the Army's needs, eliminated the need for the reservoir as a water source. Preliminary dam safety concerns resulted in significant draw down of water levels in 1978. Confirmation of dam safety risks in 1983 caused complete draw down. Currently, the dam structure does not impound any water.

Influent stream water enters a drainage tunnel at the deepest point of the basin, flows under the dam, and reenters the stream channel approximately 500 meters (m) [1640 feet (ft)] below the dam structure. If this drainage tunnel clogged and failed to transmit water beneath the dam, the reservoir would inadvertently refill and catastrophic failure of the

dam could result. In such an event, the floodwaters resulting from the dam failure would flow downstream into Wahiawā Reservoir. Relative risk to lives and property from a dam failure within the uninhabited flood zone extending from Ku Tree Dam downstream to Wahiawā Reservoir is low; however, such an event could significantly affect the safety of Wahiawā Dam and Reservoir.

Ku Tree Dam requires management to prevent dam failure and resulting environmental impacts. Complete draw down only offers temporary reduction of unsafe conditions at the reservoir and does not solve the safety problem. A 2007 safety inspection deemed Ku Tree Dam to be *unsafe, non-emergency* (Gannet Fleming, 2008). The most recent safety inspection of the dam was conducted in July 2017 (USACE, 2017). The inspection report found that Ku Tree Dam and Reservoir is in *critical condition* and should receive immediate attention to minimize the risk of structural failure. Breaching the dam would permanently remove the dangers and safety hazards should Ku Tree Dam fail.

Prior FWCA Consultation and Project History

The Army initiated an environmental impact analysis for the proposed breach of the Ku Tree Dam in early 2004. The Army sent a preliminary draft of the 2004 EA to the USFWS. The project scope included two alternatives to resolve the dam safety concerns: one alternative rerouted stream flows into a 400-foot-long cement channel that bypassed the dam entirely, and the second alternative routed stream flows into a similarly sized concrete channel built into the centerline of the dam itself. Subsequent to USFWS' review of the EA and a field visit to the dam site, the USFWS issued a letter response recommending the following summarized points:

- The USFWS believes that both of the alternatives presented in the 2004 Preliminary Draft EA would result in the permanent loss of the natural stream channel for which no compensatory mitigation was proposed to offset the loss. Additionally, the 2004 Preliminary Draft EA did not contain a discussion or evaluation for the removal of the dam and restoration of the natural channel.

- The USFWS believes that the range of alternatives considered in the 2004 Preliminary Draft EA should be expanded to include dam removal/channel restoration; and all alternatives should be evaluated on the basis of environmental impacts, environmental benefits, technical feasibility, and relative costs.

- The USFWS believes that the Hawai'i Stream Bio assessment Protocol (HSBP) — the protocol used by the Habitat and Biological Assessment of the Ku Tree Reservoir Streams — to evaluate stream fauna within the proposed project area, is inappropriate for evaluating biological conditions in the project area (note: HSBP is

biological assessment methodology accepted and used by the State of Hawai'i, Department of Health and Environmental Protection Agency as part of the CWA water quality monitoring effort). Additionally, the USFWS believes that the study's findings that the stream is severely impaired may be overstated because the survey did not include study sites downstream of the drain tunnel, where the stream channel is re-watered. In the absence of additional surveys, the USFWS stated that the Draft EA should clarify the locations and conditions of the survey sites.

- Following FWCA consultation with the USFWS in 2004, the project and the EA were put on hold. In 2011, the Army resumed preparation of the project EA to address issues raised from the 2004 scoping and consultation process. The project was again put on hold and the Draft EA never published for public review and comment. In 2018, the Army resumed the project and developed the current Revised Preliminary Draft EA document to build upon and carry forward the EA process. The current draft addresses the concerns raised by the USFWS in 2004. Amendments include a revised method to breach the dam to include a natural channel, an expanded range of alternatives to include dam removal/channel restoration, and clarification of the locations and conditions of the stream survey sites. The next section describes the new project scope for the proposed breach of Ku Tree dam and a summary of the alternatives assessed in the Revised Preliminary Draft EA. While an additional survey of the Ku Tree Reservoir streams was not conducted, the Army included and clarified the concerns raised by the USFWS in 2004 regarding the locations and conditions of the stream survey sites in the Revised Preliminary Draft EA.

Project Area

The proposed project area is approximately 29.56 acres and includes the Ku Tree Reservoir and associated components (earthen dam, tower, footbridge, and concrete spillway). In 2004, The Army identified a larger circular-shaped approximately 221-acre project area. The current project description refines and narrows the project area to a smaller footprint entirely within the previously proposed project area.

New Project Scope

The proposed project involves breaching Ku Tree Dam by excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway. The excavation of the hillside matches the elevation of the existing streambed. The natural channel has a bottom width of approximately 50 feet with 1 vertical to 1 horizontal (1V:1H) side slopes and benches every 20 feet to minimize erosion. Included provisions ensure slope stability and establishment of vegetation. Proposed use of turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene,

provides erosion control while allowing for mature plant growth at the up- and downstream ends of the newly excavated natural channel. The proposed channel returns the site to a more natural condition (i.e., natural water flows and transport of sediment and nutrients, etc.) and provides a more favorable environment to native species returning to the area. Ku Tree Dam remains in place. Excess excavated material blocks water flow from entering the upstream dam passageway.

The proposed project includes demolition of the spillway and footbridges. A portion of the valve tower is demolished and the remainder plugged/abandoned. Demolished concrete is used as fill at an upstream and secondary fill location. Rebar/metal is disposed of off-site. The drain tunnel and drain discharge tunnel are permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower remains in-place.

The proposed project provides a 1% annual chance of exceedance (ACE) 24-hour storm flood protection. Breaching the dam with a natural channel through the spillway also meets the 5-foot depth requirement upstream of the natural channel and the depths further upstream are reasonable for a 1% ACE flood event (100-year, 24-hour storm event) (USACE, 2016). Additionally, breaching of the dam removes any significant storage capacity of the reservoir, and eliminates the risk of catastrophic failure of the dam and resultant impacts on property and human safety. The estimated cost to implement the Proposed Action is $25,000,000.

Expanded Range of Alternatives

The Revised Preliminary Draft EA examines the environmental impacts, environmental benefits, technical feasibility, and relative costs of the Proposed Action and three alternative actions. A summary of the three alternative actions evaluated in the Revised Preliminary Draft EA is provided below. A number of alternatives were also considered but eliminated from further detailed evaluation in the Revised Preliminary Draft EA as they did not sufficiently satisfy the minimum project objectives and screening criteria.

Alternative A: No Action – The No Action alternative leaves the dam in place with no changes. Under this alternative, the Army conducts no improvements and/or maintenance, and the dam and its appurtenant structures continue to deteriorate. The reservoir remains in a drawn down, dewatered state and no water is intentionally impounded. In the absence of maintenance, debris is expected to accumulate in the outlet structure, which could lead to the refilling of the reservoir. Further, if the existing drain tunnel collapses or otherwise becomes inoperable, this may also lead to the refilling of the reservoir. Unintentional impounding of the water could tax the degraded structural integrity of the dam, potentially resulting in release of a large uncontrolled flow with

adverse downstream impacts. Lack of maintenance, the unknown condition of the drain tunnel, inadequate spillway capacity, the potential for overtopping, and downstream slope seepage problems all contribute to possible dam failure. The cost of the No Action alternative is $0.

Alternative B: Notching the Dam – Alternative B cuts a notch in the dam to allow water to flow along its original flow path. This alternative cuts a trapezoidal-shaped notch to the existing streambed. The notch is 50-feet wide at its base with 1V:2H side slopes, and benched every 20 feet to minimize erosion. Included provisions ensure slope stability and the establishment of vegetation. This alternative includes demolition of the valve tower, spillway, and footbridges which may be used as onsite backfill or disposed of offsite. The valve tower intake is permanently plugged at or near the base of the tower. The drain tunnel and drain discharge tunnel are also permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. Under this alternative, the dam and reservoir retain no storage capacity and catastrophic failure of the dam is averted because the dam is permanently breached. The estimated cost to implement Alternative B is $60,500,000.

Alternative C: Dam Removal and Site Restoration – Alternative C involves the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions ("natural" conditions). This alternative accomplishes stream channel restoration by grading the hillside to complement the adjacent grades and by removing dam facilities so that natural passage of stream flow returns to pre-dam conditions. Under this alternative, reconnection of the natural stream channel above and below the dam restores 442 meters or 1,450 feet of aquatic and riparian habitat. Additionally, discontinued use of the drain tunnel re-waters a currently dry 1,640-foot reach below the dam. The estimated cost to implement Alternative C is $49,000,000.

Conclusion

The intent of this project is to breach the Ku Tree Dam, thereby eliminating the existing impoundment and allowing the stream to flow free of diversion, restoring channel connectivity throughout the project site. The Army redesigned the proposed project to incorporate recommendations provided by USFWS in prior consultations aimed at minimizing impacts to wildlife resources. Based on the new project scope, analysis, site observations, EA revisions, and prior consultation with the USFWS, we have determined that impacts to wildlife resources have been adequately considered in the development of this project.

We welcome any additional recommendations the USFWS/DLNR may offer to further minimize potential impacts to fish and wildlife resources. We request USFWS/DLNR

written response within 30 days from the date of receipt of this letter. If there is no response from USFWS/DLNR within 30 days, then USAG-HI will assume that USFWS/DLNR neither objects to nor offers any additional recommendations and that the USAG-HI has completed its consultation responsibilities under the FWCA.

Following the completion of FWCA consultation with the USFWS/DLNR, the Army will conduct final updates of the EA to document prior and current issues raised and circulated to USFWS/DLNR for comment under NEPA. If USFWS/DLNR has any questions about this project please contact Kapua Kawelo, Natural Resources Manager, USAG-HI, at (808) 655-9189 or by email to hilary.k.kawelo.civ@mail.mil.

Sincerely,

BARRETT.THOMAS.JOSEPH.1179088467 Digitally signed by BARRETT.THOMAS.JOSEPH.1179088467 Date: 2020.01.03 06:27:36 -10'00'

Thomas J. Barrett
Colonel, U.S. Army
Commanding

Enclosures

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
JAN 28 2020
Division of Aquatic Resources
DAR 6082

January 24, 2020

LD 99-0122

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: for Russell Y. Tsuji, Land Administrator
SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**
LOCATION: Schofield Barracks, Island of Oahu
TMK: (1) 7-6-001:001
APPLICANT: **Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works**

Transmitted for your review and comment is information on the above subject matter. If any reviewer is interested in an optional site visit being planned for USFWS & DLNR staff, please contact Kapua Kawelo (USAG-HI) before January 31, 2020 at (808) 655-9189 or via email at hilary.k.kawelo.civ@mail.mil.

Please submit any comments to Land Division by **February 19, 2020.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: _____
Print Name: Brian J. Neilson
Date: Feb 28, 2020

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

Date: Feb. 26, 2020
DAR # 6082

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Glenn Higashi GH, Aquatic Biologist

SUBJECT: Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam

Request Submitted by: Russell Y. Tsuji, Land Administrator

Location of Project: Schofield Barracks, Island of Oahu TMK: (I) 7-6-001:001

Brief Description of Project:

Fish and Wildlife Coordination Act (FWCA) consultation with the U.S. Fish and Wildlife Service (USFWS) and State of Hawai'i Department of Land and Natural Resources (DLNR) concerning the proposed breaching of the Ku Tree Dam. The dam is located along the eastern periphery of the Schofield Plateau, Schofield Barracks East Range (SBE), on the Island of O'ahu, Hawai'i (Enclosures 1 and 2). The proposed federal action attempts to control or modify the upper reach of Kaukonahua Stream at the Ku Tree Dam. This proposed activity triggers requirement to consult with the USFWS and the DLNR in accordance with the provisions of the FWCA of 1934 (16 United States Code [USC]§ 661 et seq.; 48 Stat. 401) regarding conservation of wildlife resources in connection with

Comments:

☐ No Comments ☒ Comments Attached

Thank you for providing DAR the opportunity to review and comment on the proposed project. Should there be any changes to the project plan, DAR requests the opportunity to review and comment on those changes.

Comments Approved: _____ Date: Feb 28, 2020
Brian J. Neilson
DAR Administrator

DAR# 6082

Brief Description of Project

the proposed water resource project.

The proposed project area is approximately 29.56 acres and includes the Ku Tree Reservoir and associated components (earthen dam, tower, footbridge, and concrete spillway). In 2004, The Army identified a larger circular-shaped approximately 221-acre project area. The current project description refines and narrows the project area to a smaller footprint entirely within the previously proposed project area.

The proposed project involves breaching Ku Tree Dam by excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway. The excavation of the hillside matches the elevation of the existing streambed. The natural channel has a bottom width of approximately 50 feet with 1 vertical to 1 horizontal (1V:IH) side slopes and benches every 20 feet to minimize erosion. Included provisions ensure slope stability and establishment of vegetation. Proposed use of turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, provides erosion control while allowing for mature plant growth at the up- and down stream ends of the newly excavated natural channel. The proposed channel returns the site to a more natural condition (i.e., natural water flows and transport of sediment and nutrients, etc.) and provides a more favorable environment to native species returning to the area. Ku Tree Dam remains in place. Excess excavated material blocks water flow from entering the upstream dam passageway.

The proposed project includes demolition of the spillway and footbridges. A portion of the valve tower is demolished and the remainder plugged/abandoned. Demolished concrete is used as fill at an upstream and secondary fill location. Rebar/metal is disposed of off-site. The drain tunnel and drain discharge tunnel are permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower remains in-place.

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Additionally, breaching of the dam removes any significant storage capacity of the reservoir, and eliminates the risk of catastrophic failure of the dam and resultant impacts on property and human safety. The estimated cost to implement the proposed action is $25,000,000.

DAR# 6082

Brief Description of Project

The Revised Preliminary Draft EA examines the environmental impacts, environmental benefits, technical feasibility, and relative costs of the Proposed Action and three alternative actions. A summary of the three alternative actions evaluated in the Revised Preliminary Draft EA is provided below. A number of alternatives were also considered but eliminated from further detailed evaluation in the Revised Preliminary Draft EA as they did not sufficiently satisfy the minimum project objectives and screening criteria.

Alternative A: No Action — The No Action alternative leaves the dam in place with no changes. Under this alternative, the Army conducts no improvements and/or maintenance, and the dam and its appurtenant structures continue to deteriorate. The reservoir remains in a drawn down, dewatered state and no water is intentionally impounded. In the absence of maintenance, debris is expected to accumulate in the outlet structure, which could lead to the refilling of the reservoir. Further, if the existing drain tunnel collapses or otherwise becomes inoperable, this may also lead to the refilling of the reservoir. Unintentional impounding of the water could tax the degraded structural integrity of the dam, potentially resulting in release of a large uncontrolled flow with adverse downstream impacts. Lack of maintenance, the unknown condition of the drain tunnel, inadequate spillway capacity, the potential for overtopping, and downstream slope seepage problems all contribute to possible dam failure. The cost of the No Action alternative is $0.

Alternative B: Notching the Dam — Alternative B cuts a notch in the dam to allow water to flow along its original flow path. This alternative cuts a trapezoidal-shaped notch to the existing streambed. The notch is 50-feet wide at its base with 1V:2H side slopes, and benched every 20 feet to minimize erosion. Included provisions ensure slope stability and the establishment of vegetation. This alternative includes demolition of the valve tower, spillway, and footbridges which may be used as onsite backfill or disposed of offsite. The valve tower intake is permanently plugged at or near the base of the tower. The drain tunnel and drain discharge tunnel are also permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. Under this alternative, the dam and reservoir retain no storage capacity and catastrophic failure of the dam is averted because the dam is permanently breached. The estimated cost to implement Alternative B is $60,500,000.

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DAR# 6082

Brief Description of Project

removing dam facilities so that natural passage of stream flow returns to pre-dam conditions. Under this alternative, reconnection of the natural stream channel above and below the dam restores 442 meters or 1,450 feet of aquatic and riparian habitat. Additionally, discontinued use of the drain tunnel re-waters a currently dry 1,640-foot reach below the dam. The estimated cost to implement Alternative C is $49,000,000.

The intent of this project is to breach the Ku Tree Dam, thereby eliminating the existing impoundment and allowing the stream to flow free of diversion, restoring channel connectivity throughout the project site. The Army redesigned the proposed project to incorporate recommendations provided by USFWS in prior consultations aimed at minimizing impacts to wildlife resources. Based on the new project scope, analysis, site observations, EA revisions, and prior consultation with the USFWS, we have determined that impacts to wildlife resources have been adequately considered in the development of this project.

DAR# 6082

Comments

DAR aquatic biologist attended the site visit (2/13/20) to the Ku Tree Dam in Schofield Barracks East Range. Unfortunately, the project consultant, R.M. Towill Corporation wasn't there to answer questions about this project. An underwater video camera was taken to capture aquatic stream biota. Because of previous rains the water was murky so visibility was poor. Recorded on the underwater video camera were green swordtails (Xiphophorus helleri), mosquito fishes (Gambusia affinis), guppies (Poecilia reticulata), and crayfish (Procambarus clarkii). The population of all fish contained both sexes and juveniles. Stream channel bottom was natural consisting of boulder, cobble, gravel, and sand and covered with silt.

DAR agrees with the USFWS that the Hawai'i Stream Bio-assessment Protocol (HSBP) - the protocol used by the Habitat and Biological Assessment of the Ku Tree Reservoir Streams - to evaluate stream fauna within the proposed project area, is inappropriate for evaluating biological conditions in the project area, therefore DAR recommends that a stream biological baseline survey be conducted above and below the Ku Tree Dam site to evaluate the stream fauna that are present in this area. DAR has not conducted any stream surveys in this area.

DAR recommendations:
1) DAR believes that the impact of the complete dam removal may contribute to an increase in sediment load to the Wahiawa Reservoir and therefore does not recommend it. DAR would prefer breaching the dam by notching it allowing stream flows to continue downstream along its original flow path which would avert the dam and reservoir from retaining any storage capacity leading to catastrophic failure of the dam. The dam would also prevent any sediments from going downstream and would act as a siltation basin;
2) maintaining the spillway structure to prevent the migration of introduced/invasive species (smallmouth bass, armored catfish, etc.) from moving upstream, but is not a barrier to native stream species;
3) prior to implementation of this project, DAR requests mapping stream channel habitat areas above and below the dam to provide a model for determining the impacts of the proposed project prior to construction activities.

Thank you for providing us the opportunity to review and comment on the Request for Agency Comments on Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam. Should there be any changes, amendments or modifications to the current plans, DAR requests the opportunity to review and comment on those changes.

DAR#6082_Memorandum-ProposedBreachingofKuTreeDam

Final Audit Report 2020-02-28

Created:	2020-02-27
By:	Glenn Higashi (Glenn.R.Higashi@hawaii.gov)
Status:	Signed
Transaction ID:	CBJCHBCAABAAECUh13gOpMyCaPTEM9TJq8ROLEgbjttj

"DAR#6082_Memorandum-ProposedBreachingofKuTreeDam" History

Document created by Glenn Higashi (Glenn.R.Higashi@hawaii.gov)
2020-02-27 - 1:45:09 AM GMT- IP address: 132.160.239.30

Document approved by Glenn Higashi (Glenn.R.Higashi@hawaii.gov)
Approval Date: 2020-02-27 - 1:48:27 AM GMT - Time Source: server- IP address: 132.160.239.30

Document emailed to Brian Neilson (brian.j.neilson@hawaii.gov) for signature
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Email viewed by Brian Neilson (brian.j.neilson@hawaii.gov)
2020-02-27 - 4:03:28 AM GMT- IP address: 107.77.228.201

Document e-signed by Brian Neilson (brian.j.neilson@hawaii.gov)
Signature Date: 2020-02-28 - 5:55:30 PM GMT - Time Source: server- IP address: 132.160.239.30

Signed document emailed to Barbara Lee (barbara.j.lee@hawaii.gov), Glenn Higashi (Glenn.R.Higashi@hawaii.gov), kendall.l.tucker@hawaii.gov, Kelly Yoshizaki (kelly.k.yoshizaki@hawaii.gov), and 2 more
2020-02-28 - 5:55:30 PM GMT

ETS
STATE OF HAWAI'I

LD226

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2020 FEB 14 AM 10: 39
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 24, 2020

LD 99-0122

MEMORANDUM

FROM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: for Russell Y. Tsuji, Land Administrator
SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**
LOCATION: Schofield Barracks, Island of Oahu
TMK: (1) 7-6-001:001
APPLICANT: **Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works**

'20 JAN 28 AM 10:43 ENGINEERING

Transmitted for your review and comment is information on the above subject matter. If any reviewer is interested in an optional site visit being planned for USFWS & DLNR staff, please contact Kapua Kawelo (USAG-HI) before January 31, 2020 at (808) 655-9189 or via email at hilary.k.kawelo.civ@mail.mil.

Please submit any comments to Land Division by **February 19, 2020.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Print Name: Carty S. Chang, Chief Engineer
Date: 2/13/20

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam
TMK(s): (1) 7-6-001:001
Location: Schofield Barracks, Island of Oahu
Applicant: Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

This project will require a dam removal permit issued by the Board of Land and Natural Resources (Hawaii Revised Statutes 179D, Section 3). The permit application and the minimum design requirements are identified in the Hawaii Administrative Rules Chapter 13-190.1. Additional information and an application form may be obtained under "forms" on the DLNR Dam Safety website (dlnreng.hawaii.gov/dam).

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 2/13/20

2495

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 24, 2020

LD 99-0122

MEMORANDUM

RECEIVED
LAND DIVISION
2020 MAY -5 PM 2:29
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: for Russell Y. Tsuji, Land Administrator
SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**
LOCATION: Schofield Barracks, Island of Oahu
TMK: (1) 7-6-001:001
APPLICANT: **Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works**

Transmitted for your review and comment is information on the above subject matter. If any reviewer is interested in an optional site visit being planned for USFWS & DLNR staff, please contact Kapua Kawelo (USAG-HI) before January 31, 2020 at (808) 655-9189 or via email at hilary.k.kawelo.civ@mail.mil.

Please submit any comments to Land Division by **February 19, 2020.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Print Name: **DAVID G. SMITH, Administrator**
Date: MAY 0 5 2020

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

February 27, 2020

MEMORANDUM

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

DGS

SUBJECT: **Division of Forestry and Wildlife Comments on the Fish and Wildlife Coordination Act Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**

The Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding the Department of the Army's Fish and Wildlife Coordination Act consultation for the proposed breaching of Ku Tree Dam at Schofield Barracks East Range, on the island of O'ahu, TMK: (1) 7-6-001:001. The proposed project area is approximately 29.56 acres and comprises the Ku Tree Reservoir and associated components including an earthen dam, tower, footbridges, and concrete spillway. The proposed project consists of excavating and engineering an approximately 500-foot natural channel through the existing spillway, demolishing the spillway, footbridges, and part of the tower, and breaching Ku Tree dam.

The project work on Kaukonahua Stream could affect endangered native Hawaiian damselflies (*Megalagrion* spp.) that may be present. DOFAW recommends that a survey be conducted by a qualified entomologist to determine if listed damselflies are present in the project area and to assess any potential impacts to those species.

The State listed Hawaiian Hoary Bat or 'Ōpe'ape'a (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the project area and may roost in nearby trees. If any site clearing is required this should be timed to avoid disturbance during the bat birthing and pup rearing season (June 1 through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting DOFAW.

We note that artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, DOFAW recommends that all lights be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea.

State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) have the potential to occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact DOFAW at (808) 973-9778.

DOFAW recommends minimizing the movement of plant or soil material between worksites, such as in fill. Soil and plant material may contain invasive fungal pathogens (e.g. Rapid 'Ōhi'a Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the O'ahu Invasive Species Committee at (808) 266-7994 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid 'Ōhi'a Death and other harmful fungal pathogens.

Thank you for the opportunity for our staff to attend the site visit on February 13, 2020. We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please call 587-0166.

LD 215

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2020 FEB 13 AM 10: 45
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

RECEIVED
COMMISSION ON WATER RESOURCE MANAGEMENT
2020 JAN 28 AM 10: 55

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 24, 2020

LD 99-0122

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**
LOCATION: Schofield Barracks, Island of Oahu
TMK: (1) 7-6-001:001
APPLICANT: **Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works**

Transmitted for your review and comment is information on the above subject matter. If any reviewer is interested in an optional site visit being planned for USFWS & DLNR staff, please contact Kapua Kawelo (USAG-HI) before January 31, 2020 at (808) 655-9189 or via email at hilary.k.kawelo.civ@mail.mil.

Please submit any comments to Land Division by **February 19, 2020.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(x) Comments are attached.

Signed: /s/ M. Kaleo Manuel
Print Name: Deputy Director
Date: February 10, 2020

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON

BRUCE S. ANDERSON, PH.D.
KAMANA BEAMER, PH.D.
MICHAEL G. BUCK
NEIL J. HANNAHS
WAYNE K. KATAYAMA
PAUL J. MEYER

M. KALEO MANUEL
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

February 10, 2020

REF: RFD.5329.3

TO: Mr. Russell Tsuji, Administrator
Land Division

FROM: M. Kaleo Manuel, Deputy Director
Commission on Water Resource Management

SUBJECT: Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam

FILE NO.: RFD.5329.3
TMK NO.: (1) 7-6-001:001

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://dlnr.hawaii.gov/cwrm.

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EAP as having high water efficiency can be found at http://www.epa.gov/watersense.

☐ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://planning.hawaii.gov/czm/initiatives/low-impact-development/

☐ 6. We recommend the use of alternative water sources, wherever practicable.

☐ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program.

☐ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at

http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf.

☐ 9. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

☐ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) are required before the commencement of any well construction work.

☐ 12. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 13. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 14. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☒ 15. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a steam channel.

☐ 16. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 17. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 18. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☐ OTHER:

If you have any questions, please contact Dean Uyeno of the Commission staff at 587-0234.

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 24, 2020

LD 99-0122

MEMORANDUM

TO: **DLNR Agencies:**
_X_ Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
_X_ Engineering Division
_X_ Div. of Forestry & Wildlife
__ Div. of State Parks
_X_ Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District
_X_ Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: for Russell Y. Tsuji, Land Administrator
SUBJECT: **Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam**
LOCATION: Schofield Barracks, Island of Oahu
TMK: (1) 7-6-001:001
APPLICANT: **Department of the Army, U.S. Army Garrison-Hawaii (USAG-Hi), Directorate of Public Works**

Transmitted for your review and comment is information on the above subject matter. If any reviewer is interested in an optional site visit being planned for USFWS & DLNR staff, please contact Kapua Kawelo (USAG-HI) before January 31, 2020 at (808) 655-9189 or via email at hilary.k.kawelo.civ@mail.mil.

Please submit any comments to Land Division by **February 19, 2020.** If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Barbara Lee at 587-0453 or at barbara.j.lee@hawaii.gov. Thank you.

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]
Print Name: PATTI MIYASHIRO
Date: 1/28/2020

Attachments
Cc: Central Files

FW: Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam

TR

Tsuji, Russell Y
To Chang, Carty S; Matsuda, Edwin Y
Cc Hirokawa, Ian C; Lee, Barbara J

Tue 12:39 PM

1-7-6-001_2020-00200_2002SH02_ARCHY_6E_106_CONSULT_INFO_REQ.pdf
271 KB

From: Lebo, Susan A <susan.a.lebo@hawaii.gov>
Sent: Tuesday, February 11, 2020 12:26 PM
To: Tsuji, Russell Y <Russell.Y.Tsuji@hawaii.gov>; Hacker, Stephanie <stephanie.hacker@hawaii.gov>; hilary.k.kawelo.cov@mail.mil; Lee, Barbara J <barbara.j.lee@hawaii.gov>
Subject: Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam

Hello,

Attached is a pdf copy of our division's review of the following:

Chapter 6E-8 Historic Preservation Review –
Request for Comments
Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam
Ref. No. LD 99-0122
Wai'anae Ahupua'a, Wai'anae District, Island of O'ahu
TMK: (1) 7-6-001:001

Sincerely,

Susan

Susan A. Lebo, PhD
Archaeology Branch Chief
State Historic Preservation Division
Department of Land and Natural Resources
Kakuhihewa Building
601 Kamakila Blvd., Suite 555
Kapolei, HI 96707
(808) 692-8019

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

February 10, 2020

IN REPLY REFER TO:
Log No.: 2020.00200
Doc. No.: 2002SH02
Archaeology

Russell Y. Tsuji, Land Administrator
Land Division
State of Hawai'i Department of Land and Natural Resources
Post Office Box 621
Honolulu, Hawai'i 96809
Email: Russell.Y.Tsuji@hawaii.gov

Dear Russell Tsuji:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –**
Request for Comments
Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam
Ref. No. LD 99-0122
Wai'anae Ahupua'a, Wai'anae District, Island of O'ahu
TMK: (1) 7-6-001:001

The State Historic Preservation Division (SHPD) received a letter dated January 24, 2020 from the State of Hawai'i Department of Land and Natural Resources (DLNR), Land Division to request SHPD's comments for the Schofield Barracks East Range, Proposed Breaching of Ku Tree Dam project on the island of O'ahu. The SHPD received this submittal on January 27, 2020.

The subject submittal includes a letter from the Department of the Army (USAG-HI) to the U.S. Fish and Wildlife Service (FWS) and the DLNR in order to continue consultation under the Fish and Wildlife Coordination Act. According to the USAG-HI, Ku Tree Dam, built in 1925, requires management to prevent dam failure and resulting environmental impacts. The proposed project involves breaching Ku Tree Dam by excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway. Included provisions ensure slope stability and establishment of vegetation. Proposed use of turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene, provides erosion control while allowing for mature plant growth at the up- and downstream ends of the newly excavated natural channel. The proposed channel returns the site to a more natural condition (i.e., natural water flows and transport of sediment and nutrients, etc.) and provides a more favorable environment to native species returning to the area. Ku Tree Dam will remain in place. Excess excavated material blocks water flow from entering the upstream dam passageway.

The proposed project includes demolition of the spillway and footbridges. A portion of the valve tower will be demolished, and the remainder plugged/abandoned. Demolished concrete is used as fill at an upstream and secondary fill location. Rebar/metal will be disposed of off-site. The drain tunnel and drain discharge tunnel will be permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower will remain in-place

The USAG-HI has determined the proposed project area is approximately 29.56 acres and includes the Ku Tree Reservoir and associated components (earthen dam, tower, footbridge, and concrete spillway). In 2004, The Army identified a larger circular-shaped approximately 221-acre project area. The current project description refines and narrows the project area to a smaller footprint entirely within the previously proposed project area.

The proposed project will be carried out by the USAG-HI and requires approval from the U.S. Fish and Wildlife Service, therefore the SHPD anticipates the proposed project will be a federal undertaking as defined in 36 CFR 800.16(y) and will consequently require Section 106 review per the National Historic Preservation Act (NHPA). Additionally, if the proposed project requires approval or a permit from a state or local agency or will utilize state funds or land, the proposed project will also require historic preservation review under State of Hawai'i Administrative Rules Chapter 6E-8.

The SHPD anticipates receiving, from the lead federal agency, initiation of Section 106 consultation for the proposed project, prior to initiation of the project work. Additionally, as stated, should the proposed project require state lands, funding, approval, or permitting, the SHPD will anticipate receiving a letter from the local agency with a request for review and concurrence with the significance assessment of historic properties and the HRS 6E-8 project effect determination.

Please contact Stephanie Hacker, Historic Preservation Archaeologist IV, at Stephanie.Hacker@hawaii.gov or at (808) 692-8046 for matters regarding archaeological resources or this letter.

Aloha,

Alan Downer

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

cc: Kapua Kawelo, USAG-HI (hilary.k.kawelo.cov@mail.mil)
Barbara Lee, DLNR Land Division (Barbara.j.lee@hawaii.gov)

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
DIRECTORATE OF PUBLIC WORKS
947 WRIGHT AVENUE, WHEELER ARMY AIRFIELD
SCHOFIELD BARRACKS, HAWAII 96857-5013

3 January 2020

Katherine Mullett
Field Supervisor, Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Suzanne Case
Chairperson, Department of Land and Natural Resources
State of Hawaii
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Field Supervisor Mullett and Chairperson Case:

Subject: Fish and Wildlife Coordination Act (FWCA) Consultation Schofield Barracks East Range, U.S. Army Garrison – Hawaiʻi (USAG-HI) Schofield Barracks, Island of Oʻahu, Hawaiʻi Tax Map Key (1) 7-6-001:001

The Department of the Army is writing to continue Fish and Wildlife Coordination Act (FWCA) consultation with the U.S. Fish and Wildlife Service (USFWS) and State of Hawaiʻi Department of Land and Natural Resources (DLNR) concerning the proposed breaching of the Ku Tree Dam. The dam is located along the eastern periphery of the Schofield Plateau, Schofield Barracks East Range (SBE), on the Island of Oʻahu, Hawaiʻi (Enclosures 1 and 2). The proposed federal action attempts to control or modify the upper reach of Kaukonahua Stream at the Ku Tree Dam. This proposed activity triggers requirement to consult with the USFWS and the DLNR in accordance with the provisions of the FWCA of 1934 (16 United States Code [USC] § 661 et seq.; 48 Stat. 401) regarding conservation of wildlife resources in connection with the proposed water resource project.

The Army first consulted the USFWS in the 2004 timeframe (Enclosure 3). Since that time, the Army refined and narrowed the project area to a smaller footprint and revised the method to breach the dam to better address the project's purpose and need. The Army also revised the content of the Draft Environmental Assessment (EA) to evaluate an expanded range of alternatives, document project changes, and clarify issues raised during prior consultations. The Army will circulate the EA to USFWS/DLNR for agency comment under the National Environmental Policy Act (NEPA), following completion of all applicable federal consultations.

Assessment of the Project Area

Ku Tree Dam is a hydraulic earth-filled dam. The dam and its reservoir are located in rough and heavily vegetated terrain approximately 3 miles east of Wahiawā town on an unnamed tributary to the south fork of Kaukonahua Stream. Ku Tree Dam is located at an elevation of approximately 1,080 feet in the Kaukonahua Watershed of the Koʻolau mountain range of central Oʻahu. The Kaukonahua Stream system is formed by two major tributaries (South Fork and North Fork Kaukonahua streams) which join near the town of Wahiawā. The main stem of Kaukonahua Stream flows in a northerly direction through a visually striking valley that forms the abrupt geophysical divide between the residual Waiʻanae and Koʻolau volcanoes that form the underlying basalt geology of the island.

Kaukonahua Stream joins Ki'iki'i Stream a short distance upstream of the Ki'iki'i confluence with the sea at Kaiaka Bay on Oʻahu's North Shore. Kaukonahua Stream is the longest stream in the State of Hawaiʻi at 31 kilometers (19.3 miles) from the headwaters to its confluence with the sea. Therefore, it is considered one of the most significant surface water features in the State. The Kaukonahua system is also one of the most extensively altered stream systems in the State. Water development projects for industrial-scale sugarcane and pineapple agriculture, domestic water supply, and wastewater treatment have fundamentally altered the physical, chemical and biological features of the system for well over a hundred years. Alterations include the Wahiawā Dam and Reservoir, irrigation withdrawals with no requirement for in-stream conservation flows associated with licensing, the input of treated domestic wastewater, and input of storm water from impervious streets and structures in the proximity of urban areas of Wahiawā, Schofield Barracks, and Waialua.

Ku Tree Dam is located on an un-named perennial tributary to South Fork Kaukonahua Stream located on the U.S. Army-controlled training area known as SBE. The Army constructed the dam in 1925 to form a domestic water supply reservoir. At maximum capacity, the reservoir pool was 32 acres (13 hectares) in size and provided storage of 900 acre-feet (239 million gallons) of water. Alternative water supplies, developed in the early 1950s to meet the Army's needs, eliminated the need for the reservoir as a water source. Preliminary dam safety concerns resulted in significant draw down of water levels in 1978. Confirmation of dam safety risks in 1983 caused complete draw down. Currently, the dam structure does not impound any water.

Influent stream water enters a drainage tunnel at the deepest point of the basin, flows under the dam, and reenters the stream channel approximately 500 meters (m) [1640 feet (ft)] below the dam structure. If this drainage tunnel clogged and failed to transmit water beneath the dam, the reservoir would inadvertently refill and catastrophic failure of the

dam could result. In such an event, the floodwaters resulting from the dam failure would flow downstream into Wahiawā Reservoir. Relative risk to lives and property from a dam failure within the uninhabited flood zone extending from Ku Tree Dam downstream to Wahiawā Reservoir is low; however, such an event could significantly affect the safety of Wahiawā Dam and Reservoir.

Ku Tree Dam requires management to prevent dam failure and resulting environmental impacts. Complete draw down only offers temporary reduction of unsafe conditions at the reservoir and does not solve the safety problem. A 2007 safety inspection deemed Ku Tree Dam to be *unsafe, non-emergency* (Gannet Fleming, 2008). The most recent safety inspection of the dam was conducted in July 2017 (USACE, 2017). The inspection report found that Ku Tree Dam and Reservoir is in *critical condition* and should receive immediate attention to minimize the risk of structural failure. Breaching the dam would permanently remove the dangers and safety hazards should Ku Tree Dam fail.

Prior FWCA Consultation and Project History

The Army initiated an environmental impact analysis for the proposed breach of the Ku Tree Dam in early 2004. The Army sent a preliminary draft of the 2004 EA to the USFWS. The project scope included two alternatives to resolve the dam safety concerns: one alternative rerouted stream flows into a 400-foot-long cement channel that bypassed the dam entirely, and the second alternative routed stream flows into a similarly sized concrete channel built into the centerline of the dam itself. Subsequent to USFWS' review of the EA and a field visit to the dam site, the USFWS issued a letter response recommending the following summarized points:

- The USFWS believes that both of the alternatives presented in the 2004 Preliminary Draft EA would result in the permanent loss of the natural stream channel for which no compensatory mitigation was proposed to offset the loss. Additionally, the 2004 Preliminary Draft EA did not contain a discussion or evaluation for the removal of the dam and restoration of the natural channel.

- The USFWS believes that the range of alternatives considered in the 2004 Preliminary Draft EA should be expanded to include dam removal/channel restoration; and all alternatives should be evaluated on the basis of environmental impacts, environmental benefits, technical feasibility, and relative costs.

- The USFWS believes that the Hawai'i Stream Bio assessment Protocol (HSBP) — the protocol used by the Habitat and Biological Assessment of the Ku Tree Reservoir Streams — to evaluate stream fauna within the proposed project area, is inappropriate for evaluating biological conditions in the project area (note: HSBP is

biological assessment methodology accepted and used by the State of Hawai‘i, Department of Health and Environmental Protection Agency as part of the CWA

- water quality monitoring effort). Additionally, the USFWS believes that the study's findings that the stream is severely impaired may be overstated because the survey did not include study sites downstream of the drain tunnel, where the stream channel is re-watered. In the absence of additional surveys, the USFWS stated that the Draft EA should clarify the locations and conditions of the survey sites.

- Following FWCA consultation with the USFWS in 2004, the project and the EA were put on hold. In 2011, the Army resumed preparation of the project EA to address issues raised from the 2004 scoping and consultation process. The project was again put on hold and the Draft EA never published for public review and comment. In 2018, the Army resumed the project and developed the current Revised Preliminary Draft EA document to build upon and carry forward the EA process. The current draft addresses the concerns raised by the USFWS in 2004. Amendments include a revised method to breach the dam to include a natural channel, an expanded range of alternatives to include dam removal/channel restoration, and clarification of the locations and conditions of the stream survey sites. The next section describes the new project scope for the proposed breach of Ku Tree dam and a summary of the alternatives assessed in the Revised Preliminary Draft EA. While an additional survey of the Ku Tree Reservoir streams was not conducted, the Army included and clarified the concerns raised by the USFWS in 2004 regarding the locations and conditions of the stream survey sites in the Revised Preliminary Draft EA.

Project Area

The proposed project area is approximately 29.56 acres and includes the Ku Tree Reservoir and associated components (earthen dam, tower, footbridge, and concrete spillway). In 2004, The Army identified a larger circular-shaped approximately 221-acre project area. The current project description refines and narrows the project area to a smaller footprint entirely within the previously proposed project area.

New Project Scope

The proposed project involves breaching Ku Tree Dam by excavating an approximately 500-foot long, natural channel through the natural hillside that supports the existing spillway. The excavation of the hillside matches the elevation of the existing streambed. The natural channel has a bottom width of approximately 50 feet with 1 vertical to 1 horizontal (1V:1H) side slopes and benches every 20 feet to minimize erosion. Included provisions ensure slope stability and establishment of vegetation. Proposed use of turf reinforcement mats, made of pervious and flexible three-dimensional polypropylene,

provides erosion control while allowing for mature plant growth at the up- and downstream ends of the newly excavated natural channel. The proposed channel returns the site to a more natural condition (i.e., natural water flows and transport of sediment and nutrients, etc.) and provides a more favorable environment to native species returning to the area. Ku Tree Dam remains in place. Excess excavated material blocks water flow from entering the upstream dam passageway.

The proposed project includes demolition of the spillway and footbridges. A portion of the valve tower is demolished and the remainder plugged/abandoned. Demolished concrete is used as fill at an upstream and secondary fill location. Rebar/metal is disposed of off-site. The drain tunnel and drain discharge tunnel are permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. The existing concrete plug located at the intake tower remains in-place.

The proposed project provides a 1% annual chance of exceedance (ACE) 24-hour storm flood protection. Breaching the dam with a natural channel through the spillway also meets the 5-foot depth requirement upstream of the natural channel and the depths further upstream are reasonable for a 1% ACE flood event (100-year, 24-hour storm event) (USACE, 2016). Additionally, breaching of the dam removes any significant storage capacity of the reservoir, and eliminates the risk of catastrophic failure of the dam and resultant impacts on property and human safety. The estimated cost to implement the Proposed Action is $25,000,000.

Expanded Range of Alternatives

The Revised Preliminary Draft EA examines the environmental impacts, environmental benefits, technical feasibility, and relative costs of the Proposed Action and three alternative actions. A summary of the three alternative actions evaluated in the Revised Preliminary Draft EA is provided below. A number of alternatives were also considered but eliminated from further detailed evaluation in the Revised Preliminary Draft EA as they did not sufficiently satisfy the minimum project objectives and screening criteria.

Alternative A: No Action – The No Action alternative leaves the dam in place with no changes. Under this alternative, the Army conducts no improvements and/or maintenance, and the dam and its appurtenant structures continue to deteriorate. The reservoir remains in a drawn down, dewatered state and no water is intentionally impounded. In the absence of maintenance, debris is expected to accumulate in the outlet structure, which could lead to the refilling of the reservoir. Further, if the existing drain tunnel collapses or otherwise becomes inoperable, this may also lead to the refilling of the reservoir. Unintentional impounding of the water could tax the degraded structural integrity of the dam, potentially resulting in release of a large uncontrolled flow with

adverse downstream impacts. Lack of maintenance, the unknown condition of the drain tunnel, inadequate spillway capacity, the potential for overtopping, and downstream slope seepage problems all contribute to possible dam failure. The cost of the No Action alternative is $0.

Alternative B: Notching the Dam – Alternative B cuts a notch in the dam to allow water to flow along its original flow path. This alternative cuts a trapezoidal-shaped notch to the existing streambed. The notch is 50-feet wide at its base with 1V:2H side slopes, and benched every 20 feet to minimize erosion. Included provisions ensure slope stability and the establishment of vegetation. This alternative includes demolition of the valve tower, spillway, and footbridges which may be used as onsite backfill or disposed of offsite. The valve tower intake is permanently plugged at or near the base of the tower. The drain tunnel and drain discharge tunnel are also permanently plugged at or near the base of the tower and blocked with rebar at the outlets downstream of the dam to prevent entry. Under this alternative, the dam and reservoir retain no storage capacity and catastrophic failure of the dam is averted because the dam is permanently breached. The estimated cost to implement Alternative B is $60,500,000.

Alternative C: Dam Removal and Site Restoration – Alternative C involves the complete removal of the dam and its appurtenant structures and restoration of the site, including the natural streambed, to pre-dam conditions ("natural" conditions). This alternative accomplishes stream channel restoration by grading the hillside to complement the adjacent grades and by removing dam facilities so that natural passage of stream flow returns to pre-dam conditions. Under this alternative, reconnection of the natural stream channel above and below the dam restores 442 meters or 1,450 feet of aquatic and riparian habitat. Additionally, discontinued use of the drain tunnel re-waters a currently dry 1,640-foot reach below the dam. The estimated cost to implement Alternative C is $49,000,000.

Conclusion

The intent of this project is to breach the Ku Tree Dam, thereby eliminating the existing impoundment and allowing the stream to flow free of diversion, restoring channel connectivity throughout the project site. The Army redesigned the proposed project to incorporate recommendations provided by USFWS in prior consultations aimed at minimizing impacts to wildlife resources. Based on the new project scope, analysis, site observations, EA revisions, and prior consultation with the USFWS, we have determined that impacts to wildlife resources have been adequately considered in the development of this project.

We welcome any additional recommendations the USFWS/DLNR may offer to further minimize potential impacts to fish and wildlife resources. We request USFWS/DLNR

written response within 30 days from the date of receipt of this letter. If there is no response from USFWS/DLNR within 30 days, then USAG-HI will assume that USFWS/DLNR neither objects to nor offers any additional recommendations and that the USAG-HI has completed its consultation responsibilities under the FWCA.

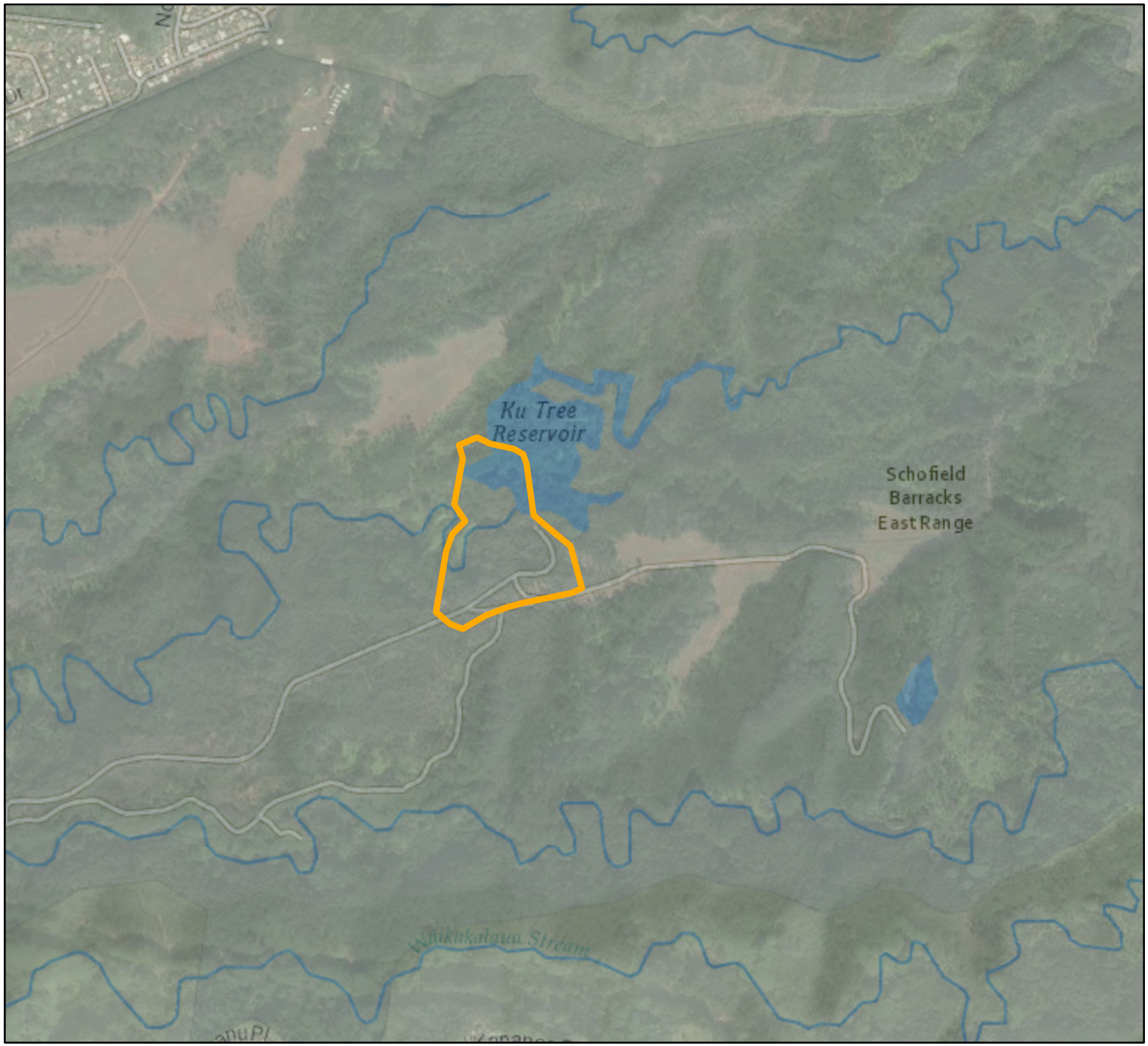
Following the completion of FWCA consultation with the USFWS/DLNR, the Army will conduct final updates of the EA to document prior and current issues raised and circulated to USFWS/DLNR for comment under NEPA. If USFWS/DLNR has any questions about this project please contact Kapua Kawelo, Natural Resources Manager, USAG-HI, at (808) 655-9189 or by email to hilary.k.kawelo.civ@mail.mil.

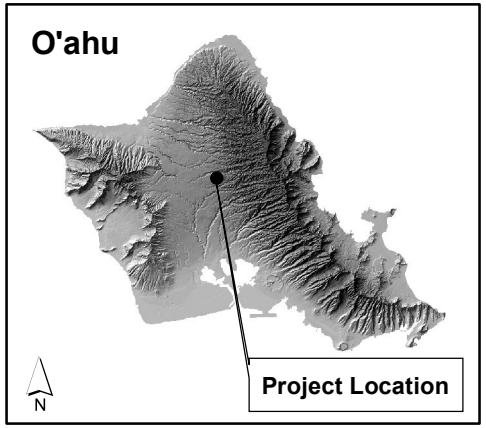
Sincerely,

Thomas J. Barrett
Colonel, U.S. Army
Commanding

Enclosures

Enclosure 1





Legend

Project Location

0 500 1,000 2,000 Feet

Project Location

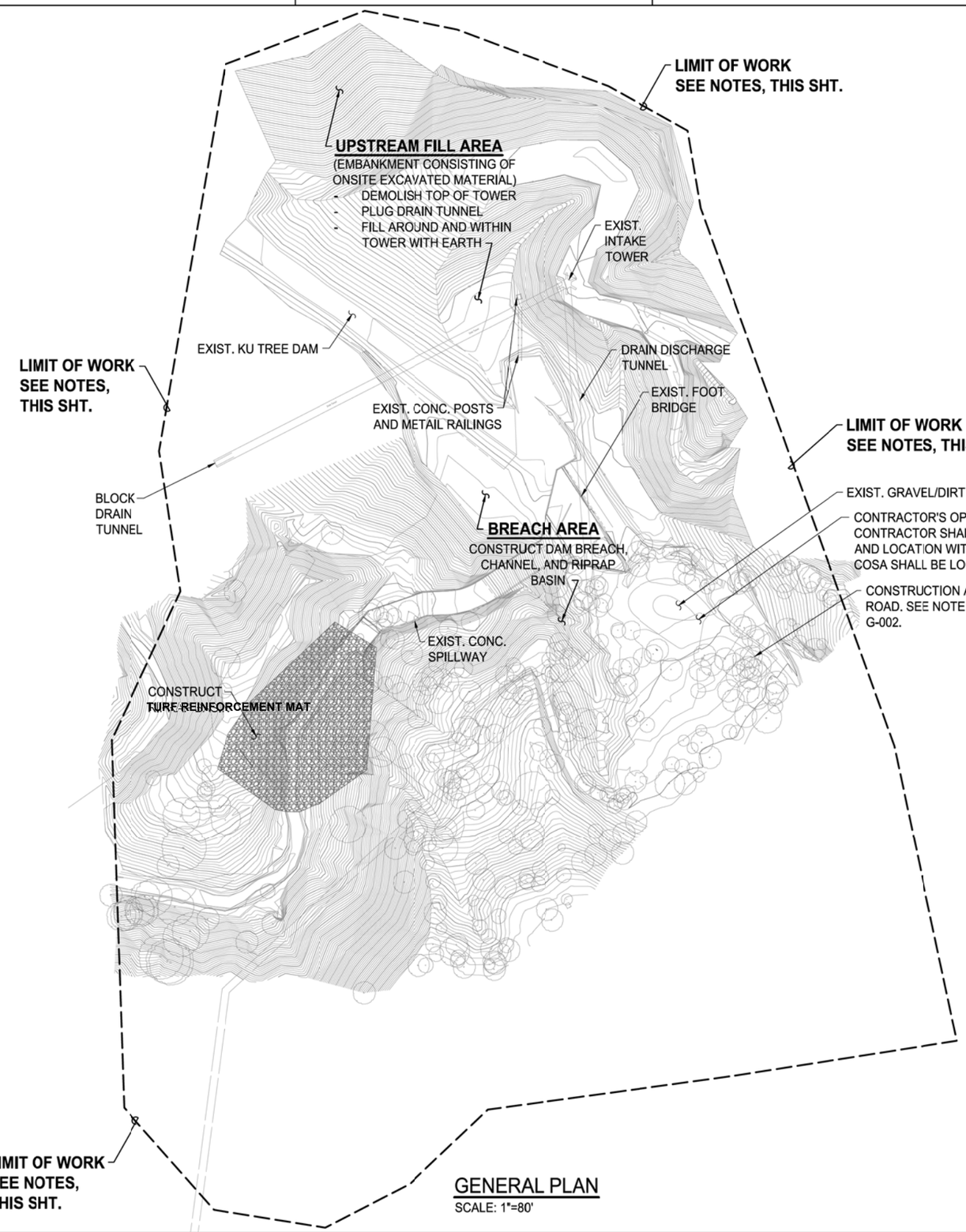
Proposed Breach of
Ku Tree Dam

East Range, Schofield Barracks
Island of O'ahu, Hawai'i

R. M. TOWILL CORPORATION

Enclosure 2

TRUE NORTH
1"=80'



GENERAL PLAN

SCALE: 1"=80'

GRAPHIC SCALE:
1" = 80' 80' 40' 0 80' 160'

NOTES:

1. THE LIMIT OF WORK, AS SHOWN IN THE DRAWINGS, IS THE AREA AVAILABLE FOR THE CONTRACTOR TO PERFORM ALL WORK ON THE PROJECT, INCLUSIVE OF ALL AREAS REQUIRED BY THE CONTRACTOR FOR OPERATIONS AND STORAGE. THE CONTRACTOR SHALL NOT PERFORM ANY WORK BEYOND THE LIMIT OF WORK.
2. THE CONTRACTOR SHALL UTILIZE THE EXISTING ACCESS ROADS TO ENTER/EXIT THE PROJECT LIMIT OF WORK.

US Army Corps of Engineers®
Honolulu District

MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

U.S. ARMY CORPS OF ENGINEERS
HONOLULU DISTRICT
FT SHAFTER, HAWAII

R.M. TOWILL CORPORATION
2024 N. KING STREET, SUITE 200
HONOLULU, HAWAII 96819
PHONE: (808) 842-1133

DESIGNED BY: JS/CL/WM/CWL
DRAWN BY: JS/CL/WM
SUBMITTED BY: FULL NAME
PLOT SCALE: 1:1
SIZE: ANSI D
CHECKED BY: CWL
PLOT DATE: 8/14/2019
FILE NAME: 195805C-101.DGN
DATE: MAY 2020
SOLICIT. /CONTRACT NO: W912BA-17-D-0007
LOCATION CODE: 7200-05
DRAWING NUMBER: C-101
REVISION:

FY 18, OMA PKG A-001
KU TREE DAM REMOVAL
SCHOFIELD BARRACKS, OAHU, HAWAII

GENERAL PLAN

SHEET IDENTIFICATION
C-101

Enclosure 3

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
PN-04-102

James L. Bersson, P.E.
Chief, Engineering and Construction Division
Environmental Technical Branch
U.S. Army Corps of Engineers
Honolulu Engineer District
Building 230
Fort Shafter, HI 96858-5440

Re: Ku Tree Dam, Schofield Barracks, Oahu, Hawaii

Dear Mr. Bersson:

The U.S. Fish and Wildlife Service (Service) has reviewed the Preliminary Draft Environmental Assessment (PDEA) you recently provided on the proposal to remove Ku Tree Dam located on an un-named tributary of South Fork Kaukonahua Stream, Oahu, Hawaii. This letter has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act of 1934 (16 USC 661 *et seq.*; 48 Stat. 401), as amended (FWCA); the Clean Water Act of 1977 (33 U.S.C. 1251 *et seq.*; 62 stat. 1155), as amended (CWA); and the National Environmental Policy Act of 1969 (42 USC 4321 *et seq.*; 83 Stat. 852), as amended (NEPA). This letter is also consistent with other authorities mandating concern for environmental values.

Ku Tree Dam is located at an elevation of approximately 1,080 feet in the Kaukonahua Watershed of the Koolau mountain range of central Oahu. The Kaukonahua Stream system is formed by two major tributaries (South Fork and North Fork Kaukonahua streams) which join near the town of Wahiawa. The main stem of Kaukonahua Stream flows in a northerly direction through a visually striking valley that forms the abrupt geophysical divide between the residual Waianae and Koolau volcanoes that form the underlying basalt geology of the island. Kaukonahua Stream joins Ki`iki`i Stream a short distance upstream of the Ki`iki`i confluence with the sea at Kaika Bay on Oahu's North Shore. Kaukonahua Stream is the longest stream in the State of Hawaii at 31 kilometers (19.3 miles) from the headwaters to it's confluence with the sea, and is, therefore, considered one of the most significant surface water features in the State. The Kaukonahua system is also one of the most extensively altered stream systems in the State. Water development projects for industrial-scale sugarcane and pineapple agriculture, domestic water supply, and wastewater treatment have fundamentally altered the physical, chemical and biological features of the system for well over a hundred years. These alterations include the

Wahiawa Dam and Reservoir, irrigation withdrawals that are licensed with no requirement for in-stream conservation flows, input of treated domestic wastewater, and input of stormwater from impervious streets and structures in the proximity of urban areas of Wahiawa, Schofield Barracks, and Waialua. Ku Tree Dam is located on an un-named perennial tributary to South Fork Kaukonahua Stream located on the U.S. Army-controlled training area known as Schofield Barracks East Range (SBER). The dam was constructed in 1925 by the Army to form a domestic water supply reservoir. At maximum capacity, the reservoir pool was 32 acres (13 hectares) in size and provided storage of 900 acre-feet (239 million gallons) of water. Over the last 50 years, alternative water supplies have been developed for U.S. Army needs and the reservoir is no longer needed for its original purpose. The reservoir was significantly drawn down in 1978 due to preliminary dam safety concerns. In 1983, the reservoir was completely drawn down and emptied when dam safety risks were confirmed. Currently, there is no impounded water behind the dam structure. Influent stream water enters a drainage tunnel at the deepest point of the basin, flows under the dam, and reenters the stream channel approximately 500 meters (m) [1640 feet (ft)] below the dam structure. If this drainage tunnel were to clog and fail to transmit water beneath the dam, the reservoir would inadvertently refill and catastrophic failure of the dam could result. In such an event, the flood waters resulting from the dam failure would flow downstream into Wahiawa Reservoir. The potential flood zone extending from Ku Tree Dam downstream to Wahiawa Reservoir is not inhabited and the relative risk to lives and property due to dam failure is not high, however, the potential for such an event to affect the safety of Wahiawa Dam and Reservoir could be significant.

General Comments

Resolution of the dam safety concerns for Ku Tree Dam has been in question for over 20 years. A review of information in our files indicates that Ku Tree Reservoir fishery resources were under intensive management on an experimental basis by the State in the late 1970s (DAR 1979, Attachment 1). These efforts were funded by the Service through our Federal Aid to Sportfish Restoration program. Development of alternative reservoir and dam management strategies also led to a substantial Army-funded study of fish and wildlife resources by our office (Service 1983). The potential for recreational fishery opportunities led the Hawaii Department of Land and Natural Resources Division of Aquatic Resources (DLNR-DAR) and the Service to recommend restoration and retention of the dam and reservoir. At that time, restoration of the dam was considered a reasonable alternative and both agencies recommended bringing the dam's structural integrity into compliance with applicable safety guidelines in order to retain the reservoir for recreational fishery use.

We were notified of current plans to permanently remove Ku Tree Dam from service in February of 2004. At that time, consultants for the Army provided the Service with notification that a DEA for the project was under development pursuant to NEPA. This notification letter included a brief description of the alternatives under development. This early correspondence indicated that no alternative to remove the dam and restore the stream channel was under consideration. As a result, we contacted your consultants and staff from your office by telephone with a request for more information and a recommendation to include a stream restoration alternative in project

planning. At our request, a field visit with representatives from the U.S. Army Corps of Engineers (Corps), the consultants and the Service was conducted on April 28, 2004. At the conclusion of the field trip, we recommended that dam removal and stream channel restoration strategies should be developed and that this combined action be considered along with other reasonable alternatives to achieve the proposed project purpose.

The current PDEA describes two alternatives to resolve the dam safety concerns: one alternative would reroute stream flows into a 400-foot-long cement channel that bypasses the dam entirely, and the second alternative would route stream flows into a similarly-sized concrete channel built into the centerline of the dam itself. Either of these alternatives would result in the permanent loss of the natural stream channel with no compensatory mitigation to offset this loss. There is no discussion of removal of the dam and restoration of the natural channel in the PDEA. A re-created channel, following the historic stream course, would result in approximately 442 m (1450 ft) of restored aquatic and riparian habitat (not counting the currently dry 500 m reach below the dam that would be re-watered if use of the existing drainage tunnel was discontinued). As previously discussed with Corps staff, we continue to maintain that NEPA requirements to "fully consider a range of reasonable alternatives" will not be met until a dam removal/stream restoration alternative is brought forward for consideration and assessed on its environmental and technical merits.

Dam removal and stream restoration is met with increasing acceptance nationwide, and a growing body of technical literature now supports dam removal to re-establish water quality functions, hydrologic functions, sediment budgets, and biological communities (Babbit 2002, Bednarek 2001, Bushaw-Newton in press, Doyle et al. in press, Hart et al. 2002, see additional references below). Circumstances vary with every project, however, there is a growing consensus that the short-term technical challenges and monetary costs of removing dams is outweighed by the long-term environmental benefits of restoring natural function to hydrologic systems. Over 50 dams have been removed in the state of Wisconson alone (Born et al. 1998). In the majority of these actions, the Service has provided technical support regarding conservation and restoration of natural resources, and we are ready to provide assistance in the development of a Ku Tree Dam removal/channel restoration alternative.

A variety of regulatory requirements, backed by extensive policy and technical guidance, support development of alternatives that include dam removal and stream channel restoration. For example:

- Under NEPA, action agencies are required to rigorously analyze and discuss "all reasonable alternatives" that accomplish the purpose of the proposed project. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the agency.

- A CWA section 404 permit will be required because the project will involve placement of material within U.S. jurisdictional waters. This will require that the action agency clearly

demonstrate that the proposed action was developed under a planning process that seeks to avoid, minimize, or compensate for unavoidable environmental impacts.

- The FWCA mandates protection of fish and wildlife when Federal actions result in the control or modification of a natural stream or body of water. The statute requires Federal agencies to take into consideration the effect that water-related projects would have on fish and wildlife resources; take action to prevent loss or damage to these resources; and provide for the development and improvement of these resources.

- The Army's Oahu Training Areas Integrated Natural Resources Management Plan (INRMP) provides a framework for ongoing efforts to meet environmental challenges on Army lands. The INRMP states that the overall goal of watershed management on Army lands, including SBER, is to "protect and enhance watershed stability and native ecosystems by managing for natural rates of runoff, erosion and sedimentation, maintaining surface water quality and aquatic health."

Specific comments

Page 3-6. Project Description.

1. The proposed action that would result in a 400-ft-long cement channel bypassing the dam was selected prematurely and without adequate development of a full range of reasonable alternatives as required by NEPA.

Recommendation: Develop a dam removal/channel restoration alternative and adequately evaluate its potential implementation.

2. The long-term cost of maintenance of the proposed concrete channel is not addressed. A responsible party that would fund and undertake maintenance within the Department of the Army is not identified.

Recommendation: Any alternatives that consider construction of a concrete channel will require a maintenance plan and a responsible party to fund and undertake maintenance actions *in perpetuity*. Note that a restored natural channel would be self-sustaining after an initial rehabilitation period, with no perpetual maintenance requirement.

Page 3-9. Alternatives Considered.

1. An alternative that removes the dam and restores the natural stream channel and adjacent riparian area is not included.

Recommendation: An alternative that includes dam removal and stream channel restoration should be described. The dam removal/channel restoration alternative should compare and contrast the long term environmental benefits of improved water quality,

restored natural hydrologic function, and support of biological communities against the anticipated environmental costs of lost environmental functions of the permanently lost stream channel in the project area. Comparative benefit–cost analysis among alternatives should include all foreseeable costs, including up-keep of the artificial channel structures, and should include potential defrayment of disposal costs for excavated dam material (redwood core, rip-rap, earth fill) through re-sale or re-use whenever appropriate.

Page 4-22. Stream Fauna.

1. The Hawaii Stream Bioassessment Protocol (HSBP) was used to evaluate the stream fauna within the proposed project area. The HSPB is a scored evaluation of stream fauna based on presence/absence of larger migratory species. However, Wahiawa Dam and Reservoir constitute an impassable barrier to the migration of aquatic organisms (Glen Higa, DAR, pers. com.), a condition that has been in existence since the construction of Wahiawa Dam in 1918. Therefore, no migratory species are expected to occur in the proposed project area. Given this circumstance, it is unclear why the HSBP was employed in this aquatic system, and the extraordinarily low scores indicating a "highly impaired stream fauna" are without context and potentially misleading.

Recommendation: Because no migratory native species are expected *a priori* to be found in the proposed project area, applying a scoring system based on presence/absence of migratory species is not a practicable method to evaluate stream biological condition. We recommend applying a survey method that evaluates stream environmental parameters in the known absence of larger migratory species. Biological descriptions would necessarily be limited to surveys of non-migratory native species such as aquatic insects and other freshwater species (e.g., mollusks, sponges, algae) that could provide an indication of the biological characteristics of the streams in the absence of larger migratory species. Stream survey techniques that evaluate physical and chemical features, such as stream channel form and function and riparian habitat conditions, may be more applicable.

2. The stream study indicates that four sites were established to measure stream habitat and biotic conditions: two above and two below the dam. However, the locations of the two study areas below the dam apparently were placed below the dam but *upstream* of the re-entry point of surface flows from the tunnel through which stream waters currently flow. (The stream water that flows in the under-dam tunnel returns to the stream channel a considerable distance downstream and is difficult to reach on foot.) It is not clear how an adequate survey of stream biological conditions can be made if half of the survey sites are undertaken in a stream reach that has been continuously dewatered since 1925 and, therefore, is not expected to continuously support any aquatic organisms during base flow conditions. We believe this further confounds the results of the stream survey and again results in the conclusion that stream conditions are more degraded than they actually are.

Recommendation: Although it appears that an upstream/downstream survey approach was attempted to evaluate stream condition, the downstream observations were not located in the appropriate area of "re-watered" stream channel and are of limited value. We therefore recommend that an additional survey of stream biological condition be completed to include the below-dam reaches of stream that actually contain the return surface flows from the discharge tunnel. In the absence of additional surveys, the DEA should clarify that the only two stream sites surveyed were located in the abandoned and heavily silted-in reservoir pool and that no sites were surveyed downstream of the tunnel return water re-entry point.

Page 4-24. Potential Impacts and Mitigation Measures. Despite its limitations, the ultimate conclusion of the aquatic resources section is that "Reconnection of the *natural stream channel* above and below the reservoir/spillway with the proper grade would no doubt improve habitat condition..." (emphasis added). This conclusion is ignored under the proposed action which calls for elimination of aquatic habitat completely by installation of a concrete channel that would result in bypassing the original stream channel altogether.

Recommendation: A recreated natural channel would directly restore a minimum of 444 m (1450 ft) of aquatic and riparian habitat and re-water an additional 500 m (1640 ft) of streambed. Yet, the proposed action would replace this with 120 m (400ft) of concrete channel. The Draft EA should provide a full explanation of anticipated environmental impacts and should describe proposed mitigation measures that will compensate for the loss of aquatic habitat.

Summary Comments

We recommend that a the Draft EA include consideration of an expanded range of alternatives, specifically a dam removal/channel restoration alternative that is adequately evaluated against the dam bypass alternatives on the basis of its environmental impacts, environmental benefits, technical feasibility, and relative actual costs. The Kaukonahua Watershed is a highly significant feature of the Oahu landscape and is amenable to physical and hydrological restoration. For example, the City and County of Honolulu is presently developing plans to discontinue discharge of treated wastewater from Wahiawa Reservoir which may lead to restoration of flows in the lower watershed.

We are willing to work with the Corps in the development of a viable stream restoration alternative. Concurrently, we recognize that there may be site-specific constraints that definitively preclude dam removal and channel restoration. However, if such constraints exist, they must be documented in detail and disclosed through the NEPA, FWCA and CWA processes prior to reaching the conclusion that a bypass channel outside of the historical stream course is in the least environmentally damaging practicable alternative and represents a responsible Federal natural resource management decision that protects the public interest. We appreciate the opportunity to provide comments on the PDEA for the proposed project. If you have questions

regarding these comments, please contact Gordon Smith of our Environmental Review Program at 792-9400.

Sincerely,

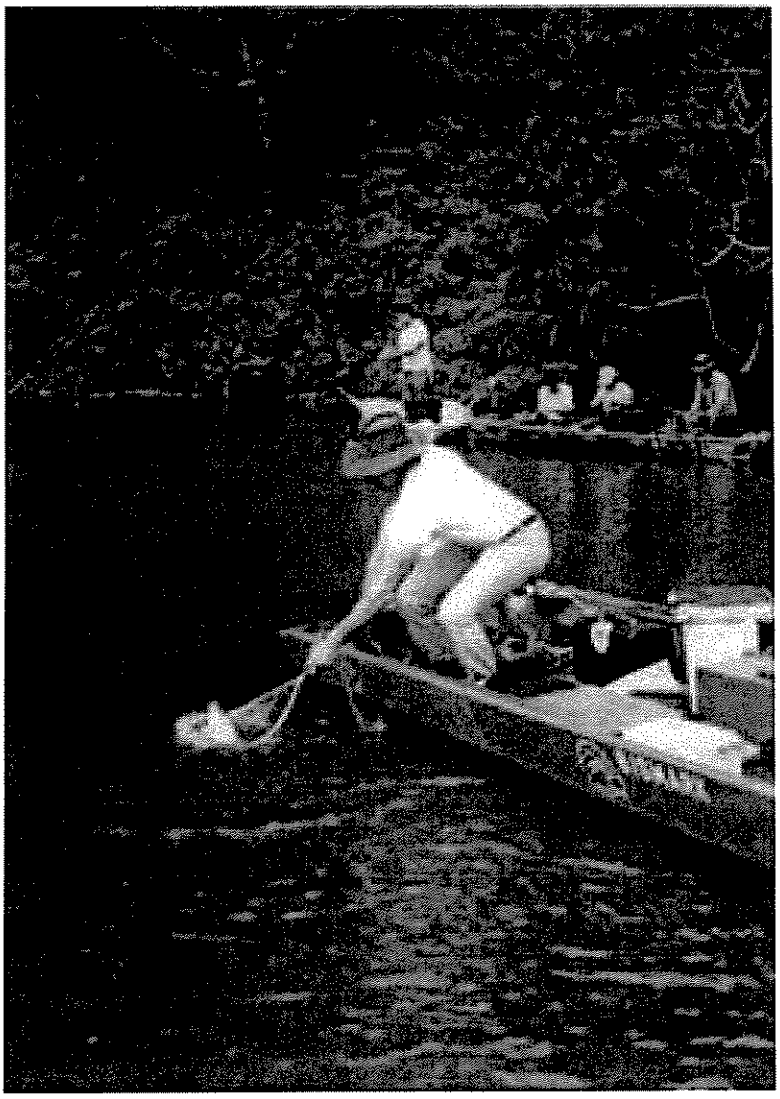
Gina Shultz
Acting Field Supervisor

Enclosure

cc: EPA–Region IX, Honolulu
USACE–Regulatory Branch, Fort Shafter
U.S. Army DPW, Schofield Barracks
DAR, Honolulu
CZMP, Honolulu
CWB, Honolulu

Enclosure

1. Thirteen-pound channel catfish (*Ictalurus punctatus*) from Ku Tree Reservoir produced as a result of intensive fishery management between 1975 and 1978. DLNR-DAR photo.



2. Recreational fishing in Ku Tree Reservoir as a result of a cooperative U.S. Army–DAR project that allowed public fishing access to the managed reservoir fishery, (c. 1978). DLNR-DAR photo.

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CC: ADDRESSES FOR SECRETARIAL USE ONLY-DO NOT MAIL

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Appendix G:
Endangered Species Act, Section 7 Consultation

From: Donmoyer, Kevin L
Sent: Wednesday, March 4, 2020 11:09 AM
To: Kawelo, Hilary K (Kapua) CIV USARMY IMCOM PACIFIC (USA)
Cc: LeBlanc, Darren; Kwon, James

Hello Kapua,

This email will act as documentation that the Fish and Wildlife Service has received the determination of no effect from Oahu Army Garrison regarding the Ku Tree Dam breaching project. Determination of no effect is at the discretion of the action agency, but the service recommends you contact our office immediately if new information or project alterations change this determination and trigger consultation under the ESA.

We appreciate your efforts to conserve threatened and endangered species. If you have any questions concerning these recommendations please feel free to contact me.

Kevin Donmoyer
Fish and Wildlife Biologist
DoD Coordination & Consultation

U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Honolulu, HI 96850

From: Kawelo, Hilary K (Kapua) CIV USARMY IMCOM PACIFIC (USA)
Sent: Wednesday, March 4, 2020 7:24 AM
To: Donmoyer, Kevin L

CLASSIFICATION: UNCLASSIFIED

Thanks Kevin, We have made a no effect determination internally about ESA because project going to avoid tree felling during pupping season. If you have any TES concerns that I am not considering, let me know. Mahalo! kapua

H. Kapua Kawelo
Natural Resource Manager
U.S. Army Garrison, Hawaii

Appendix H:
Clean Water Act, Section 401 and 404 Consultation

Meeting on Water Quality and Related Issues
Tuesday, March 9, 2004, 10:00 am
DOH Environmental Planning Office
Attendance sheet attached

Chad McDonald (Mitsunaga): There has been no maintenance on the existing dam. Inlets are overloaded with debris—so much so that can't even see the inlets. There is one remaining outlet tunnel and there are already signs of collapse.

Where does the tunnel put the water? Puts the water in the natural channel of the same tributary that the dam stops up. Same receiving waters

Owner of the dam is the Schofield garrison.

Dave Penn (DOH): There is concern on the DOH enforcement side that Lake Wilson appears muddier than usual. Kaiaka Bay is also muddier. There's concern that something happening at Ku Tree might worsen downstream conditions—little things add up. Since water flow is constricted by the dam and tunnel, there is sediment detention behind the dam. With the breach, we would lose that function.

Chad: The Army is not maintaining the tower system, so it's unlikely they would maintain a sediment pond. Therefore the breach is proposed. The breach is at the existing spillway, not the dam itself. The dam has a height of 80-90 feet. Streambed is higher than the new inlet (channel); therefore there will be some retention.

Chad: Alternatives considered.
(1) rehabilitate
(2) microtunneling through the dam
There were evaluated on the basis of cost and effects on maintenance

How soon will inlet silt or clog up if there's no settling area? Need to have a bigger retention area?

How much fill? Estimated 74,000 cubic yards. 80,000 cubic yards of storage space planned.

Libby (DOH): This project designs a flood control channel, not a flood control basin. Debris will pass through faster and quicker. Open channel, no controls.

Chad: There is sufficient capacity for the Standard Project Flood at 3,900 cfs (100+ year flood, but not 500 year flood). Inlet is at elevation of 1015 feet. Outlet at elevation of 985 feet.

DOH: There are also concerns about loadings.

DOH: How much will it cost to maintain the dam?

DOH; Possibility of tying in upslope land management and/or downstream detention.

Craig (COE): Surrounding area is used for troop movement exercises. No burns. No track vehicles, though in the future might involve Stryker vehicles.

DOH: project might involve a cost savings for the Army, but downstream users could be faced with more costs.

Chad: primary reason for this project is safety.

DOH: Otake Camp is at risk if Wahiawa reservoir breaks. A few households are left, but they don't want to relocate (although that is the best long-term solution for this floodprone area). Also people living under the bridge on lower side of Mokuleia.

DOH: Was a routing analysis done? Chad: all studies he's seen say water confined to the South Fork.

DOH: Water balance studies done in the mid 1970s identified percentage distribution of waters contributing to the Wahiawa Reservoir.

DOH: Background studies currently being done for the TMDL. DOH is finalizing contract with Tetra Tech. Phased studies will start with the North and South Forks of Kaukunahoa. (2) Wahiawa Reservoir, and (3) receiving waters (bays).

DOH: Consider giving presentation to the Waialua Neighborhood Board. There are intake valves at the bottom of Wahiawa Reservoir. If the bottom is turbid, that turbidity goes into Kaukunahoa Stream and people complain. Also receive odor complaints. If people know something is happening at Ku Tree, public might relate these events.

Other Contacts:

- Sterling Yong, DLNR, regarding FEMA and NMR (no map revision), dam safety
- Division of Aquatic Resources
- CZM—John Nakagawa

Potential issues to address in EA:

- Post-project pollution loadings
- Construction-related impacts
- Phasing, since we're closing one outlet and opening a new one
- Stream biology. Can fish migrate up the existing drainage tunnel?
- Capacity of tributary to be affected
- Duration

Permits and Approvals

Farley (COE): Hardening of channel requires 404 permit because of the length, lining, and being in an impaired water segment. Otherwise the Corps doesn't regulate excavation in a freshwater, non-tidally influenced stream.

DOH: Will need NPDES since there's more than an acre of fill involved.

- Stormwater, dewatering
- BMPs for erosion and sedimentation control

Under 303d (impaired waters), need to address

- Short-term construction
- Long-term operations

DLNR: Will also need SCAP

ATTENDANCE SHEET

Clean Water Branch
Environmental Management Division
919 Ala Moana Boulevard, Room 301
Honolulu, Hawaii 96814-4920

Phone: (808) 586-4309
Fax: (808) 586-4352

Date: 3-9-04 **Time:** 1000

Purpose: Ka Tue Reservoir

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Darryl Lum	CWB	"	"	
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DAVE PENN	DOH/EPO	586-4339	586-4370	dpenn@eha.health.state.hi.us

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Appendix I:
Minutes of Neighborhood Board Meetings

WAHIAWA NEIGHBORHOOD BOARD

REGULAR MEETING MINUTES
MONDAY, MARCH 15, 2004
WAHIAWA RECREATION CENTER

CALL TO ORDER: Chair Ben Acohido called the meeting to order at 7:06 p.m. A quorum was present.

At this time, Chair Acohido laid the ground rules for the meeting, including asking everyone to be civil and have decorum (especially for the dislocation of Poamoho Camp residents agenda item).

MEMBERS PRESENT: Ben Acohido, Silvia Koch, Edith Kubo, Mary Jane Lee, Kathleen Masunaga, Yoshiro Nakamura, Jyun Yamamoto.

MEMBERS ABSENT: Randall Kamisato (excused), Keith Tamashiro (excused).

GUESTS: Kim Ribellia and Brandon Mitsuda (Council Chair Donovan Dela Cruz's office), James Nakatani (U.S. Representative Ed Case's office), Laurence Lau (Governor's Representative), Senator Robert Bunda, Representative Marcus Oshiro, Representative Michael Magaoay, Capt. Anthony Marks (Honolulu Fire Department); Lt. Stanford Afong, Lt. Brian Chang, Lt. John Matassa, Maj. William Chur and Cap. Michael Thomas (Honolulu Police Department); Duke Chung (Board of Water Supply), Geri Tramontano (Wahiawa Satellite City Hall); Beverly Gotelli, Susan Hagiwara, Maurice Morita and Roger Takabayashi (HSTA); Dennis Greer, LTC. Renee Roberts and Col. Rick Hatch (U.S. Army); LTJG Richard Hall and Capt. Mary McClendon (NCTAMS PAC), Don Robbins (Ka Nupepa), Nancy Nishikawa (Kimura International), Leolani Abdul (Galbraith Turst), Tracy Takano (ILWU), Iese Su'a (Del Monte); Mansing Agustin, Silvestre Arreola, Jr., Gavino and W. Bumanglag, Mr. and Mrs. Percy Cabo, Donald Cabrera, Raymond Cendana, Tino and Zack Docktor, Hector and Rachael Garcia, Betty and Warren Ickes, Betty Ishii, Boyd Isnec, Benjamin Juan, Edwardo Lagua, Mr. & Mrs. Clay Minter, Andrea Pasion; Erasmus Patacsil, Bonnie Patelesio, Darlene, Denny, Johnathan, Patrick and Paul Pedro; Johnathan, Randy and Sa Sanborn; Minda and Willy Tasani; Estella, Melita and Rizal Tungpalan; Lynn and Vaeleti Tyrell, Expedito, Mariefe and Marietta Uberita (Poamoho Camp Community Association); David Aki, S. Alailima, Walter Benavitz, Marian Genovia, Ellen Hyer, Leonardo Jamias, Robert Kent, Daniel Nyer, Lauzanne Oshiro, Benny Quiseng, Steve J. Rodrigues (Neighborhood Commission Office staff).

(Nakamura arrived at 7:08 p.m.)

APPROVAL OF THE FEBRUARY 9, 2004 REGULAR MEETING MINUTES: Masunaga moved and Lee seconded to approve the minutes as submitted. The motion carried unanimously.

TREASURER'S REPORT: Yamamoto read the Financial Statement for February 2004. The Operating Account expenses were $44.46, leaving a balance of $1,123.44. The Publicity Account did not incur any expenses, leaving the balance at $2,110.00. The Refreshment Account did not incur any expenses, leaving the balance at $120.00. The report was accepted subject to audit.

Chair Acohido said the Board will hold a special meeting on April 26 honoring Township Mayors of Schofield Barracks. He said a motion is needed to use the Board's Refreshment Account for this meeting. **Nakamura moved and Masunaga seconded that the Wahiawa Neighborhood Board No. 26 use its Refreshment Account funds for its April 26 special meeting. The motion carried unanimously.**

REPORTS AND CONCERNS:

Honolulu Fire Department (HFD) – Captain Anthony Marks reported: 1) For the month of February, they responded to 6 fires, 58 medical emergencies, 2 search and rescues and 3 miscellaneous calls. On January 14, they responded to three blown roofs, two power lines down and one haz-mat incident. He noted it's not their job to repair roofs, but just to stop the problem. 2) Fire Safety Tip: "Cooking fires are the leading cause of home fires and the second major cause of death among older adults. If you are cooking and must leave the kitchen, even for only a few minutes, turn off of the stove. Keep a fire extinguisher (with a minimum rating of 2A10BC) in or near your kitchen and learn how to use it. Inspect the fire extinguisher regularly to ensure that it has not expired." 3) Suggestion of the month: Keep fire hydrants in your neighborhood clear of obstructions, including parked cars, debris and weed.

Concerns and comments followed:

1) Nakamura asked if HFD would demonstrate short circuit wiring. Capt. Marks answered arrangements would have to made with HFD's Fire Prevention Bureau. He also suggested contacting HECO.

2) Capt. Marks stated he reviewed the plans for the proposed ambulance facility. He submitted comments indicating there isn't adequate space behind the fire station for such a facility.

Honolulu Police Department (HPD) – Lt. Brian Chang reported: 1) For the month of February, there were 25 burglaries, 21 UEMV (unauthorized entry into a motor vehicle) and 31 thefts. 2) He introduced Capt. Michael Thomas, Lt. Stanford Afong, Maj. William Chur and Lt. John Matassa.

Maj. Chur gave a brief update on HPD's bills before the Legislature. Every year HPD submits a package of bills, along with supporting the package of bills submitted by the Law Enforcement Coalition (LEC). The coalition's key bill would change wiretap laws. HPD's bills include a non-emergency 311 number and enhance wireless technology that would link your cell phone into the 911 system. Several bills for traffic safety (i.e. speeding, etc.) are being pushed by LEC and HPD. One of the bills HPD opposes is to add a State Highway Patrol because it would only duplicate the services of the City.

Concerns and comments followed:

1) Masunaga asked for the bill numbers. Maj. Chur will follow-up.

2) In response to Chair Acohido regarding HPD's position on a State Highway Patrol, Maj. Chur said if HPD didn't have an officer shortage they would be better able to enforce speeding, etc. At one point, they were 300 officers short. Chief Donohue has said that they should be close to full staffing next year. Nakamura mentioned that Rodney Haraga, Director of Department of Transportation (DOT), told the Board last month that there was no opposition to a State Highway Patrol.

3) Maj. Chur stated unadjudicated traffic fines being returned to the City have been part of the City's package for a number of years. HPD has never felt they benefit from the tickets they issue, but it doesn't factor in the decision-making. They support the bill, but it's not one of their priorities.

4) Masunaga inquired about the walk-and-talk bill. Maj. Chur answered the bill is being held.

5) Maj. Chur said HPD's position on the van cam is that they would like to see it come back, but only for red light enforcement, especially the intersections that have a lot of accidents. They don't want the public to perceive that they are issuing more tickets to get more revenue.

WAHIAWA LIVING TREASURES – Chair Acohido encouraged the community to submit nominations for Wahiawa Living Treasures. Next month, the Board will honor Wahiawa police officers. A nomination was received from the floor for Vaeleti Tyrell of Poamoho Camp.

Chair Acohido called for a recess at 7:32 p.m. Orders resumed at 7:38 p.m.

RESIDENTS' CONCERNS:

Various Concerns – Lee had the following concerns: 1) Large household items being dumped on Palm Street, which led to rat infestation and feral cats. There is a conflict between the State and City

regarding bulky trash. 2) There are also four abandoned vehicles on Palm Streets, which have been stripped. 3) An increase of doves in Wahiawa, which bothers dogs. She asked if doves carry any diseases. 4) Manholes on California Avenue. Every time a truck runs over a manhole at night it makes a loud noise. 5) Crosswalks in Wahiawa needs to be repainted because it's difficult to see.

California/Center Streets Intersection – Resident Betty Ickes had concerns about the design of the California Avenue and Center Street intersection. Chair Acohido said the concern will be noted and addressed to the Department of Transportation Services (DTS).

HSTA – Roger Takabayashi, president of HSTA, introduced himself. Chair Acohido said the Board will hold an education forum at April's meeting to address education reform.

GOVERNMENT AGENCIES AND COMMUNITY GROUP REPRESENTATIVES:

Elected Officials:

Mayor's Representative – Cheryl Okuma-Sepe sent her regrets.

U.S. Representative Ed Case – James Nakatani circulated Representative Case's report and highlighted the following: 1) Congressman Case has co-sponsored four federal initiatives that will help to address the affordable housing crisis in Hawai'i and across the nation. 2) An education forum will be held on Saturday, March 27, 2004, Kapolei. 3) Enactment of a new law will provide VA nursing home and medical services to Commonwealth Army veterans and New Philippine Scouts who are residing in the U.S. and are citizens or permanent residents.

Council Chair Donovan Dela Cruz – Kim Ribellia circulated Council Chair Dela Cruz's monthly report. Brandon Mitsuda highlighted the following: 1) Council Chair Dela Cruz sends his regrets. 2) Their office conducted site visits throughout the district recently. For the Department of Parks and Recreation, requests were submitted for damaged portable restrooms at Kahi Kani Neighborhood Park; fencing repairs at Wahiawa Botanical Gardens; and check lighting and courts at Wahiawa District Park. 3) Schofield Sunset in the Park will be held on Marc 20-21, 2004, Sills Field, 12:00 noon. 4) Pineapple Festival will be held on April 17, Kaala Elementary School. The festival will be held in conjunction with the annual Wahiawa Pineapple Run. 5) Regarding Nakamura's inquiry about who introduced Bill 66 (prohibiting the introduction of unnecessary chemical additives, considered to be medication, into Oahu's drinking water supply), it was Councilmember Tam.

Chair Acohido said if anyone wants to volunteer for Schofield Sunset in the Park to see him after the meeting. Volunteers who work four hours will receive a free meal and t-shirt.

Governor's Representative – Laurence Lau circulated his monthly report, along with the Governor's Report and highlighted the following: 1) He will follow-up on Lee's concern regarding Palm Street. 2) For more information about the Governor's education initiatives, he encouraged everyone watch "Education: It's Your Decision" on Channel 56 on March 20 at 7:30 p.m. and March 21 at 2:00 p.m. or visit www.care.hawaii.gov. 3) Follow-up items: a) contact Paul Conroy, Department of Land and Natural Resources Division of Forestry and Wildlife, at 587-0166 to report feral pigs; b) if the Galbraith Trust lands remain private, the only action the State Historic Preservation Division can take to further protect the Kukaniloko Birthstones is though its review of state and county land use approvals and permit actions. At last resort, the land could be condemned for public purposes, but this requires a sufficient legislative appropriation that would be difficult; c) the Department of Health can require the Wahiawa Wastewater Treatment Plant to have backup power to prevent future sewage spills during power outages, but the treatment plant already has and emergency generator.

Masunaga asked if the public would still have access to the Kukaniloko Birthstone. Lau will follow-up.

Senate President Robert Bunda – Senator Bunda stated: 1) April 22 is the last day that the Legislature will address a constitutional amendment. There is adequate time if the Board holds its education forum on April 19. 2) His office is interested in doing studies to mitigate the flooding problems at Lake Wilson so it won't affect residents of Otake Camp and Wai'alua. 3) Legislators are very interested in their constituents concerns. He will defer the Poamoho Camp issue to Representatives Oshiro and Magaoay. Senator Bunda said he's concerned about agricultural and stated it should be a mainstay in Wahiawa.

Representative Marcus Oshiro – Representative Oshiro circulated his monthly report. Included in his report were bills relating to education reform, prescription drugs, death with dignity, employment modification and land exchange with the Galbraith Trust. 2) He introduced Representative Michael

Magaoay. Representative Magaoay said Poamoho Camp and Kunia is part of his district.

City Agencies:

Wahiawa Satellite City Hall – Geri Tramontano stated most of the transactions they do are for vehicle registration. She encouraged soldiers to bring in their military non-resident form. Also, vehicle registration is available online on the City's website.

Board of Water Supply (BWS) – Duke Chung reported: 1) For the month of February, there were no main breaks in Wahiawa. 2) There are no new construction projects in Wahiawa. Over $4 million have been spent in Wahiawa on construction projects. 3) BWS is hosting a workshop for all Neighborhood Board members on Saturday, April 17, 2004, Honolulu Hale Courtyard, 9:00 a.m. to 12:00 noon. Topics of discussion will range from current projects to new initiatives to day-to-day operations. Registration forms must be returned by April 7. 3) More than 2000 O'ahu elementary school students entered BWS annual water conservation poster contest. Winners will be announced at BWS' Board meeting on April 26. 4) Water use on O'ahu is up slightly. Residents consumed an average of 133.08 million gallons of water a day during the week ending March 10. That's an increase of 2.55 mgd over the previous week, but a decrease of 12 mgd from last year.

Wahiawa Vision Team – Chair Acohido said the Wahiawa Vision Team is made of voluntary community members. The Vision Team selected three projects: Wahiawa Botanical Gardens; signage for Wahiawa; and Wahiawa Civic Center.

Lee stated a groundbreaking ceremony was held on March 5 for three buildings and the parking area at Wahiawa Botanical Gardens. The garden encompasses 27 acres, 10 of which are under cultivation. She invited everyone to visit the facility, which is open 9:00 a.m. to 4:00 p.m. There is no admission fee. Lee thanked all the members of the Vision Team, Neighborhood Board, WCBA, Senator Bunda, Representative Oshiro, Councilmember Dela Cruz and the community.

Military Officers:

U.S. Army – Col. Rick Hatch stated: 1) In January, 4,000 soldiers from the 25th Infantry Division (Light) deployed to Iraq. A Honolulu Advertiser photographer and journalist are embedded with them. The next deployment of troops will be going to Afghanistan. About 175 soldiers are already on ground. They will be deployed for one year. A deployment ceremony will be held this Thursday, Sills Field at 2:00 p.m. Everyone is invited to attend. 2) Army transformation (Stryker Brigade) is ongoing. The Draft Environment Impact Statement (EIS) has been completed. They have received over 600 comments. The final EIS will be published April 30. A decision will be made on June 7. 3) To adopt a platoon in Iraq or Afghanistan, please call 625-0177. 4) For the past 20 months, it has been a pleasure representing the Army. He has never seen a closer net community. Col. Hatch introduced his replacement, Lt. Col. Renee Roberts.

Chair Acohido said "Aloha Oe and God Bless You".

Ku Tree Reservoir – Nancy Nishikawa, Kimura International – Nishikawa gave a brief presentation on the Ku Tree Reservoir project. Currently, they are conducting an Environment Assessment (EA). The reservoir is located three miles from Wahiawa.

Concerns and comments followed:

1) Nishikawa stated the project is for safety reasons. The reservoir could backup and send a surge of water through Wahiawa.

2) Lee questioned why the project hasn't taken so long to begin since the problem has been known for years.

3) Nishikawa said they have money for design, but not construction. The public comment deadline for the EA is in May.

4) Col. Hatch stated Ku Tree Reservoir isn't being used as it was before.

5) Chair Acohido asked for a site inspection for 15 people (9 Board members, 4 elected officials and 2 residents). Nishikawa will follow-up.

NCTAMS PAC – Capt. Mary McClendon introduced herself and said she is looking forward to work closely with the Board and the community.

Community Groups:

Wahiawa Community Business Association (WCBA) – Chair Acohido said WCBA and other participating organizations should be recognized for their yellow ribbon campaign to recognize the military.

Friends of Wahiawa Library – Masunaga stated the Friends of Wahiawa Library recently raised $822 from their booksale.

OMPO's Citizen Advisory Committee (CAC) – Chair Acohido recognized Robert Kent and Daniel Neyer, who represents the Board and sits on the committee. There is a request for a two-hour parking limit on Lehua Avenue, fronting the Wahiawa Public Library. Currently, it's a safety hazard. Neyer will gather signatures in support of the request. After the petition is received, the Board will offer a resolution in support of the signage. Chair Acohido said another area of concern is the Foodland parking lot because of poor visibility.

Chair Acohido stated at next month's meeting the Department of Transportation Services will give an update on the 13 traffic calming project the Board submitted for FY 2003.

PRESENTATIONS:

Dislocation of Poamoho Camp Residents – Chair Acohido said three parties are presented tonight to discuss the dislocation of Poamoho Camp residents: the bank representing Galbraith Trust, ILWU and Poamoho Camp residents. Del Monte was invited to attend, but Richard Contreras, Vice President, sent a letter of regret. In the letter, Contreras stated Del Monte is a producer of fresh fruits with operations at Kunia and Poamoho. Del Monte's presence in Poamoho dates back to the early 1900's. He recognizes that Del Monte is part of Hawaii's history and look forward to maintain their operations in Hawai'i, however, their Hawai'i operations have been producing products at a competitive disadvantage and they have been forced to make adjustments to their operations to regain a strong market position. Del Monte's rationale included expansion of operations in Kunia; ceasing of operations in Poamoho; assurance jobs would not be lost and maintain employment level over the long haul; and housing not intended to be permanent, month-to-month lease may be ended by the landlord or tenant upon proper notice. Notices were delivered on February 10, 2004 because no viable alternatives were developed. If a viable plan develops, Del Monte would be pleased to discuss it with all concerned. The closing paragraph of the letter states in sum, Del Monte's Hawai'i operation has been continuously losing money and they must direct their resources to obtain the best long-term results for their company and employees. If Del Monte were to choose to continue to expand their resources to run Poamoho Camp for the benefit of a relatively small number of employees, they could be jeopardizing the long-term viability of all of their Hawai'i operations. Del Monte choose, instead, to provide jobs for all of their valued employees so that they can make a better future for them and their company.

Vaeleti Tyrell, Poamoho Camp Community Association, stated most of the 300 residents were born and raised at the camp. On February 10, they received a letter from Del Monte indicating their month-to-month lease will terminate in 120 days. Their 63 homes will be demolished on June 30, 2004. He asked the Board to write a letter of support.

Tracy Takano, ILWU, said the union doesn't want to see the 300 residents on the street. He's concerned that everything has to end by June 30. They are negotiating with Del Monte and asking the Galbraith Trust to continue to lease to Del Monte or another organization to prevent eviction. Wahiawa is lucky to have area representatives who want to work with the residents.

Concerns and comments followed:

1) Leolani Abdul, Galbraith Trust, stated the original term of the lease expired in the mid-90s. Currently, the

   lease is month-to-month. Chair Acohido asked without notice when would the lease expire. Abdul answered whenever notice was given.

2) Abdul said the Galbraith Trust will terminate in 2007. It was created by his will and it can't be

changed. Anything a trustee does, it has to benefit the trust. They can't give away land or forgive debt and must live under the terms of the lease. The trust cannot be a landlord for many reasons. There are many obstacles involved. The Galbraith Trust has been part of the community for many years.

3) Nakamura asked if there is possibility that Dole could be involved. Takano said he didn't know.

4) Tyrell stated they met with Del Monte twice (the last time being February 26) and made their proposal to lease the 90 acres.

5) Takano said they support Representative Oshiro's resolution, which asks that the lease be extended until December 2005. It would give them more time to find a solution.

6) Abdul stated the site would be cleaned-up after the lease is terminated.

7) Resident Betty Ickes asked if the Galbraith Trust is willing to sell the 90 acres to the Poamoho residents. Abdul answered they are willing to sell the property to anyone who can pay fair market value. Ickes asked what is the fair market value for agricultural-zoned land. Abdul said she didn't know the answer right now. Resident Warren Ickes said they are not asking for a handout, they just want a chance. The government has helped people in the past.

8) Representative Oshiro said he introduced a bill for the Department of Land and Natural Resources (DLNR) to negotiate a land exchange with the Galbraith Trust. He's been in contact with DLNR and Department of Agriculture and will speak with Lau, Governor's representative. All the area representatives are trying their best to move things along.

9) Takano stated legally ILWU can't be the leaser of the property. They have talked with a non-profit organization. There are lots of things in motion. The union's interest is to work with the community.

10) Senator Bunda said there are conflicting statements being made by Del Monte to the legislators and the community. He stated it's troubling that Del Monte is not here to address concerns.

11) Representative Magaoay echoed Senator Bunda's comments. He commended the residents for coming out and encouraged everyone to stand together. Representative Magaoay asked if Galbraith Trust could appraise the land with the structures included. Abdul answered they would appraise it on land value.

12) Masunaga questioned if residents would be to afford to pay fair market value for their homes.

13) Abdul stated the Galbraith Trust need to sell all their land by 2007. All they will have remaining is liquid assets.

14) Resident D. Tyrell, secretary for PCCA, said they are in the process of applying to become a non-profit organization.

15) Chair Acohido suggested calling the Governor's Office and asking her to speak with Del Monte to postpone the eviction date. He also suggested contacting WCBA. Chair Acohido said the Neighborhood Board is only advisory and can't get involved in a landlord and tenant dispute. Board members can sign a petition as a private citizen in support of Representative Oshiro's resolution.

The Neighborhood Assistant departed at 10:00 p.m. The remainder of the minutes was taken by the Board's secretary Kathleen Masunaga.

Submitted by:
Steve J. Rodrigues,Neighborhood Assistant

Wednesday, April 14, 2004

MILILANI MAUKA/LAUNANI VALLEY NEIGHBORHOOD BOARD

REGULAR MEETING MINUTES
TUESDAY, MARCH 16, 2004
MILILANI MAUKA ELEMENTARY SCHOOL CAFETERIA

CALL TO ORDER: Chair Graffigna called the meeting to order at 7:04 p.m., with a quorum of seven members present.

MEMBERS PRESENT: Tim Dittrick, David Ellis, Melissa Graffigna, Dean Hazama, Lily Canas, Pamela Young, and Martin Ortogero.

MEMBERS ABSENT: Alonzo Sandoval and Lance Yoshimura.

GUESTS: Major Bill Chur, Lt. John Matassa and Lt. Charles Wong (Honolulu Police Department – HPD); Clayton Brown (Board of Water Supply – BWS), Emily Viglielmo (Ka Nupepa), Mindy Norris (LOTMA), Simone Cantrell, Firefighter III Matt Takashige (Honolulu Fire Department – HFD), Randy Prothero (Rep. Ontai's Office staff), Brandon Mitsuda (Council-Chair Dela Cruz's Office staff), Jan Kemp (Governor's Representative), Scott Ishikawa (State DOT), Tom Smite, Rep. Marilyn Lee, Nancy Nishikawa (Kimura International), Chad McDonald (Mitsunaga & Associates), David Aki, Nick Kakaroukas (Mayor's Representative), and Charles Herrmann Jr. (Neighborhood Commission Office staff).

PLEDGE OF ALLEGIANCE: The Mililani Mauka Boy Scout Troop #664 Honor Guard posted the colors of the State of Hawaii and the United States. All rose and recited the Pledge of Allegiance.

APPROVAL OF THE TUESDAY, FEBRUARY 17, 2004 REGULAR MEETING MINUTES: the following corrections/additions were made to the minutes:

1) pages 2-8, under page heading, change the date to read "February 17, 2004".

2) Page 2, under Castle & Cooke, first line change "Ainamamuka" to read "Ainamakua".

3) Page 3, seventh line, change "there are" to read "their area".

4) Page 3, under question 2, fifth line from the bottom, delete the word "not".

5) Page 4, under question 3, next to last line, change "having to the" to read "having to go to the".

6) Page 4, under question 4, second line change "BOE" to read "Governor".

7) Page 1, under Guests, fifth line, put the word "and" between Gaston and Carleton.

8) Page 2, under Mililani Mauka HFD Truck, third line, change "that" to "there".

9) Page 3, thirteenth line, change, "criticism" to "criticisms".

10) Page 4, under question 4, fourth line, change "your" to "his"; fifth line, after the sentence ends

add "Also Young asked if it was common in other localities for principals to be members of unions."

Canas moved and Hazama seconded the motion to accept the minutes as amended. The motion carried, unanimously, 7-0-0.

TREASURER'S REPORT: Treasurer Hazama reported the following for the period ending February 29, 2004: 1) the operating account expenditures were $73.66, leaving a balance of $884.50; 2) the publicity account expenditures were $19.11, leaving a balance of $557.89; 3) the refreshment account expenditures were $25.26, leaving a balance of $94.74. **Ellis moved and Ortogero seconded the motion to accept the Treasurer's Report, subject to audit, as given. The motion carried unanimously, 7-0-0.**

RECOGNITIONS: Chair Graffigna announced there were no Recognitions planned for this meeting.

COMMUNITY REPORTS AND CONCERNS:

Honolulu Fire Department – HFD – Firefighter III Matt Takashige reported the following: 1) the statistics for the month of February 2004 included: 7 structure, 1 rubbish, and 1 vehicle fire; 12 medical, 2 search/rescue, and 4 miscellaneous emergency calls; 2) Fire Safety Tip: cooking fires are the leading cause of home fires and the second major cause of death among older adults. If you are cooking and must leave the kitchen, even for only a few minutes, turn off the stove. Keep a fire extinguisher (with a minimum rating of 2A10BC) in or near your kitchen and learn how to use it. Inspect the fire extinguisher regularly to ensure that it has not expired. 3) Suggestion of the Month: Keep fire hydrants in your neighborhood clear of obstructions, including parked cars, debris, and weeds.

Honolulu Police Department – Lt. Charles Wong reported the following: 1) the statistics for the month of February included: 17 burglaries, 36 thefts, and 52 thefts from motor vehicles; 2) HPD has made several arrests regarding thefts from motor vehicles, which should reduce the statistics next month.

Lt. Wong introduced Lt. John Matassa and Major Bill Chur, legislature trackers for HPD who gave the following information regarding proposed bills being considered this session: 1) they supported the Law Enforcement Coalitions proposed bills regarding: a) protecting animals that work for HPD, b) electronic surveillance, c) changing the current Megan's Law to address the Supreme Court's concerns, d) 311 non-emergency system, e) wireless phone 911 enhanced system surcharge. 2) They are following the bills relating to traffic safety and racing closely. 3) They opposed the creation of a State highway patrol and allowing the Chief to give permits to carry a concealed registered weapon (gun permit).

Questions and answers: HPD supported the bill related to deferring their medical co-payments, but they did not write it and the bill has crossed over.

Board of Water Supply – BWS – Clayton Brown distributed copies of the monthly written report and reported the following: 1) There were no water main breaks in the area during February 2004; 2) BWS is hosting all Neighborhood Board members on Saturday, April 17, 2004 at the Honolulu Hale Courtyard, from 9:00 a.m. through noon; invitations will be sent with registration forms that must be returned by April 7, 2004; 3) more than 2000 O'ahu students from kindergarten to sixth grade entered this year's annual BWS conservation poster contest. Winners will be announced at the April 26, 2004 regular monthly BWS meeting; 4) Water use is up slightly, as on the week ending March 10, 2004 it increased 2.55 million gallons per day. We all need to continue to conserve water wisely to allow our aquifers to recharge; 5) BWS projects; a) Mililani (4) Site improvements are 100% complete; b) Mililani Wells II Renovations are currently pending.

Questions and answers: Brown will follow-up on the bills being considered regarding protecting the Pearl Harbor aquifer.

Castle & Cooke – Tony Gaston reported the following: 1) The Meheula Parkway/Ainamakua Drive intersection has been re-striped and the traffic flow has already started to improve; 2) They fielded nine different classes during the recent Mililani High School career day; 3) They held their grand opening for their Island Classics Model homes recently, but the concrete strike limited the amount of houses available for delivery (houses run between $425,000.00 and $500,000.00); 4) Recreation Center #7 has fallen even further behind due to the concrete strike and the adjusted opening date should be in early 2005.

Questions and answers: 1) Gaston asked that Board and community members allow time for the traffic signal adjustments to function properly before they press for additional changes. 2) The intersection will be tweaked/adjusted again on March 24, 2004.

Leeward O'ahu Transportation Management Association – LOTMA – Mindy Norris reminded everyone of LOTMA's services: 1) Two morning and two evening buses that run to Waikiki and back, which can be ridden for $85.00 monthly or $41.00 for 21 trips; 2) Emergency ride reimbursement program; and 3) Carpool matching service (if you enter into the system for carpool matching service you become eligible to receive a $50.00 Safeway gift card).

No other community reports or concerns were expressed at this meeting.

PUBLIC/COMMUNITY PRESENTATIONS:

Proposed Breach of Ku Tree Dam – Chad McDonald (Mitsunaga & Associates) and Nancy Nishikawa (Kimura International) - McDonald reported the dam was built in 1925 and in 1938 the military started using deep-water wells for their drinking water source instead of the dam. During an inspection in 1978 the dam was deemed unsafe and in 1983 the water level was lowered to the existing stream level. In 1984 they did a study regarding a proposed controlled breach of the dam. They have decided to cut a flood control channel, about 30 feet wide and graded down 70-80 feet to allow the river free flow to the Wahiawa Reservoir. The dam currently stores no water, but if the dam should fail the flood would flow into Wahiawa town and create a lot of damage. The project should take one year to eighteen months to complete.

Questions and answers: 1) The dam is located on Federal Property and they are currently in the process of doing the Environmental Assessment (EA). After the EA is completed, they will address the Environmental Impact Statement (EIS). 2) They will discuss allowing both this Neighborhood Board and the Wahiawa Neighborhood Board to do a site visit. 3) There was no problem with the recent heavy rains, but there was evidence of water back up in the reservoir.

Department of Parks and Recreation Update on Parks in the Mililani Area – Nick Kakaroukas congratulated Lily Canas and welcomed her back to the Board. Kakaroukas reported the following:

1) The Mililani Mauka Off-Leash Dog Park should be operational by the end of August. The park is located at the future site of the Child Care Center next to the park and ride facility. They have completed the water line and graded the land. The trees and grass will be planted soon, then the fence will be constructed and it should be operational by the end of this summer.

2) The community and park users accepted Mililani Mauka District Park Master Plan in 1998. Part of the project was funded in the 2004 budget, this includes construction of the comfort station, the north softball field, some of the parking stalls, and backstops. This year's budget should include funding for the gym, recreation center building, 2 soccer fields, 3 baseball fields, lighting, tennis courts, and additional parking stalls. The Department of Design and Construction (DCC) is considering moving the softball field closer to the highway and then moving the tennis courts closer to the park entrance to allow better monitoring by HPD.

3) Mililani Mauka District Park will consist of 3 ball fields, several tennis courts, comfort station, parking stalls, and a collector road. The funding for Phase 1 was approved in the 2004 Budget and the contract is currently out to bid. Phase 1 includes: 1 ball field, the walkway, and the comfort station.

Questions and answers:

1) Concern was expressed that if the district park builds only the north field at this time it would create disruption when they build the other ball fields.

2) Kakaroukas said he would work with the Chair to ensure someone from DDC would be present at the next meeting to answer any questions regarding any of the concerns with the parks.

3) There were concerns expressed about the construction vehicles speeding in the residential neighborhood.

4) Concern was expressed regarding the lighting for the fields and whether they would include some type of shielding/hooding to control the light from shining into nearby homes.

5) Tim Dittrick should be listed as the project champion not Dick Poirier.

6) It is believed that the Deed for the District Parkland has been accepted by the City at this time, but Council-Chair Dela Cruz will follow-up just to make sure.

7) Concern was expressed about the amount of past funding. The Mayor promised an additional $500,000.00 for the Project but there is only $600,000.00 appropriated. There should be more than the current $600,000.00; funds from the Neighborhood Board Vision and the Mililani Vision were previously submitted; Kakaroukas said he would follow-up on the issue.

8) The district park includes about 16 acres of land; the community park includes about 12 acres of land and the dog park includes about 2 acres of land.

Chair Graffigna and Kakaroukas will work together to get DDC to attend the next Board meeting to address the questions.

COMMITTEE REPORTS:

Transportation Committee – Chair Young reported the following: 1) The next O'ahu Metropolitan Planning Organization (OMPO), Citizen Advisory Committee (CAC) meeting is scheduled for Wednesday, March 17, 2004, at 4:00 p.m., at the Mayor's Conference Room at Honolulu Hale; one of the agenda topics is the Aloha Pace Car Program presentation; 2) Chair Young submitted written copies of the Monday, March 15, 2004 Transportation Meeting summary regarding: a) Pedestrian safety improvements on Lehiwa Drive, b) Speed monitors, and c) the dedication of Wikao Street.

Chair Report – Chair Graffigna reported the following: 1) She attended a meeting last night with the "Friends of Makakilo" regarding the Board's Manifesto and they are considering an alliance; 2) The main story in the last issue of the Ka Nupepa was the Board's Manifesto; 3) Both Ellis and Chair Graffigna testified on the bill regarding Impact Fees.

No other committee reports were given at this meeting.

UNFINISHED/OLD BUSINESS:

Central O'ahu Regional Park – Ka Uka/Paiwa Connector Road – Young moved and Ellis seconded the motion to support the resolution supporting an internal circulation road through the Central O'ahu regional Park from Kamehameha Highway to Paiwa Street. The motion failed, 2-5-0. Ayes: Young and Ortogero. **Nays:** Canas, Ellis, Hazama, Dittrick, and Graffigna.

Discussion followed:

1) Concern was expressed that there is still a need to have the other communities involved that surround the park. It was reported that Darrel Young of Councilmember Nestor Garcia's office had already spoken to the Waikele Community Association and they are looking into the issue.

2) It was also reported that area residents are rethinking an emergency access route through the area.

3) Concern was expressed that it would be hard to support the resolution until the proposed roadway plans were shown to the community and Board. Young mentioned that the proposed resolution was drafted with residents in mind and the intent was to keep the street widening to a 2-lane road.

4) There appears to be a need to have the City involved before the Board can consider the proposed resolution.

Ellis moved and Hazama seconded the motion to table the issue until the affected community

groups have had their say on the issue. The motion failed, 4-3-0. **Ayes:** Ellis, Canas, Hazama and Dittrick. **Nays:** Graffigna, Young and Ortogero. *(This Board has nine members, this means a majority of five (5) members voting in support are required for a motion to pass.)*

Neighborhood Commission Office 2005 Budget Proposal – Chair Graffigna reported the Neighborhood Commission held a meeting with the Board Chairs and they decided to support the requested Budget. The 2005 Budget is basically the same as the 2004 Budget and the commission is asking for the Boards to support their proposed Budget. **Young moved and Hazama seconded the motion to support the proposed 2005 Neighborhood Commission Office budget. The motion carried unanimously, 7-0-0.**

NEW BUSINESS:

Alternative Sites for a New Municipal Solid Waste Landfill on O'ahu – Chair Graffigna asked if there were any objections to deferring the issue until a later date, there were no objections expressed so the issue was deferred indefinitely.

REPORTS BY PUBLIC OFFICIALS:

Mayor's Representative – Nick Kakaroukas distributed copies of the following: 1) A flyer inviting everyone to attend the Schofield Sunset in the Park event on March 20 & 21, 2004. The event starts at noon on both days and will be held at Sills Field on Schofield Barracks; 2) The fiscal Year 2005 Executive Program and Budget Highlights for Neighborhood Boards. Kakaroukas said some of the interesting things about the Budget are: a) The Budget includes no residential property tax increase and 2) The budget has only a 4.1% increased from last year's budget.

Governor's Representative – Jan Kemp distributed written copies of the Governor's Update for the week of March 6-12, 2004 and introduced Scott Ishikawa, Department of Transportation (DOT) and Tom Smite, Director of the State Economic Development and Tourism Board to address the previous concerns of the Board.

Ishikawa distributed written copies of the following: 1) A report regarding the feasibility of establishing Flyer stops within right-of-way of O'ahu's H-2 freeway. Ishikawa reported that HCR No. 188, regarding creating flyer stops on the freeway, is dead. There were many concerns expressed regarding safety because the flyer stops would be located in the center of the freeway and traffic coming out of the stops would be flowing into the fast lanes and would create traffic accidents and problems. There were concerns expressed by the Sierra Club and the Outdoor Circle because they want more beautiful freeways to be built in Hawaii. 2) A news release from DOT in regards to regarding the DOT reverting back to the old Zipper Lane rules form prior to the bus strike. On Monday, April 5, 2004 DOT will be reverting back to the pre-bus strike rules for the Zipper Lane. Vehicles will need at least three occupants to use the Zipper Lane from 5:00 a.m. – 7:00 a.m. on weekdays. Vehicles with two occupants or more can use the Zipper Lane from 7:00 a.m. – 8:30 a.m., on weekdays. 3) The Waimalu widening project construction should start in mid-May. 4) DOT is pushing to widen the Kipapa Gulch Bridge; Ishikawa will follow-up on the issue at the next meeting.

Tom Smite, Director of the Economic Development and Tourism Board, reported they are currently working with the federal government to acquire help for the businesses in the Wahiawa area when the 25th Infantry Division deploys overseas. They are working on a program called the Hawaii Emergency Loan Program (HELP), which would allow businesses to borrow up to $50,000.00 with no interest for the first year and a 3% interest rate for the rest of the five-year loan term. Due to the fact that the legislature limited their expenditures last year they are working on a new law to allow them to give loans to the businesses. They have the funding to give, but under the current laws they can't give any away. They are also working with the tax department to include them with the tax laws and breaks that are available to them. They are also sponsoring events like the Sunset in the Park event and they plan another event for when the troops return home.

Questions and answers:

1) It was suggested that the State allow the City to use their Van-Pool vehicles instead of renting additional vehicles when they need them, such as during the bus strike.

2) There are changes to the original plans for the Koa Ridge Project including the possible widening of the Kipapa Gulch Road.

3) Ishikawa said he would check into adjusting the traffic signal on the Meheula Parkway intersection (heading toward the town bound entrance to the H-2) by increasing the green light's time.

4) Ishikawa expressed concern that many vehicles were driving through the mauka bound red light at the Meheula Parkway/Ainamakua Drive intersection.

5) Concerns were expressed that Wahiawa would end up like Kaneohe did ten years ago when the Marines deployed.

6) The federal government does not view deployment the same as a base closure and therefore does not provide funding to help local businesses. Currently the military is predicting that only 10% of the military dependants will leave Hawaii and return back home and not the 90% that left when the Marines were deployed ten years ago. They are working with local banks to create small business loans.

7) Concern was expressed that the local businesses would experience a loss of their workforce due to the deployment.

Council Chair Donovan Dela Cruz – Brandon Mitsuda distributed copies of the following: 1) the Council Chair's monthly written report; 2) Copies of an article from Ka Nupepa regarding bills that could boost Wahiawa's economy; 3) Copies of HB 2661 and HB 2662 regarding boosting Wahiawa's economy; 4) Bill 52 relating to impact fees for traffic and roadway improvements in Ewa; 5) HRS general provisions regarding impact fees, for more information please call Elizabeth Chin at 523-4217; 6) A flyer regarding the April 17, 2004 Pineapple Run and the April 2004 Pineapple Festival 2004, contact Jerry Linville at 227-8229, or by FAX at 739-5355, or by e-mail at: linville@hawaii.rr.com or at website: www.hawaiisealofquality.org for more information or to volunteer to help; 7) Information regarding the Sunset in the Park event at Schofield Barracks this weekend; 8) Information regarding the Partnering for a Safe Community Fair on Saturday, April 24, 2004 at the Windward Mall from 10:00 a.m. – 4:00 p.m.; 9) Mitsuda will follow-up on the exact amount of money the City has collected in impact fees from the area.

Senator Ron Menor – Sen. Menor reported the following: 1) The Hawaii Prescription Drug Bill has passed and should save consumers 15-60% on their prescriptions, copies of his speech regarding this bills were distributed; 2) SB 3062 regarding impact fees is still alive; 3) All bills that must go through more than one committee must reach their last committee by next Wednesday to remain alive; he suggested that the Board and community members submit testimony by next Wednesday in support of any bills they want to reach the final committee hearing by next Wednesday.

Questions and answers: The Senator was reminded that both Mililani Neighborhood Boards met and wrote up some information that they reached by consensus, copies will be resent to all elected officials.

Representative Marcus Oshiro –Rep. Oshiro reported that he had included funding to repair the Leilehua High School field and he has submitted a resolution regarding the deployment of the 25th Infantry Division.

Representative Guy Ontai – Randy Prothero distributed copies of the Representative's monthly written report, which included information regarding the status of some of key bill from this session after the first crossover.

Representative Marilyn Lee – Rep. Lee distributed copies of the following: 1) Her monthly written report; 2) A flyer regarding the House Democrats education reform package; 3) A flyer regarding information on reasonable access to prescription drugs for all Hawaii residents; and 4) her mid-session highlights report. Rep. Lee reported the following: 1) Funding ($5.7 million) for a new 10-classroom addition at the Mililani High School is included in HB

1800 HD1, which has passed its third reading on March 11, 2004; 2) Students from the Kipapa School entertained and provided dinner for members of the 25th Infantry Division that are deploying soon at their school; 3) The middle school drug treatment bill is still alive.

Questions and answers: Concerns were expressed that the Governor is being disruptive and has too much power when it come to releasing the funding for school projects. It was suggested that a bill relieving her of that power be supported and passed.

ANNOUNCEMENTS: Chair Graffigna announced the following: 1) The next regular meeting of the Board would be held on Tuesday, April 20, 2004, at 7:00 p.m., at the Mililani Mauka Elementary School Cafeteria, 95-1111 Makaikai Street; 2) The next Committee of the Whole meeting will be held on Tuesday, April 6, 2004, at 7:00 p.m., at the Mililani mauka McDonalds, 95-1860 Meheula Parkway.

ADJOURNMENT: Chair Graffigna adjourned the meeting at 9:24 p.m., without objection.

Submitted by:

Charles Herrmann, Jr.
Neighborhood Assistant

Wednesday, April 14, 2004

Appendix J:
Pre-Assessment Scoping and Consultation

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EPO-04-014

February 24, 2004

Mr. Glen T. Kimura
Kimura International, Inc
1600 Kapiolani Blvd, Suite 1610
Honolulu, Hawaii 96814

Dear Mr. Kimura:

SUBJECT: Pre-Assessment Consultation
Breach Ku Tree Dam
East Range, Schofield Barracks, Island of Oahu, Hawaii
FY 04 OMA PKG A-130

Thank you for allowing us to review and comment on the subject document. We have the following comments to offer:

Environmental Planning Office

This project is located in the drainage basin of Kiikii Stream and Waialua/Kaiaka Bays, where stream, estuary, embayment, and coastal waters are currently listed under section 303(d) of the Clean Water Act as waterbodies in which water quality is impaired by excessive nutrients and turbidity (and suspended solids for Waialua/Kaiaka Bays) (http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf).

The impaired status of these waters requires that the Department of Health establish Total Maximum Daily Loads (TMDLs) suggesting how much the existing pollutant loads should be reduced in order to attain water quality standards in the coastal waters. Although these TMDLs are yet to be established and implemented, a first step in achieving TMDL objectives is to prevent any project-related increases in pollutant loads. We expect that this would be accomplished through the proper application of suitable best management practices in all phases of the project and adherence to the City and County of Honolulu Rules Relating to Storm Drainage Standards and any applicable permit conditions.

The Department of Health is beginning a new project that will establish TMDLs for the south fork of Kaukonahua Stream and pollutant load allocations for the surrounding lands. We will then develop an implementation plan to achieve these load allocations and improve stream water quality by reducing the polluted runoff entering the stream receiving waters. To facilitate TMDL development and assessment of the potential impact of the proposed project upon pollutant loading in the stream receiving waters, we suggest that the draft Environmental Assessment for this project quantify pre-and post project pollutant loading for the affected drainage basin, and that the Army plan additional pollutant load reduction practices for future management of the watershed.

If you have any questions about these comments or the Total Maximum Daily Load program, please contact David Penn at 586-4337.

Solid Waste Program

The waste materials resulting from demolition of the tower and other waste fill should meet the definition of "inert fill" as defined in Hawaii Revised Statutes Ch. 342H-1.

If the materials do not meet this definition, more information on their proper management should be included in the environmental assessment.

Please contact the Solid Waste Program at 586-4226 with any questions regarding these comments.

Sincerely,

June F. Harrigan-Lum

JUNE F. HARRIGAN-LUM, MANAGER
Environmental Planning Office

c: EPO
SHWB

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EPO-04-014

March 8, 2004

Mr. Glen T. Kimura
Kimura International, Inc
1600 Kapiolani Blvd, Suite 1610
Honolulu, Hawaii 96814

Dear Mr. Kimura:

SUBJECT: Pre-Assessment Consultation
Breach Ku Tree Dam
East Range, Schofield Barracks, Island of Oahu, Hawaii
FY 04 OMA PKG A-130

Thank you for allowing us to review and comment on the subject document. We have the attached standard comments to offer.

Sincerely,

June F. Harrigan-Lum

JUNE F. HARRIGAN-LUM, MANAGER
Environmental Planning Office

Enclosures

c: EPO
SHWB
NRAIQ
CWB
WWB
CAB
HEER

Standard Comments

Environmental Planning Office Dated 3/2/04

The Environmental Planning Office (EPO) is responsible for several surface water quality management programs mandated by the federal Clean Water Act or dictated by State policy . (http://www.state.hi.us/doh/eh/epo/wqm/wqm.htm). Among these responsibilities, EPO:

- maintains the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* (http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf);
- develops and establishes Total Maximum Daily Loads (TMDLs) for listed waters (suggesting how much existing pollutant loads should be reduced in order to attain water quality standards, please see http://www.epa.gov/owow/tmdl/intro.html);
- writes TMDL Implementation Plans describing how suggested pollutant load reductions can be achieved; and
- conducts assessments of stream habitat quality and biological integrity.

To facilitate TMDL development and planning, and to assist our assessment of the potential impact of proposed actions upon water quality, pollutant loading, and biological resources in receiving waters, we suggest that environmental review documents, permit applications, and related submittals include the following standard information and analyses:

Waterbody type and class

1. Identify the waterbody type and class, as defined in Hawaii Administrative Rules Chapter 11-54 (http://www.state.hi.us/doh/rules/11-54.pdf), of all potentially affected water bodies[1].

Existing water quality management actions

2. Identify any existing National Pollutant Discharge Elimination System (NPDES) permits and related connection permits (issued by permittees) that will govern the management of water that runs off or is discharged from the proposed project site or facility. Please include NPDES and other permit numbers; names of permittees, permitted facilities, and receiving waters (including waterbody type and class as in 1. above); diagrams showing drainage/discharge pathways and outfall locations; and note any permit conditions that may specifically apply to the proposed project.

3. Identify any planning documents, groups, and projects that include specific prescriptions for water quality management at the proposed project site and in the

potentially affected waterbodies. Please note those prescriptions that may specifically apply to the proposed project.

Pending water quality management actions

4. Identify all potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* including the listed waterbody, geographic scope of listing, and pollutant(s) (See Table 7 at http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf).

5. If the proposed project involves potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*, identify and quantify expected changes in the following site and watershed conditions and characteristics:
   - surface permeability
   - hydrologic response of surface (timing, magnitude, and pathways)
   - receiving water hydrology
   - runoff and discharge constituents
   - pollutant concentrations and loads in receiving waters
   - aquatic habitat quality and the integrity of aquatic biota

Where TMDLs are already established they include pollutant load allocations for the surrounding lands and point source discharges. In these cases, we suggest that the submittal specify how the proposed project would contribute to achieving the applicable load reductions.

Where TMDLs are yet to be established and implemented, a first step in achieving TMDL objectives is to prevent any project-related increases in pollutant loads. This is generally accomplished through the proper application of suitable best management practices in all phases of the project and adherence to any applicable ordinances, standards, and permit conditions. In these cases we suggest that the submittal specify how the proposed project would contribute to
reducing the polluted discharge and runoff entering the receiving waters, including plans for
additional pollutant load reduction practices in future management of the surrounding lands and drainage/discharge systems.

Proposed Action and Alternatives Considered

We suggest that each submittal identify and analyze potential project impacts at a watershed scale by considering consider the potential contribution of the proposed project to cumulative, multi-project watershed effects on hydrology, water quality, and aquatic and riparian ecosystems.

We also suggest that each submittal broadly evaluate project alternatives by identifying more than one engineering solution for proposed projects. In particular, we suggest the consideration of "alternative," "soft," and "green" engineering solutions for channel

modifications that would provide a more environmentally friendly and aesthetically pleasing channel environment and minimize the destruction of natural landscapes.

If you have any questions about these comments or EPO programs, please contact Ryan Davenport at 586-4346.

[1]"Potentially affected waterbodies" means those in which proposed project activity would take place and any that could receive water discharged by the proposed project activity or water flowing down from the proposed project site. These waterbodies can be presented as a chain of receiving waters whose top link is at the project site upslope and whose bottom link is in the Pacific Ocean, and can be named according to conventions established by Chapter 11-54 and the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*. For example, a recent project proposed for Nuhelewai Stream, Oahu might potentially affect Nuhelewai Stream, Kapalama Canal, and Honolulu Harbor and Shore Areas.
[OTHER EXAMPLES OR DIAGRAM??]

Solid and Hazardous Waste Branch Dated 3/2/04

1)
The OSWM recommends the development of a solid waste management plan that encompasses all project phases including demolition, construction, and occupation/operation of the completed project.

Specific examples of elements that the plan should address include:

- The recycling of green-waste during clear and grub activities;
- Recycling construction and demolition wastes, if appropriate;
- The use of locally produced compost in landscaping;
- The use of recycled content building materials;
- The provision of recycling facilities in the design of the project.

- -

2)
The developer shall ensure that all solid waste generated during project construction is directed to a Department of Health permitted solid waste disposal or recycling facility.

- -

3)
The developer should consider providing space in the development for recycling activities. The provision of space for recycling bins for paper, glass, and food/wet waste would help to encourage the recycling of solid waste(s) generated by building occupants.

- -

4)
The discussion of solid waste issues contained in the document is restricted to activities within the completed project. The OSWM recommends the development of a solid waste management plan that encompasses all project phases, from construction (and or demolition) to occupation of the project.

Specific examples of plan elements include: the recycling of green-waste during clear and grub activities; maximizing the recycling of construction and demolition wastes; the use of locally produced compost in the landscaping of the project; and the provision of recycling facilities in the design of the project.

- -

5)
Hawaii Revised Statutes Chapter 103D-407 stipulates that all highway and road construction and improvement projects funded by the State or a county or roadways that are to be accepted by the State or a county as public roads shall utilize a minimum of ten per cent crushed glass aggregate as specified by the department of transportation in all base-course (treated or untreated) and sub-base when the glass is available to the quarry or contractor at a price no greater than that of the equivalent aggregate.

If you have any questions, please contact the Solid and Hazardous Waste Branch at (808) 586-4240.

Noise, Radiation & Indoor Air Quality Branch Dated 3/2/04

"Project activities shall comply with the Administrative Rules of the Department of Health:

- Chapter 11-39 Air Conditioning and Ventilating.
- Chapter 11-45 Radiation Control.
- Chapter 11-46 Community Noise Control.
- Chapter 11-501 Asbestos Requirements.
- Chapter 11-502 Asbestos-Containing Materials in Schools.
- Chapter 11-503 Fees for Asbestos Removal and Certification
- Chapter 11-504 Asbestos Abatement Certification Program

Should there be any questions, please contact Russell S. Takata, Environmental Health Program Manager, Noise, Radiation and Indoor Air Quality Branch, at 586-4701."

Clean Water Branch Dated 3/2/04

1. The Army Corps of Engineers should be contacted at (808) 438-9258 to identify whether a Federal license or permit (including a Department of Army permit) is required for this project. Pursuant to Section 401(a)(1) of the Federal Water Pollution Act (commonly known as the "Clean Water Act"), a Section 401 Water Quality Certification is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters...."

2. A National Pollutant Discharge Elimination System (NPDES) general permit coverage is required for the following activities:

   a. Storm water associated with industrial activities, as defined in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi).

b. Construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the commencement of the construction activities.**

c. Discharges of treated effluent from leaking underground storage tank remedial activities.

d. Discharges of once through cooling water less than one (1) million gallons per day.

e. Discharges of hydrotesting water.

f. Discharges of construction dewatering effluent.

g. Discharges of treated effluent from petroleum bulk stations and terminals.

h. Discharges of treated effluent from well drilling activities.

i. Discharges of treated effluent from recycled water distribution systems.

j. Discharges of storm water from a small municipal separate storm sewer system.

k. Discharges of circulation water from decorative ponds or tanks.

The CWB requires that a Notice of Intent (NOI) to be covered by a NPDES general permit for any of the above activities be submitted at least 30 days before the commencement of the respective activities. The NOI forms may be picked up at our office or downloaded from our website at http://www.state.hi.us/health/eh/cwb/forms/genl-index.html.

3. The applicant may be required to apply for an individual NPDES permit if there is any type of activity in which wastewater is discharged from the project into State waters and/or coverage of the discharge(s) under the NPDES general permit(s) is not permissible (i.e. NPDES general permits do not cover discharges into Class 1 or Class AA receiving waters). An application for the NPDES permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at http://www.state.hi.us/health/eh/cwb/forms/indiv-index.html.

4. Hawaii Administrative Rules, Section 11-55-38, also requires the owner to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD. Please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.

If you have any questions, please contact the CWB at 586-4309.

Waste Water Branch Dated 3/2/04

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294.

Clean Air Branch Dated 3/2/04

Construction/Demolition Involving Asbestos:

Since the proposed project would entail renovation/demolition activities which may involve asbestos, the applicant should contact the Asbestos Abatement Office in the Noise, Radiation and Indoor Air Quality Branch at 586-5800.

Control of Fugitive Dust:

A significant potential for fugitive dust emissions exists during all phases of construction. Proposed construction activities will occur in proximity to **existing residences, businesses, public areas and thoroughfares**, thereby exacerbating potential dust problems. It is recommended that a dust control management plan be developed which identifies and addresses all activities that have a potential to generate fugitive dust. Implementation of adequate dust control measures during all phases of development and construction activities is warranted.

Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust.

The contractor should provide adequate measures to control dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

a) Plan the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Provide an adequate water source at the site prior to start-up of construction activities;
c) Landscape and provide rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimize dust from shoulders and access roads;
e) Provide adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Control dust from debris being hauled away from the project site.

Hazard Evaluation and Emergency Response Office(HEER) Dated 3/2/04

1. A phase I Environmental Site Assessment (ESA) should be conducted for developments or redevelopments. If the investigation shows that a release of petroleum, hazardous substance, pollutants or contaminants occurred at the site, the site should be properly characterized through an approved Hawaii State Department of Health (DOH)/Hazard Evaluation and Emergency Response Office (HEER) soil and or groundwater sampling plan. If the site is found to be contaminated, then all removal and remedial actions to clean up hazardous substance or oil releases by past and present owners/tenants must comply with chapter 128D, Environmental Response Law, HRS, and Title 11, Chapter 451, HAR, State Contingency Plan.

2. All lands formerly in the production of sugarcane should be characterized for arsenic contamination, If arsenic is detected above the US EPA Region (preliminary remediation goal (PRG) for non-cancer effects, then a removal and or remedial plan must be submitted to the Hazard Evaluation and Emergency Response (HEER) Office of the State Department of Health for approval. The plan must comply with Chapter 128D, Environmental Response Law, HRS, and Title 11, Chapter 451, HAR, State Contingency Plan.

3. If the land has a history of previous releases of petroleum, hazardous substances, pollutants, or contaminants, we recommend that the applicant request a "no further action" (NFA) letter from the Hawaii State Department of Health (DOH)/ Hazard Evaluation and Emergency Response (HEER) Office prior to the approval of the land use change or permit approval.

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

March 2, 2004

Mr. Glenn Kimura
Kimura International
1600 Kapiolani Blvd. Suite 1610
Honolulu, HI 96814

Subject: Breach Ku Tree Dam, East Range, Schofield Barracks, Oahu, Hawaii

Dear Mr. Kimura,

We have received your letter dated January 27, 2004 regarding the Breach Ku Tree Dam project. At this time, we have no comment and reserved further comments when the documents are submitted.

Should you have any questions, please feel free to call our office at 586-4185.

Sincerely,

Genevieve Salmonson

Genevieve Salmonson
Director

LINDA LINGLE
GOVERNOR OF HAWAII

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04 FEB 3 AM : 27

COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 30, 2004

LD/NAV
BREACHKAUTREEDAM.CMT

Suspense Date: 2/11/04

MEMORANDUM:

~~TO:~~ FR:

XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Engineering Division
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Oahu District Land Office

RECEIVED
LAND DIVISION
2004 FEB 18 A 9: 24
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

~~FROM:~~ TO:

Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Early Consultation for Preparation of a Draft Environmental Assessment for the breach of Ku Tree Dam, located within the east range training Area of Schofield Barracks Military Reservation, Oahu, Hawaii

Please review the attached Kimura International letter dated 1/27/04 (summary of project) pertaining to the subject matter and submit your comments (if any) on Division letterhead signed and dated by the suspense date.

Should you have any questions, please contact Nick Vaccaro at ext.: 7-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments.

(✓) Comments attached.

Signed: [signature]

Date: FEB 13 2004

Print Name: Ernest Y.W. Lau

Division: CWRM

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON

MEREDITH J. CHING
CLAYTON W. DELA CRUZ
JAMES A. FRAZIER
CHIYOME L. FUKINO, M.D.
STEPHANIE A. WHALEN

ERNEST Y.W. LAU
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

P.O. BOX 621
HONOLULU, HAWAII 96809

February 13, 2004

TO: Ms. Dede Mamiya, Administrator
Land Division

FROM: Ernest Y.W. Lau, Deputy Director
Commission on Water Resource Management (CWRM)

SUBJECT: Pre-Draft EA, Breach Ku Tree Dam, Schofield, Oahu.

FILE NO.: BreachKuTreeDam.cmt

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[ ] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[ ] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and an amendment of the instream flow standard for the affected stream(s).

[X] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[ ] OTHER:

If there are any questions, please contact David Higa at 587-0249.

c. DLNR, Engineering Division

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
DEPUTY DIRECTOR - WATER

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

January 30, 2004

LD/NAV
BREACHKAUTREEDAM.CMT

Suspense Date: 2/11/04

MEMORANDUM:

TO: XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Engineering Division
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Oahu District Land Office

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Early Consultation for Preparation of a Draft Environmental Assessment for the breach of Ku Tree Dam, located within the east range training Area of Schofield Barracks Military Reservation, Oahu, Hawaii

Please review the attached Kimura International letter dated 1/27/04 (summary of project) pertaining to the subject matter and submit your comments (if any) on Division letterhead signed and dated by the suspense date.

Should you have any questions, please contact Nick Vaccaro at ext.: 7-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(X) We have no comments at this time ( ) Comments attached.
We will wait for a copy of Draft EA.

Signed: _____ Date: FEB - 3 2004

Print Name: _____ Division: _____

MICHAEL G. BUCK, ADMINISTRATOR
DIVISION OF FORESTRY AND WILDLIFE

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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Land Division

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Should you have any questions, please contact Nick Vaccaro at ext.: 7-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(✓) We have no comments. ( ) Comments attached.

Signed: [signature] Date: 2/4/04

Print Name: Daniel S. Quinn Division: State Parks

FEB 3 3 17 PM '04

2004 FEB -4 P 3:

RECEIVED

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
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January 30, 2004

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Suspense Date 2/11/04

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TO: XXX Division of Aquatic Resources
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Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Oahu District Land Office

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Early Consultation for Preparation of a Draft Environmental Assessment for the breach of Ku Tree Dam, located within the east range training Area of Schofield Barracks Military Reservation, Oahu, Hawaii

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Should you have any questions, please contact Nick Vaccaro at ext.: 7-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments. (X) Comments attached.

Signed: Eric T. Hirano Date: 2/18/04

Print Name: ERIC T. HIRANO, CHIEF ENGINEER Division: Engineering

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LA/NAV

Ref.: BREACHKAUTREEDAM.CMT

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone D.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is D.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.

( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

(X) Other: The draft EA should address the hydrologic requirements, hydraulic capabilities, and anticipated flooding impacts of the proposed breach. Also, a Dam Construction/Alteration/Removal permit is required to be obtained from our department, prior to the actual work.

Should you have any questions, please call Mr. Eric Yuasa of the Planning Branch at 587-0254.

Signed: Eric T. Hirano
ERIC T. HIRANO, CHIEF ENGINEER

Date: 2/18/04

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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XXX Office of Conservation and Coastal Lands
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FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Early Consultation for Preparation of a Draft Environmental Assessment for the breach of Ku Tree Dam, located within the east range training Area of Schofield Barracks Military Reservation, Oahu, Hawaii

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Should you have any questions, please contact Nick Vaccaro at ext.: 7-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(✓) We have no comments. ( ) Comments attached.

Signed: Date: 2-9-04

Print Name: Robert M. Ing Division: Land

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

Glenn T. Kimura
President
Kimura International
1600 Kapiolani Blvd., Suite 1610
Honolulu, Hawaii 96814

MAR - 1 2004

LOG NO.: 2004.0413
DOC NO.: 0402EJ21

Dear Mr. Kimura:

SUBJECT: National Historic Preservation Act Section 106 Review - Pre-Environmental Assessment (EA) Consultation on the Proposed Breach of the Ku Tree Dam East Range, Schofield Barracks, Island of O`ahu, Hawaii FY 04 OMA PKG A-130
Wai`anae Uka, O`ahu
TMK: (1) 7-6-001

Thank you for the opportunity to provide comment on the proposed breaching of the Ku Tree Dam. The undertaking involves the excavation of a channel approximately 400 feet long through the natural hillside. The new channel will be concrete lined with a bottom width of approximately 30 feet. The proposed channel will be tied to the existing discharge end of the spillway and basin. Material excavated will be placed along the upstream face of the existing dam, the existing tower will be demolished and buried, the drain tunnel will be permanently plugged, a small diameter drain will be installed for water seepage and a section of the existing discharge tunnel will be plugged. The proposed improvements will provide Standard Project Flood (SPF) protection for the unnamed stream through Ku Tree Dam and is proposed to prevent dam failure and possible environmental impacts associated with such an event.

A review of our records shows that there are no known historic sites at this location except for the Ku Tree 'Reservoir' and its associated components, State Site No. 50-80-05-5509 (Robins & Spear, May 2002. *Cultural Resources Inventory Survey and Limited Testing, Phase II, of the U. S. Army Schofield Barracks Training Areas for the U. S. Army Garrison Hawaii Ecosystem Management Program, Island of O`ahu Hawai`i).* The reservoir was built by 1925 to support the population increase at Schofield Barracks. According to the report, prepared for the U. S. Army Corps of Engineers, the Ku Tree Reservoir complex is considered significant under criterion D and therefore eligible for the National and Hawaii Register of Historic Places. The Ku Tree Reservoir site was also recommended for preservation in the report.

Given the above information we believe that the proposed undertaking may have an "adverse effect" on this historic site. However, we cannot make that determination for the Federal Agency responsible for this action. Therefore, we look forward to being a party to a National Historic Preservation Act Section 106 consultation on this undertaking.

Should you have any questions about archaeology, please feel free to call Sara Collins at 692-8026 or Elaine Jourdane at 692-8027. Should you have any questions about architectural matters, please feel free to contact Susan Tasaki at 692-8032.

Sincerely,

Peter T. Young
State Historic Preservation Officer

EJ:jen

c: Susan Tasaki, Architecture Branch
David Scott, Executive Director, Historic Hawaii Foundation

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD04/1272

March 17, 2004

Glenn T. Kimura, President
Kimura International, Inc.
1600 Kapi`olani Blvd, Suite 1610
Honolulu, HI 96814

RE: Request for Consultation Prior to Completion of Draft Environmental Assessment for a Breach of Ku Tree Dam, East Range, Schofield Barracks, O`ahu

Dear Mr. Kimura,

The Office of Hawaiian Affairs is in receipt of your January 27, 2004, request for comments on the above project. OHA has no comments at this time, but requests that a rescheduled site visit be conducted for interested parties before the Draft Environmental Assessment is completed.

Mr. Tom Lenchanko told OHA that because the weather was so inclement before and during the Saturday, March 13, 2004, site visit, interested parties were unable to get very close to the dam. One access point, a tunnel, had been bricked off; visitors could not see through the dense forest; and the roads were impassable. Therefore, no determination of the area could be made. Another opportunity for a site visit – on a sunny, dry day – would be appreciated. OHA would like to be contacted should such an occasion arise.

Thank you for the opportunity to comment. If you have further questions, please contact Heidi Guth at 594-1962 or e-mail her at heidig@oha.org.

Sincerely,

Donald D Mun

for Clyde W. Namu`o
Administrator

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
PHONE: (808) 523-4564 ! FAX: (808) 523-4567
WEB SITE ADDRESS: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

TIMOTHY E. STEINBERGER, P.E.
DIRECTOR

CDD-A 04-0033

February 26, 2004

Mr. Glenn T. Kimura
Kimura International, Inc.
1600 Kapiolani Boulevard, Suite 1610
Honolulu, Hawaii 96814

Dear Mr. Kimura:

Subject: Breach Ku Tree Dam
East Range, Schofield Barracks
TMK: 7-6, Island of Oahu, Hawaii
FY04 OMA Pkg A-130, Early Construction

This is in response to your letter, dated January 27, 2004, regarding early consultation on your proposed project to breach Ku Tree Dam.

It appears that the proposed project discharges into Kaukonahua Stream. Due to the past flooding history of Kaukonahua Stream and Waialua Town, we strongly recommend that impacts to the downstream drainageways be taken into consideration.

If you have any questions, please contact Dennis Toyama of our Civil Division at 523-4756.

Very truly yours,

TIMOTHY E. STEINBERGER, P.E.
Director

DT:FK:pto

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 ULUOHIA STREET, KAPOLEI HALE, SUITE 215, KAPOLEI, HAWAII 96707
TELEPHONE : (808) 692-5054 FAX: (808) 692-5857

RECEIVED
FEB 05 2004

JEREMY HARRIS
MAYOR

LARRY J. LEOPARDI, P.E.
DIRECTOR AND CHIEF ENGINEER

ALVIN K. C. AU
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 04-105

February 4, 2004

Mr. Glenn Kimura
Kimura International
1600 Kapiolani Boulevard, Suite 1610
Honolulu, Hawaii 96814

Dear Mr. Kimura:

Subject: **Early Consultation - Breach Ku Tree Dam - East Range, Schofield Barracks, Island of Oahu, Hawaii, FY 04 OMA PKG A-130**

Thank you for the opportunity to consult on the above subject project. We have no comments at this time but look forward to commenting at such time as the Draft Environmental Assessment is prepared.

Should you have any questions, please call me at 692-5054.

Very truly yours,

LARRY LEOPARDI, P.E.
Director and Chief Engineer

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
Phone: (808) 523-4414 • Fax: (808) 527-6743

RECEIVED
FEB 13 2004

JEREMY HARRIS
MAYOR

ERIC G. CRISPIN, AIA
DIRECTOR

BARBARA KIM STANTON
DEPUTY DIRECTOR

2004/ELOG-187 (df)

February 12, 2004

Mr. Glenn T. Kimura, President
Kimura International
1600 Kapiolani Boulevard, Suite 1610
Honolulu, Hawaii 96814

Dear Mr. Kimura:

Breach of Ku Tree Dam - East Range, Schofield Barracks, Wahiawa, TMK: 7-6-01:01

This is in response to your January 27, 2004 letter requesting our department's input to the subject project prior to the completion of the draft environmental assessment. The project appears to be located within the State Conservation District and we recommend comments be requested from the State Department of Land and Natural Resources (DLNR) which has jurisdiction over the Conservation District and the State Dam Safety Program.

Otherwise, we have no comments to offer at this time.

If there are any questions, please contact Mr. Don Fujii of the Site Development Division at 547-7320.

Sincerely yours,

for ERIC G. CRISPIN, AIA
Director of Planning and Permitting

EGC:ky
[277305]

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

February 13, 2004

Mr. Glenn T. Kimura
Kimura International
1600 Kapiolani Boulevard, Suite 1610
Honolulu, Hawaii 96814

Dear Mr. Kimura:

Subject: Your Letter of January 27, 2004 on the Breach Ku Tree Dam Early Consultation

Thank you for the opportunity to comment on the proposed Breach of Ku Tree Dam.

We do not have any objections to the proposed project.

If you have any questions, please contact Joseph Kaakua at 748-5440.

Very truly yours,

K. Shida

for CLIFFORD S. JAMILE
Manager and Chief Engineer

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

GEN-6 (EIS/EA)

March 10, 2004

Mr. Glenn T. Kimura, President
Kimura International, Inc.
1600 Kapiolani Boulevard - Suite 1610
Honolulu, HI 96814

Dear Mr. Kimura:

Re: Breach of Ku Tree Dam
East Range, Schofield Barracks
Wahiawa, Oahu
FY04 OMA PKG A-130

Thank you for the opportunity to comment on the above-referenced project. We have reviewed the information provided in your January 27, 2004 notice of preparation of DEA and have no comments at this time.

HECO reserves the opportunity to further comment on the protection of existing powerlines and electric power facilities that may be affected by the project until construction plans are finalized. We look forward to reviewing the DEA when it becomes available.

Again, thank you for the opportunity to comment on this project.

Sincerely,

Kirk S. Tomita
Senior Environmental Scientist

verizon

Verizon Hawaii Inc.
P.O. Box 2200
Honolulu, HI 96841

February 6, 2004

Kimura International
1600 Kapiolani Blvd., Suite 1610
Honolulu, Hawaii 96814

Attention: Glenn T. Kimura

Subject: Breach Ku Tree Dam, East Range, Schofield Barracks
FY04 OMA PKG A-130 Early Consultation

Dear Sir:

Thank you for including us in your Early Consultation regarding the above subject project that will lead to a Draft Environmental Assessment for the U.S. Army Corps of Engineers. Based on your description of the work location,Verizon Hawaii does not have any facilities in the area and does not have any comments to offer at this time.

Should you have any questions, please call Garret Hayashi at 840-1438.

Sincerely,

Jill Z. Lee
Section Manager - OSP Engineering

cc: File (Wahiawa)