



Water has no substitute.....Conserve it

March 11, 2002

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

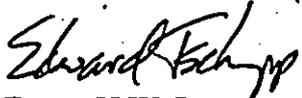
Dear Ms. Salmonson:

Subject: Finding of No Significant Impact for Kalaheo Water System –
0.5 Million Gallon Reservoir, Booster Pump and Connecting Pipelines
T.M.K. 2-4-04: por. 5 and 49
Kalaheo, Koloa, Kauai, Hawaii

The County of Kauai Department Water has reviewed the comments received during the 30-day public comment period, which began on September 8, 2001. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the March 23, 2002 OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final EA. Please call Mr. Keith Fujimoto (808) 245-5449 if you have any questions.

Sincerely,


for Ernest Y.W. Lau
Manager and Chief Engineer

Enclosures

c: ParEn Inc. (Mr. Keith Uemura)

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FINAL ENVIRONMENTAL
ASSESSMENT

2002-03-23-KA-PEA-

FOR

(KALAHEO WATER SYSTEM)
0.5 MILLION GALLON
RESERVOIR,
BOOSTER PUMP AND
CONNECTING
PIPE LINES

This environmental document prepared pursuant to Chapter 343, HRS

Prepared for:

Department of Water
County of Kauai
P.O. Box 1706
Lihue, Hawaii 96766-5706

March 2002

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- A Botanical Resources Assessment Kalaheo Reservoir. Char and Associates, August 2000.
- B Avifaunal and Feral Mammal Survey of Proposed Kalaheo Reservoir and Booster Pump Site Kalaheo Water System. Phil Bruner, January 4, 2001.
- C Archaeological Inventory Survey Report for State Sites 50-30-10-406 and 50-30-10-485 for the Proposed Improvements to the Kalaheo Water System "Final". Cultural Surveys of Hawaii, March 2001.
- D Copies of Agencies' Correspondences Received during the 30-day Draft EA Comment Period

I. EXECUTIVE SUMMARY

The Kauai County Department of Water (DOW) proposes to improve system reliability in the Kalaheo municipal system. Proposed construction includes a 500,000-gallon reservoir, control building, booster pump, emergency generator and fuel storage facility, connecting pipelines, appurtenances and site improvements.

The Environmental Assessment (EA) is a preliminary document prepared to determine if a particular action has potentially significant environmental impacts. After a review of the EA by various governmental agencies and other interested organizations followed by a formal comment period, the proposing agency has determined that the project will not have significant environmental impacts and is issuing a "Finding of No Significant Impact" (FONSI).

II. SUMMARY INFORMATION

CHAPTER 343, HAWAII REVISED STATUTES (HRS) ENVIRONMENTAL ASSESSMENT

Proposing Agency: Department of Water (DOW)
Kauai County
P.O. Box 1706
Lihue, Hawaii 96766-5706

Prepared By: ParEn, Inc. dba Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813

Project Name: Kalaheo Water System

Project Description: The proposed project involves the construction of a 500,000-gallon reservoir, booster pump, control building, emergency generator and diesel fuel storage facility, connecting pipelines, appurtenances and miscellaneous site improvements.

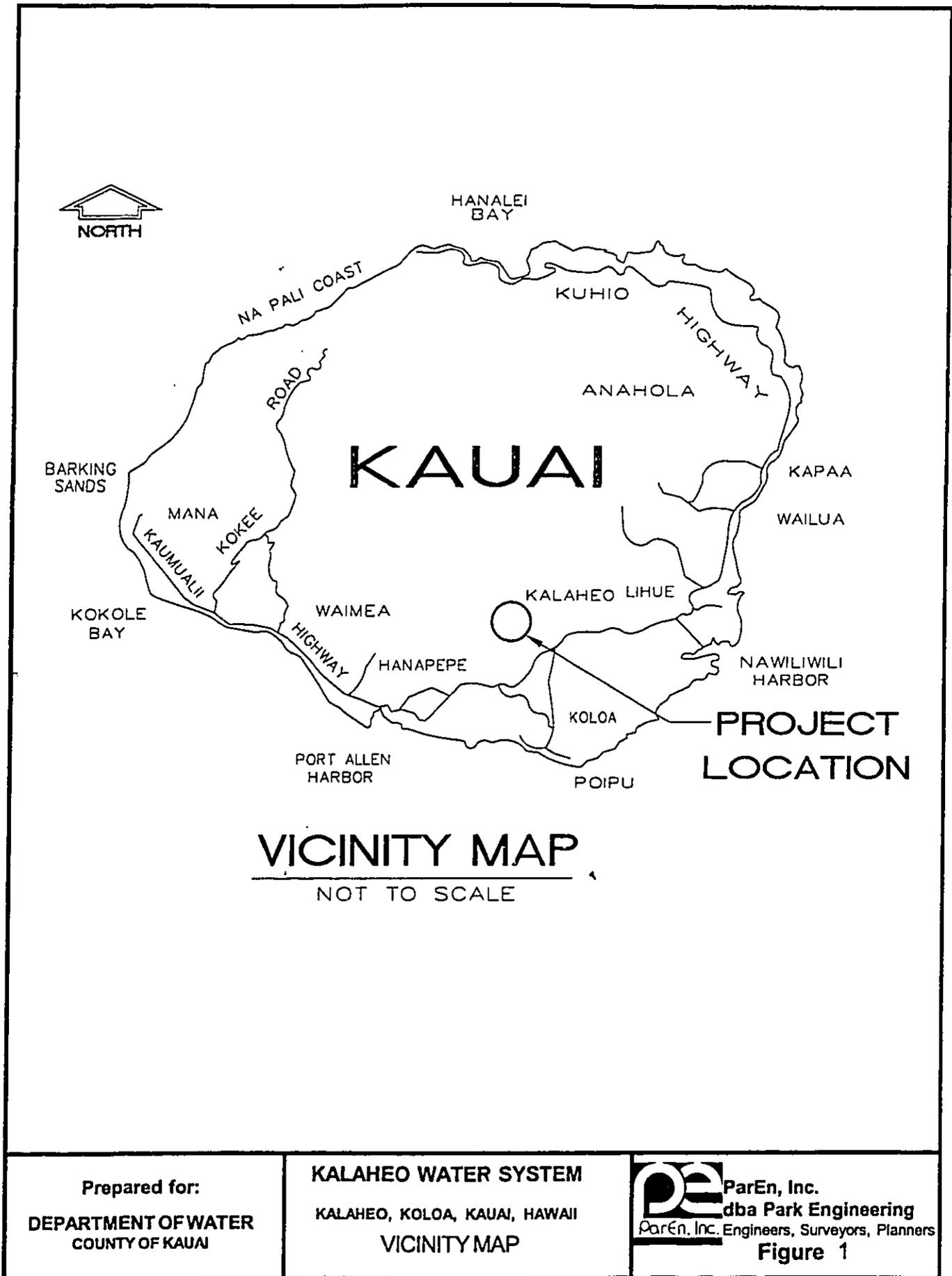
Project Location: Kalaheo, Koloa, Kauai, Hawaii (See Figure 1)

Tax Map Key: 4-2-4-04: 5 and 49

Land Area: Reservoir and Booster Pump Site: 13,750 square feet

State Land Use
Designation: Conservation

Land Owner: State of Hawaii
County of Kauai - Department of Water



III. AGENCIES CONSULTED

Federal:

U.S. Department of Agriculture
U.S. Department of Interior
U.S. Department of Army

State of Hawaii:

Department of Land and Natural Resources
Department of Health
Department of Transportation
University of Hawaii at Manoa

County of Kauai:

Department of Public Works
Planning Department

Utility:

Verizon Hawaii
Kauai Electric

IV. APPROVALS AND PERMITS REQUIRED

A. APPROVALS

1. State Department of Health
2. State Office of Environmental Quality Control - Environmental Assessment

B. PERMITS

1. State Department of Land and Natural Resources
Conservation District Use Permit (CDUP)
2. State Department of Health
National Pollutant Discharge Elimination System (NPDES) general permit
(Notice of Intent will need to be filed if discharges of hydrotesting effluent into
State waters are required)

V. PROJECT DESCRIPTION

A. Background

The County of Kauai Department of Water plans to upgrade the Kalaheo water system as part of an ongoing effort to improve the capability and reliability of the municipal water system. The proposed project will ensure an adequate and continuous supply of water to satisfy the current and future needs of residents served by this system.

B. Project Location

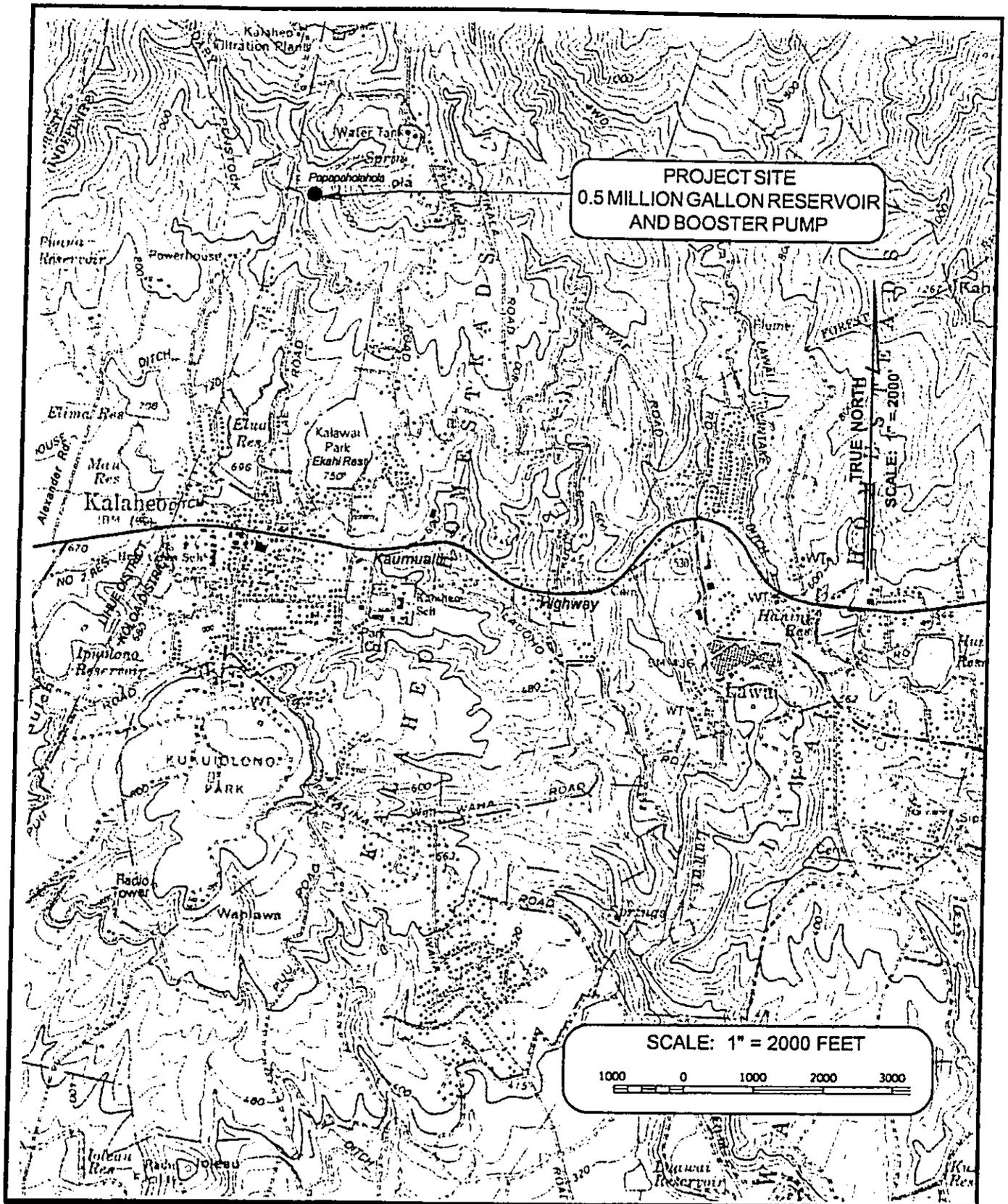
The community of Kalaheo is located in the Koloa District on the leeward side of Kauai, west of Lihue and east of the Hanapepe River. The project site is located on the western slopes of Papapaholahola in the northern portion of the Kalaheo Homesteads. The 52-acre Wahiawa Mauka State Park Reserve lies to the north and west, while residential properties lie to the south and east. The proposed site can be reached by turning north off Kaumualii Highway on either Puuwai Road or Kuli Road to Kikala Road or from Lae Road to Poohiwa Road. See Figure 2.

C. Technical Characteristics

This project involves installation of a 500,000-gallon reinforced concrete reservoir, booster pump and building for housing the booster pump controls. Another facility will be constructed to shelter the emergency generator and a 2,000-gallon diesel fuel storage tank. The reservoir will measure almost 72 feet in diameter and about 21 feet high, with a floor elevation of 890 mean sea level (msl) and spillway elevation of 908 msl.

The associated water piping system will consist mainly of 12-inch ductile iron lines, dedicated influent and effluent lines, overflow and washout lines. A new 6-inch ductile iron line will connect the new 12-inch line to an existing 6-inch main east of the proposed reservoir. A ¾-inch sampling line and a 1-inch chlorinator line will also be installed as part of this project.

Site improvements include a perimeter drain around the reservoir and a 12-foot wide asphalt concrete (ac) access road around the reservoir. The road will be bordered by a reinforced concrete retaining wall approximately 160 feet in length. Surface runoff will be conveyed to a perimeter drain system installed around the reservoir. Flows from the washout and overflow lines will be directed to on-site drainage inlets and then to an 18-inch reinforced concrete pipe (rcp) which discharges into a proposed concrete rubble masonry (crm) ditch about 50 feet in length. The outlet for the ditch will consist of a grouted riprap apron enclosed by a cutoff wall. The design of the outlet will minimize the impact of runoff water into a man-made drainage ditch located west of the proposed reservoir. See Figure 3.

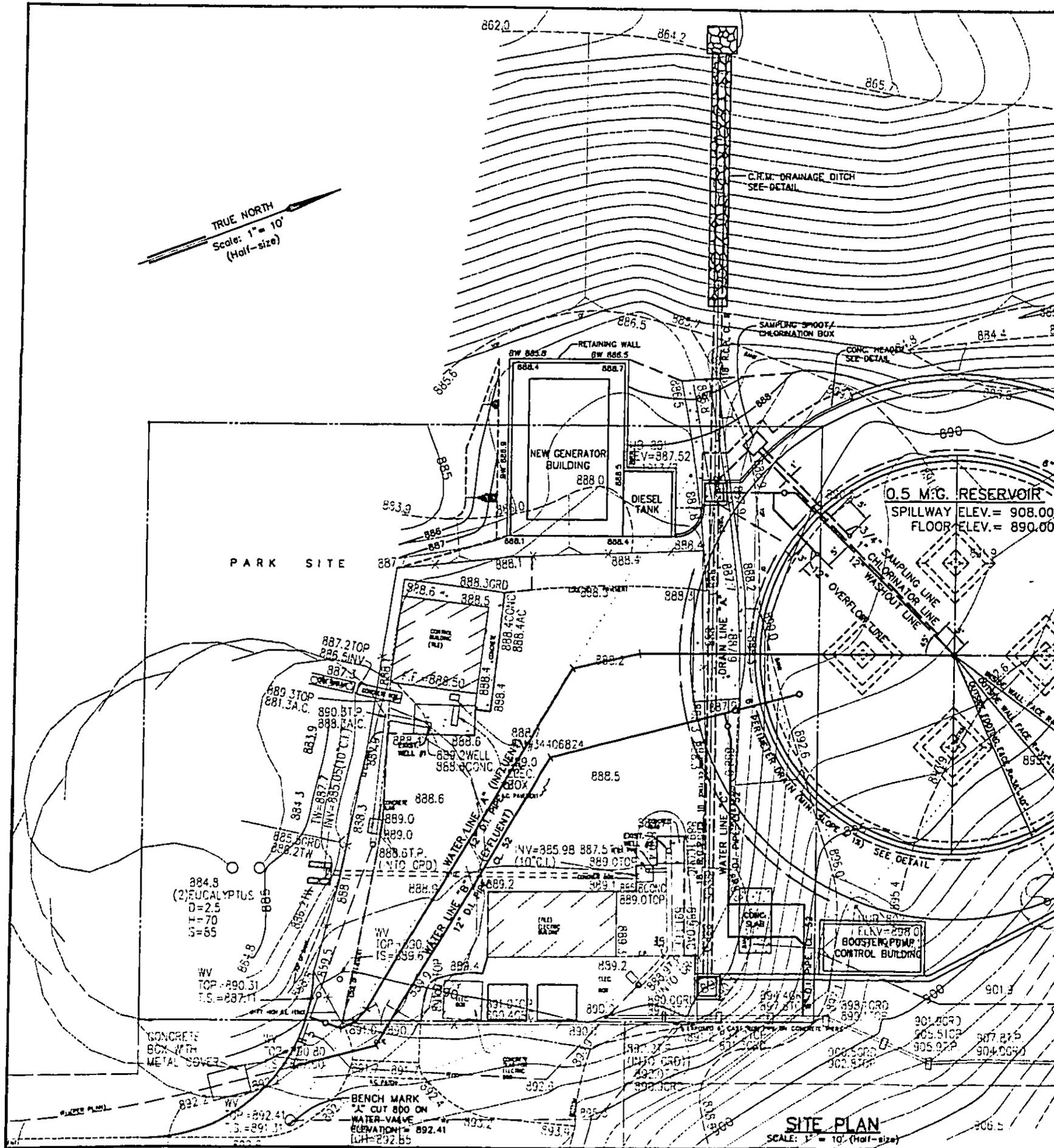


Prepared for:
DEPARTMENT OF WATER
COUNTY OF KAUAI

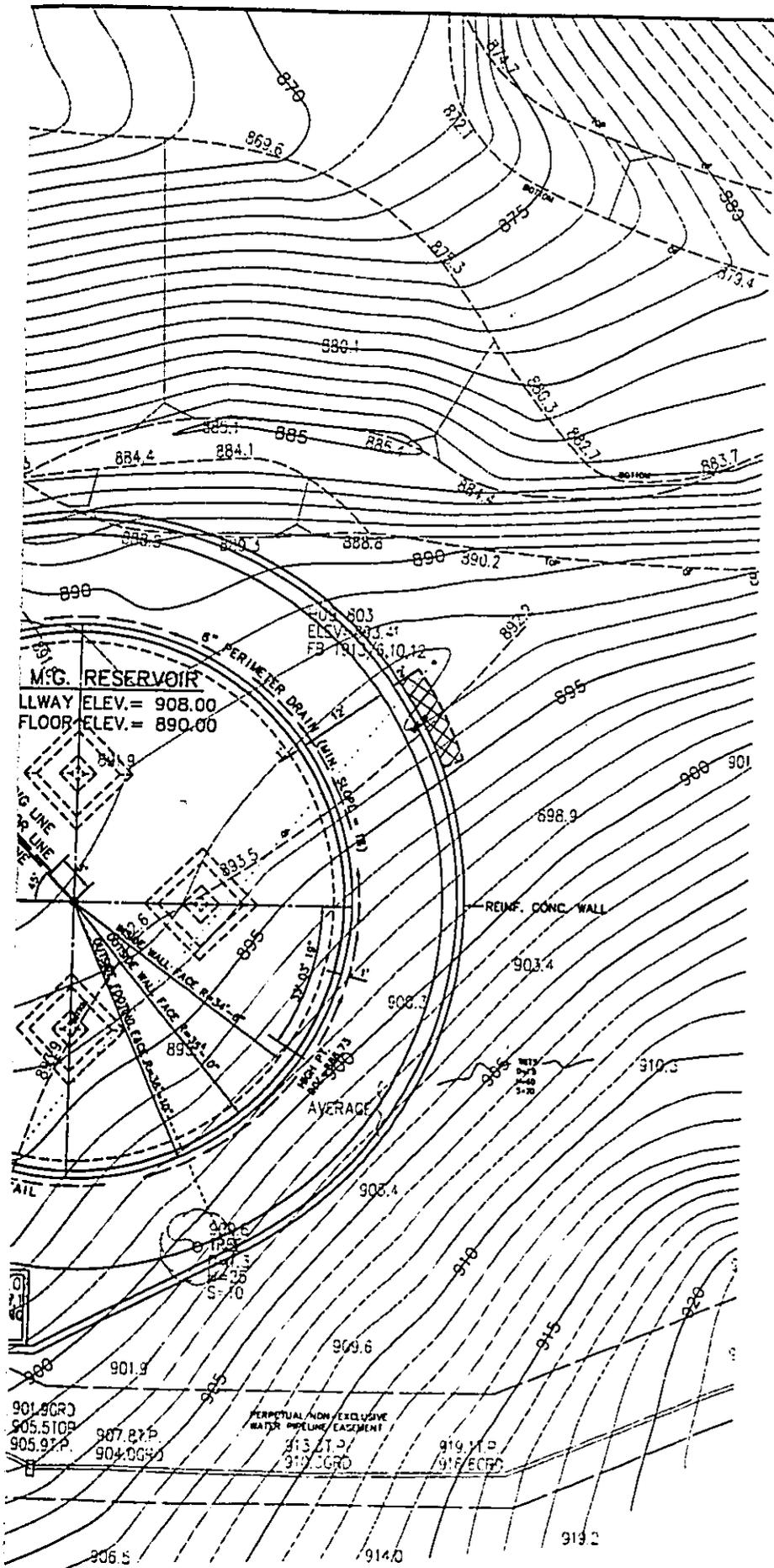
KALAHEO WATER SYSTEM
KALAHEO, KOLOA, KAUAI, HAWAII
LOCATION MAP

PE ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners
ParEn, Inc. Figure 2

TRUE NORTH
Scale: 1" = 10'
(Half-size)



SITE PLAN
SCALE: 1" = 10' (Half-size)



REVISION	DATE	DESCRIPTION	MADE BY	APPROVED
DEPARTMENT OF WATER COUNTY OF KAUAI				
KALAHEO WATER SYSTEM 0.5 MILLION GALLON RESERVOIR, BOOSTER PUMP AND CONNECTING PIPE LINES KALAHEO, KOLOA, KAUAI, HAWAII				
SITE PLAN FIGURE 3				
APPROVED:			DATE:	
MANAGER AND CHIEF ENGINEER, DEPARTMENT OF WATER COUNTY OF KAUAI				
DESIGNED BY	DRAWN BY	CHECKED BY		

D. Socio-Economic Characteristics

An immediate economic impact of these projects is the estimated \$1.1 million of work for the construction industry.

E. Environmental Characteristics

Temporary disruptions to the environment may occur due to construction activity such as clearing, grubbing and grading of the project site, noise from construction equipment, and storm runoff from graded areas of the site. The generator will create intermittent noise during emergency operations. Diesel fuel storage at the facility could potentially result in limited environmental exposure. Environmental impacts caused by this improvement project will be mitigated to comply with applicable regulations, and will be discussed further in subsequent sections.

VI. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. Topography

The proposed project site is situated on a hill covered with tall trees, next to an open park. Existing elevations vary from 910 msl at the southeast portion of the site, to 885 msl at its northern boundary. A break divides the site, with the southeast half having steep grades of 24% to 31% sloping in a northwest direction. The northwest half of the site is less steep with slopes ranging between 8% and 13%. To the north of the existing well is a steep-sided, but shallow drainageway. The existing site was bulldozed in the past to create the level surface the facility currently rests on. Boulders and rocks resulting from these bulldozing operations surround the existing site.

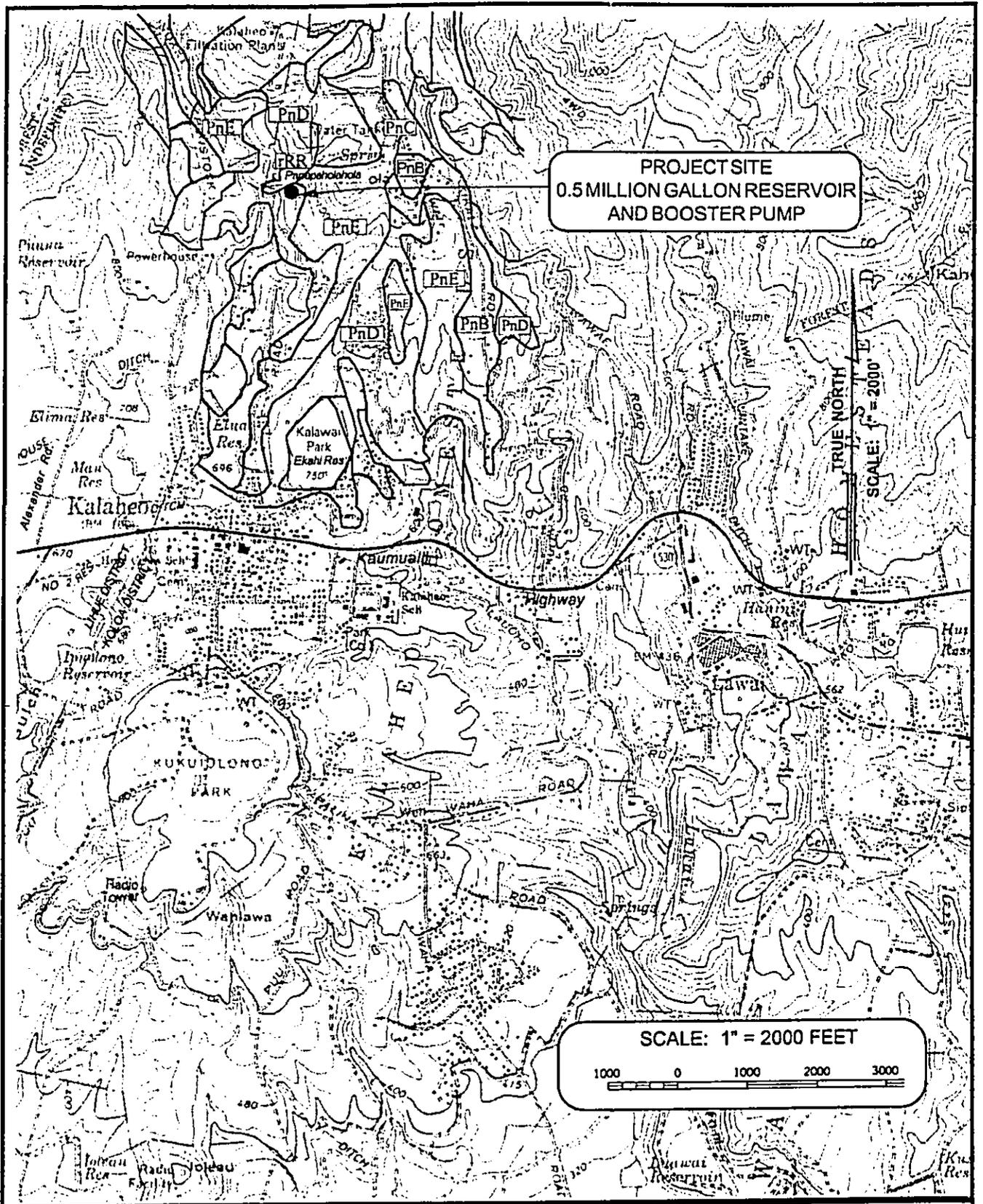
B. Soils

In the vicinity of the reservoir site are soils belonging to the Puhi series as classified as by the U.S. Department of Agriculture Soil Conservation Service (SCS). These soils are well drained and generally found on the uplands of Kauai. A section of Rough Broken Land occupies the area to the north of the site. These soils are typically used for sugarcane, pineapple, orchards, pasture, woodland, wildlife habitat and water supply. See Figure 4.

Puhi (PnE) - Silty clay loam and silty clay, 25 to 40 percent slopes. Runoff is rapid and and the erosion hazard is severe.

Puhi (PnD) - Silty clay loam and silty clay, 15 to 25 percent slopes. Runoff is medium and and the erosion hazard is moderate.

Puhi (PnC) - Silty clay loam and silty clay, 8 to 15 percent slopes. Runoff is slow and and the erosion hazard is slight.



Prepared for:
DEPARTMENT OF WATER
COUNTY OF KAUAI

KALAHEO WATER SYSTEM
KALAHEO, KOLOA, KAUAI, HAWAII
SOILS MAP



ParEn, Inc.
dba Park Engineering
Engineers, Surveyors, Planners
Figure 4

Rough Broken land (rRR) – occurs in gulches and mountainsides and consists of very steep land (slopes from 40% to 70%) broken by numerous intermittent drainage channels. The runoff is rapid and geologic erosion is active.

C. Climate

The climate of Kauai is comfortably uniform with northeast trade winds. Monthly temperatures in the vicinity of the proposed reservoir range between 69 degrees Fahrenheit in February to 77 degrees Fahrenheit in August. The project site area has annual rainfall ranging between 79 and 118 inches. Tradewinds often are interrupted by Kona storms during the months of October through April. During these periods the air becomes very humid, winds shift by blowing from the south or west, and heavy rainfall and flooding often result.

D. Hydrology

1. Basal Water - The most extensive source of groundwater is the "basal freshwater lens" that floats on seawater under much of the island. The fresh water floats on the heavier salt water, both of which permeates through the subsurface rock.

2. Perched Water - Groundwater held up, or "perched" on horizontal impermeable beds such as dense volcanic ash, beds of weathered and solidified ash, or clay-bearing sediments are also present in the area. Discharge of perched water sometimes occurs as springs where the perching member has been breached by erosion especially on the valley walls. Such a spring is located north of the proposed project site near Papapahohola. Water from these springs is generally excellent in quality.

3. Surface Flow - Perennial streams flow to the sea in all parts of Kauai except west of Waimea Canyon. The flow of streams is maintained by direct runoff from persistent rainfall in the mountains and by discharge of water from high level springs. Runoff calculations for a 60-acre drainage area surrounding the stream north of the project site were computed to determine flow depth and velocity during 10-year and 50-year one-hour storms. Based on the runoff generated by these storms the flow depth would rise to about one foot (0.96 to 1.13). Because these storms would generate high velocities of about 10 feet per second (10.3 to 11.3) riprap may be needed to protect the stream banks from erosion.

4. Aquifer - A designation system to logically categorize aquifer systems for computing water budgets and deriving sustainable yields has been developed by the Water Resources Research Center of the University of Hawaii. Classifying and assigning aquifer codes provides the framework for a groundwater protection strategy for each island in the State of Hawaii. Existing wells at the site withdraw water from the Koloa aquifer of the Lihue Sector (code 20101). The aquifer providing source water for the Kalaheo system is adequate through the year 2020 (Kauai Department of Water Waterplan 2020).

5. Two existing wells, the Kalaheo Wells A and B are located in the vicinity of the proposed reservoir site.

E. Geology

Kauai is the oldest and most structurally complex of the Hawaiian Islands. The island consists mainly of a huge shield volcano, with rocks of the major Kauai shield known as the Waimea Canyon Volcanic Series. The "Lihue Depression" which lies to the north of the project site was formed by the collapse of the eastern slopes of major shield volcanoes forming the island more than two million years ago. This was followed by a long period of erosion in which the island became deeply eroded. The Koloa volcanic series is the name for the lavas, cinder cones, ash beds and rocks accumulated during this period. Many basalt outcrops and large boulders characterize the slopes of Papapahohola in the vicinity of project site.

F. Land Use

The proposed reservoir site is designated Conservation by the State Land Use Commission. With the relatively small total required land area, the projects will not have significant negative impacts on Conservation lands. See figure 5.

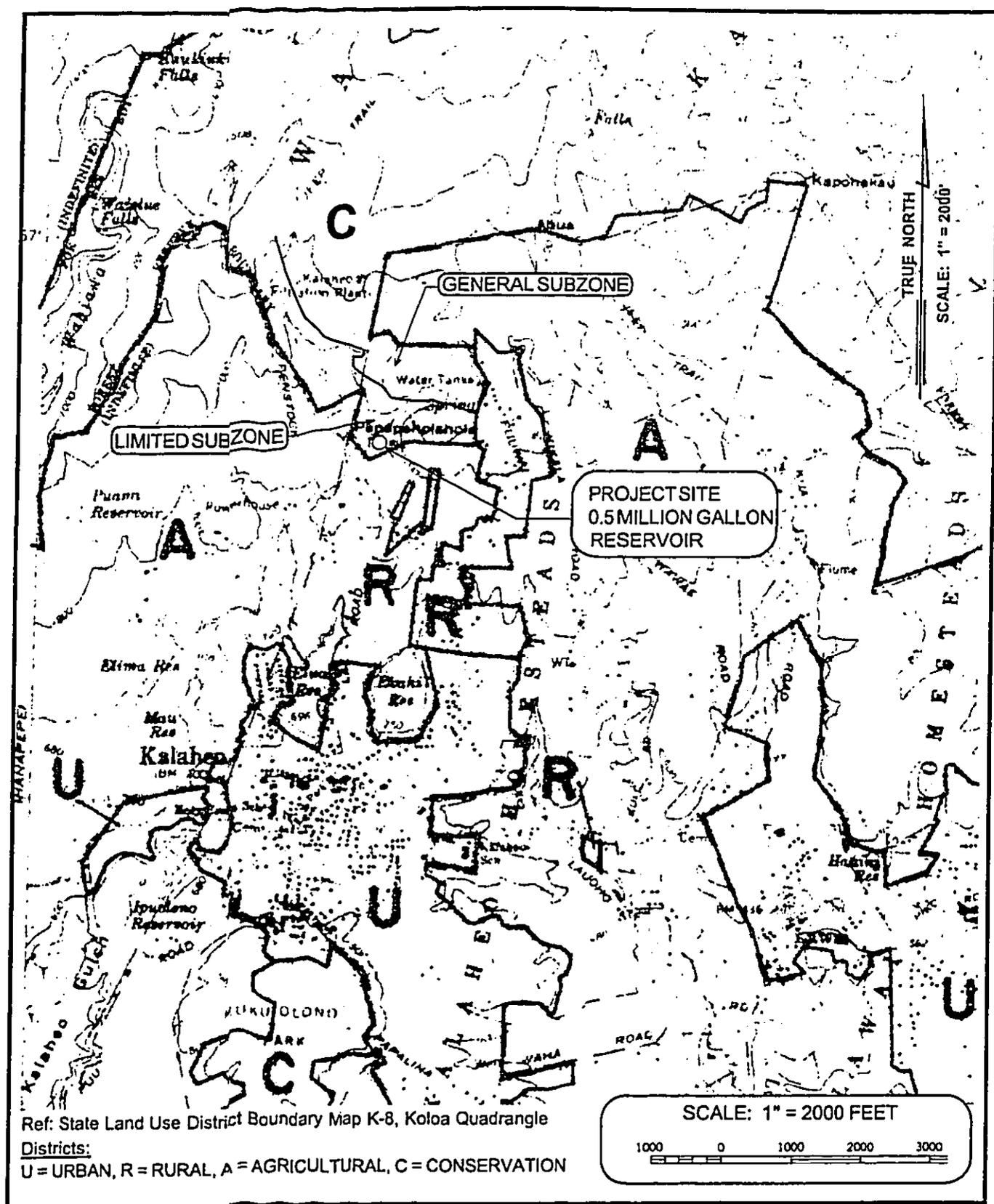
G. Flora and Fauna

A field study was conducted by Char and Associates on July 27, 2000. The dominant vegetation found on the project site was Eucalyptus and Cook Pine trees, Strawberry Guava and Basketgrass. None of the plants observed are threatened, endangered or are a species of concern. Therefore, Char's survey report concluded that the proposed use of the site is not expected to have a significant negative impact on botanical resources. See Appendix A.

During a field survey of the project site conducted by Phil Bruner on December 27, 2000 the usual variety of introduced species of birds and mammals was observed and recorded. None of these observed birds are threatened or endangered. No native, migratory or sea birds and no suitable habitat for these species was observed. One feral pig was observed during the survey along with tracks and uprooted ground. Tracks of cats and dogs were also observed. Based on this survey it was concluded that the proposed development would not have a significant impact of the population of birds and mammals in the project area. See Appendix B.

H. Historic Sites and Archaeological Resources

By recommendations made by the State Historic Preservation Division, agricultural features found on the site including terraces, rock mounds, water diversion structures, platforms and walls were investigated by qualified archaeologists to determine their historic significance. Cultural Surveys Hawai'i, Inc. was contracted to conduct an archaeological survey of the site, which included research on historic and



<p>Prepared for: DEPARTMENT OF WATER COUNTY OF KAUAI</p>	<p>KALAHEO WATER SYSTEM KALAHEO, KOLOA, KAUAI, HAWAII STATELANDUSE DESIGNATIONS</p>	<p> ParEn, Inc. dba Park Engineering Engineers, Surveyors, Planners Figure 5</p>
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archaeological background of the area, a complete ground survey, limited subsurface testing and interviews with local long-time residents.

Two areas within or near the project site were designated as areas with historical significance. Based on historical documentation, interviews and excavation results it was concluded that these sites were likely built by European settlers in the early 1900s. The historical designation was given because the features aid in "the understanding of the spatial relationships, probable age, and likely function of historic agricultural features in Kalaheo". Although one of these historical features will be disturbed by the proposed construction the information contained in this feature has been adequately recorded with photographs, a tape and compass map, and a written description and no further historic preservation was recommended. See Appendix C.

VII. POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

A. Impacts During Construction

Activities associated with construction and installation of the proposed improvements will be short term, temporary impacts confined to the immediate vicinity of the project sites. Increased intermittent traffic, noise, dust, and vehicular and equipment emissions can be expected and will be controlled. These impacts will not be significant because the project site is small, and is surrounded by tall Eucalyptus and Cook Pine trees and open fields. It is recommended that all trees within 50 feet of the proposed reservoir site be cut down. Areas cleared of vegetation should be revegetated as soon as possible to prevent soil erosion, especially on the sloped areas. Wedelia and Hilo Grass that already occurs on the site can be used for this revegetation effort.

Equipment noise controls will be implemented according to Department of Health (DOH) guidelines.

A Dust Control Management Plan shall be implemented by the Contractor to control the generation of fugitive dust during construction activities. This plan shall identify and address activities that have a significant potential for fugitive dust and must comply with provisions of Hawaii Administrative Rules 11-60.1-33. As a minimum, the components of this plan shall include:

1. Planning in order to minimize the amount of dust-generating materials and activities. This might involve centralizing material transfer points and on-site vehicular traffic routes and locating dusty equipment in the areas of least impact.
2. Providing an adequate water source at the site for dust control prior to the start of construction.
3. Landscaping and rapid covering of bare areas, including slopes starting from the initial grading phase.
4. Controlling of dust from shoulders, project entrances and access roads.

5. Providing adequate dust control measures during weekends, after hours and prior to daily start-up of construction activities.

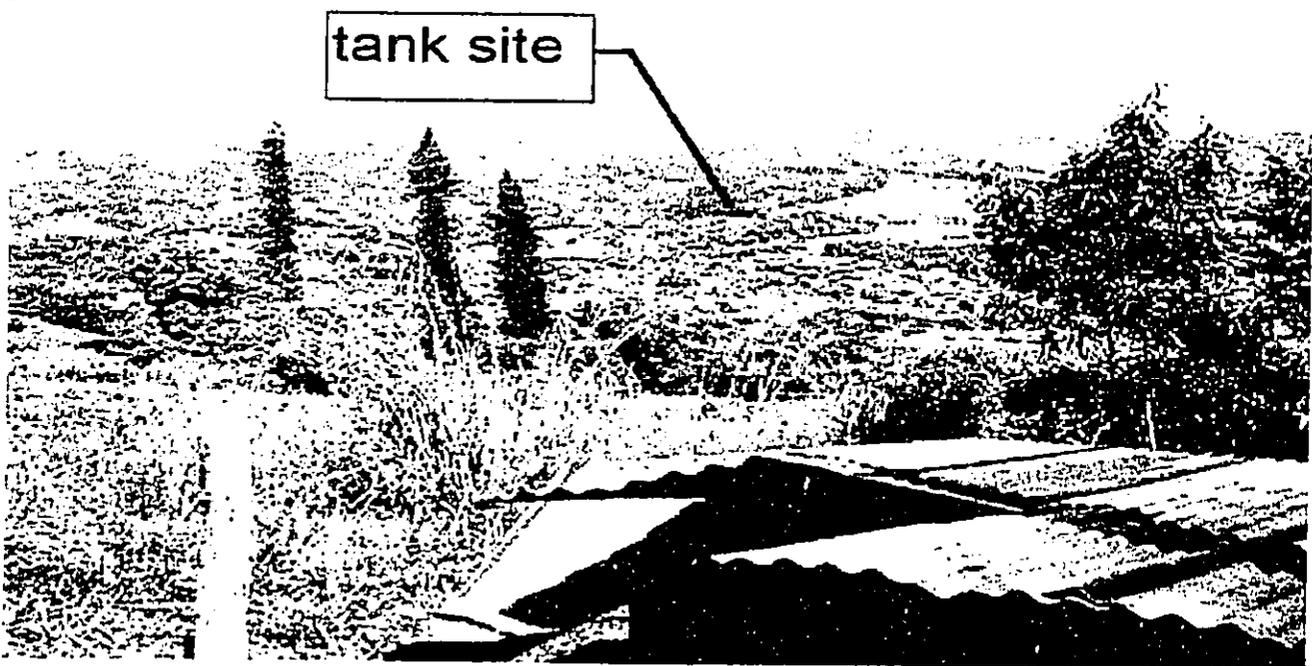
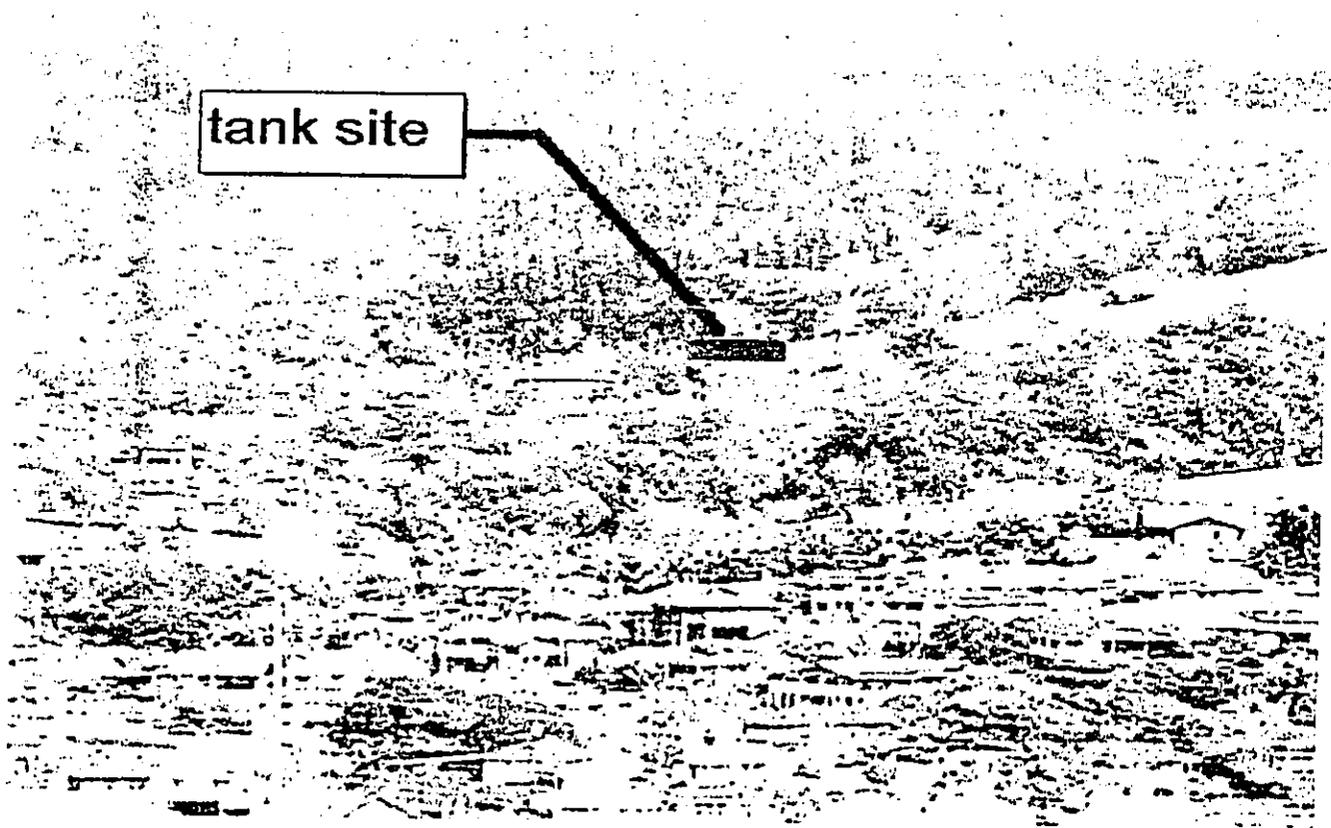
Waste materials associated with the construction of the control building or installation of the piping and appurtenances will be disposed of in an environmentally safe manner in accordance with State Department of Health (DOH) requirements and guidelines.

New water lines shall be hydrotested after installation. If discharges of hydrotest effluent into State waters is required a Notice of Intent will be filed with DOH in order to be covered by a National Pollutant Discharge Elimination System (NPDES) general permit.

B. Long term impacts

Long-term impacts are generally related to the operation of the proposed water system improvement project. Efficient and effective operations and maintenance will mitigate any potential negative long-term impacts associated with the proposed improvements. Intermittent use of the emergency generator will produce some noise, which should be adequately dampened by the generator's built-in muffler system and the building sheltering the unit. The fuel storage tank shall be a double containment tank in full compliance with DOH regulations. Routine inspections and maintenance will prevent the occurrence of unanticipated releases of diesel fuel. Operation of the facility will not involve any discharges of wastewater; therefore no NPDES individual permit will be required.

Although the proposed project site is situated on a hill covered with tall trees, the reservoir will have some visual impact from certain vantagepoints. A photo of the project site with the proposed reservoir superimposed on it simulates the visual impact of the project from public viewplanes (Figure 6). The Department of Water has a policy to environmentally coat aboveground facilities and provides landscaping in order to blend these facilities with the surrounding environment. Reestablishment of native trees and vegetation will also assist in screening the facility.



Two views looking north from Kalaheo Homesteads

Visual Impact
Figure 6

VIII. ALTERNATIVES CONSIDERED

A. NO ACTION ALTERNATIVE

According to the DOW's Water Plan, the Kalaheo service area will need an additional 500,000 gallons of storage to satisfy peak demand and fireflow requirements. Failure to provide sufficient storage will result in decreased systemwide reliability and potentially inadequate fire protection capabilities. The no action alternative is therefore not an acceptable alternative.

B. ALTERNATIVE SITE

An alternative site at Kukuiolono was initially investigated as to its feasibility for construction of a reservoir. That site development has been complicated by drainage issues. The proposed Kalaheo site allows for consolidation of DOW facilities and improves upon the reliability for the mauka Kalaheo area. It also allows for improved service for systems receiving water from the Nursery Tank, which receives water from the Kalaheo Wells.

IX. FUNDING AND PHASING

The Department of Water has allocated full funding for this project. Preliminary construction cost for the project is estimated at \$1.1 million. The project will not be phased but will be completed in its entirety.

The Department of Water actively seeks cooperative funding for projects from Federal, State and private sources. For example, if a Federal grant or loan program funds were available, this project may be funded by Federal Funds through the State of Hawaii's Drinking Water State Revolving Fund (DWSRF) program, which would constitute a federal action, and will require the project to meet all Hawaii DWSRF program requirements. At present, use of Federal, State and private funds is not anticipated for this project.

X. DETERMINATION, FINDINGS AND REASONS TO SUPPORT DETERMINATION

This Draft Environmental Assessment is part of the environmental review process that meets the requirements of Chapter 343, HRS. After completing an assessment of the potential environmental effects of the proposed project and consulting with government agencies and interested parties, the proposing agency does not anticipate any significant impacts. Therefore, the DOW anticipates a Finding of No Significant Impact (FONSI) will be made, with reasons supporting this determination discussed below:

1. The proposed actions will not involve any irrevocable commitment to loss or destruction of any natural or cultural resource. There appears to be no cultural resources associated with the project.
2. The proposed actions will not curtail the range of beneficial uses of the environment and will be compatible with the uses of the surrounding area.
3. The proposed actions will not conflict with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions or executive orders.
4. The proposed actions will not substantially affect the economic or social welfare of the community or state. Upgrading of the water system will improve water service to meet the domestic and fire protection needs of the community.
5. The proposed actions will not substantially affect public health as construction-related air and noise impacts will be temporary and short-term in nature.
6. The proposed actions will not have a secondary impact, such as population changes or effects on public facilities.
7. The proposed actions will not involve a substantial degradation of environmental quality. Any effect on the environment during the construction phase will be limited in area and short in duration.
8. The proposed actions will be individually limited and cumulatively will not have a considerable effect on the environment, nor require a commitment to larger actions.
9. The proposed actions will not affect any rare, threatened or endangered species or their habitats. There is no known rare, threatened or endangered species or habitat associated with the project site.
10. The proposed actions will not have any permanent detrimental effects on air or water quality, or ambient noise levels.

11. The proposed actions will not affect or be likely to cause damage to an environmentally sensitive area. The project site is not located in a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.
12. The proposed action will not affect scenic vistas and viewplanes identified in county or state plans or studies. The Department of Water has a policy to environmentally coat aboveground facilities and provides landscaping in order to blend these facilities with the surrounding environment. Reestablishment of native trees and vegetation will also assist in screening the facility.
13. The proposed action will not require substantial energy consumption. Energy consuming construction equipment such as backhoes, trucks, compactors will be used for water facility installation. After construction is complete, energy consumption to power the existing deepwell pumps to fill the reservoir should remain relatively unchanged from current levels. The proposed booster pump will improve efficiency of pumping to the Nursery tank, which is currently done by the existing deepwell pump. A generator will be used only during emergency situations.

This Notice of Negative Declaration shall serve to meet the requirements of Chapter 343, HRS.

XI. REFERENCES

1. Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, United States Department of Agriculture, Soil Conservation Service in cooperation with the University of Hawaii, Agricultural Experiment Station, August 1972.
2. Final Environmental Assessment for 1.5 million gallon storage tank and connecting pipe line, Job no. 87-1, Koloa-Poipu Water system, Kauai county Dept. of Water and GMP Associates, February 1998.
4. Geology and Ground-water Resources of the Island of Kauai, Hawaii, G.A. Macdonald, D.A. Davis, D.C. Cox, 1960.
5. Waterplan 2020, Kauai Department of Water, March 2001.

APPENDIX A

Botanical Resources Assessment
Kalaheo Reservoir

Char and Associates, August 2000.

CHAR & ASSOCIATES

Botanical/Environmental Consultants

4471 Puu Panini Ave.
Honolulu, Hawaii 96816
(808) 734-7828

August 2000

BOTANICAL RESOURCES ASSESSMENT KALAHEO RESERVOIR KALAHEO, KOLOA DISTRICT, KAUA'I

INTRODUCTION

The proposed 0.5 million gallon reservoir and booster pump site is located north of Kalaheo Town and adjacent to an existing Kaua'i Department of Water facility located at the end of Po'ohiwi Road. The proposed reservoir and pump site is located to the northeast of the existing facility and will extend into the hillside. A 50-foot wide buffer zone around the facility is also proposed. All trees within the buffer zone would be cut down. This would prevent damage to the proposed facility during tropical storms and hurricanes. The study site is surrounded by large blocks of forestry plantings, primarily Eucalyptus and Cook pine.

Field studies to assess the botanical resources on the proposed facility and the 50-foot wide buffer zone were conducted on 27 July 2000 by a team of two botanists. The primary objectives of the survey were to provide a general description of the vegetation on the site and to search for threatened and endangered species as well as species of concern.

DESCRIPTION OF THE VEGETATION

The plant names used in this report follow Wagner et al. (1990). The few recent name changes since 1990 follow those recorded in the Hawaii Biological Survey series (Evenhuis and Miller 1995-1998; Evenhuis and Eldredge 1999).

A large stand of Eucalyptus trees, 60 to 70 feet tall, is found on the proposed reservoir site and the 50-foot wide buffer zone. Eucalyptus robusta is the most commonly planted species; other Eucalyptus spp. make up the remainder of the planting. Strawberry guava (Psidium cattleianum) shrubs, 15 to 20 feet tall, form scattered thickets between the large trees. Scattered through the Eucalyptus planting are trees of rose apple (Syzygium jambos), paperbark (Melaleuca quinquenervia), white moho (Heliocarpus popayanensis), Macaranga tanarius, and Australian red cedar (Toona ciliata var. australis). A grove of bamboo (Bambusa vulgaris) is also found here. Ground cover consists primarily of leaf litter, saplings of the plants mentioned above, and shade-tolerant species such as basketgrass (Oplismenus hirtellus), palmgrass (Setaria palmifolia), hairy swordfern (Nephrolepis multiflora), elephant's foot (Elephantopus mollis), and thimbleberry (Rubus rosifolius).

The slopes on the northeast side of the facility support rows of very large Cook pine trees (Araucaria columnaris), 70 to 90 feet tall. Understory vegetation is very sparse with a few small, scattered plants of strawberry guava and lantana (Lantana camara) and patches of basketgrass, palmgrass, and scarlet ruellia (Ruellia graecizans). A thick layer of "pine needles" carpets the ground.

Around the existing facility, the Eucalyptus forest supports a few landscape specimens which have established themselves here; these include wedelia (Spagneticola trilobata), a Philodendron sp., pothos or taro vine (Epipremnum pinnatum), and coffee (Coffea arabica). A few clumps of banana (Musa X paradisiaca) are also found here.

DISCUSSION AND RECOMMENDATIONS

Introduced species such as Eucalyptus, Cook pine, strawberry guava, basketgrass, etc., are the dominant components of the vegetation on the project site. Introduced or alien species are all those plants which were brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is, Cook's discovery of the islands in 1778. Large blocks of forestry plantings surround the existing facility, and occur on the proposed reservoir and booster pump site and the 50-foot wide buffer zone.

None of the plants observed during the field studies is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999). All of the plants are introduced species or of Polynesian introduction. All of the plants can be found in similar disturbed habitats throughout Hawai'i.

Given the findings above, the proposed use of the site is not expected to have a significant negative impact on the botanical resources. It is recommended, however, that areas cleared of vegetation be revegetated as soon as possible to prevent soil erosion, especially on the sloping areas. Wedelia and Hilo grass (Paspalum conjugatum), which already occur on the site, could be used for the revegetation effort.

LITERATURE CITED

- Evenhuis, N.L. and S.E. Miller, editors. 1995-1998. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 41-56.
- Evenhuis, N.L. and L.G. Eldredge, editors. 1999. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 58-59.
- U.S. Fish and Wildlife Service. 1999. U.S. Fish and Wildlife Service species list, plants. March 23, 1999. Pacific Islands Ecoregion Office, Honolulu, HI.
- Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI. Bishop Museum Special Publication 83.

APPENDIX B

Avifaunal and Feral Mammal Survey of Proposed Kalaheo
Reservoir and Booster Pump Site - Kalaheo Water
System

Phil Bruner, January 4, 2001

AVIFAUNAL AND FERAL MAMMAL SURVEY OF A PROPOSED
KALAHEO RESERVOIR AND BOOSTER PUMP SITE
KALAHEO WATER SYSTEM, KAUAI

Report prepared for:

Park Engineering, Honolulu

Report prepared by:

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Environmental Consultant
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4 January 2001

INTRODUCTION

The purpose of this report is to present the findings of a one day (27 December 2000) field survey of a site proposed for a reservoir and booster pump at Kalaheo, Kauai. The report also includes references to pertinent published and unpublished sources that provide information on the birds and mammals that potentially could occur in this region of the island. The objectives of the field survey were:

- 1- Document which species of birds and mammals currently occur on or near the property proposed for development.
- 2- Obtain data on the relative abundance of birds at this site.
- 3- Note any natural resources that may be important to native or migratory birds and the native, endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*).

GENERAL SITE DESCRIPTION

The property is located at approximately 800-1000 feet elevation in second growth introduced forest. Surrounding the site are ranch lands and residential property. The topography of the site is relative steep and irregular. Hiking trails allow access to the site and adjoining lands. No wetlands were noted, although the low lying areas probably flood during heavy rains.

STUDY METHODS

The site was covered on foot using existing trails and where necessary cross-country hiking in order to access all of the site and nearby lands. All birds seen or heard were noted. Relative abundance estimates were obtained by tallying birds over an eight minute period at selected census stations. These stations were placed far enough apart to avoid double counting birds noted on other stations. Data obtained in this fashion can only give a snapshot of bird activity. Long term census data gathered on repeated visits at different times during the year would yield more accurate information. However, the scope of this study did not warrant such an effort. Mammals were surveyed by visual observations and the presence of tracks. No attempts was made to trap mammals in order to obtain information on their occurrence and relative abundance. An effort of this sort was beyond the time available for the survey.

Weather during the survey was clear and calm in the morning and cloudy with light rain during the afternoon. These conditions did not adversely impact the gathering of data.

The scientific names used in this report follow Pyle (1997) and Honacki et al. (1982). These sources use the currently accepted taxonomy.

RESULTS AND DISCUSSION

Native Birds:

No native birds were observed on this survey. The habitat and location of this site make it unlikely that native birds would be found frequently in this area. The Short-eared Owl or Pueo (*Asio flammeus sandwichensis*) forages in open habitats such as ranch lands and can also be seen in forests (Hawaii Audubon Society 1993). This subspecies of the Short-eared Owl is listed as endangered by the State of Hawaii on the island of Oahu, but not on Kauai. Pueo hunt at dawn and dusk but can also be seen at mid-day. The introduced Barn Owl (*Tyto alba*) is nocturnal. People frequently confuse this species for the native Pueo (personal observation).

Migratory Birds:

No migratory birds were seen on the site of the proposed reservoir and booster pump. No habitat suitable for these species occurs on the property. Nearby property with open ranch lands contain the common Pacific Golden-Plover (*Pluvialis fulva*). This species is not listed as endangered or threatened. The life history of this bird has been extensively investigated (Johnson et al. 1981, 1989, 2001).

Seabirds:

No seabirds were recorded on the survey. The site does not contain suitable habitat for nesting seabirds. The threatened Newel Shearwater (*Puffinus newelli*) nests on Kauai at higher elevation. None would be expected at this site.

Introduced Birds:

A total of nine species of introduced (non-native) birds were tallied on the survey. Table One lists these species and notes their relative abundance. None of these birds are threatened or endangered. Pratt et al. (1987) and Hawaii Audubon Society (1993) provide a complete list of introduced species found in Hawaii. It is possible that other introduced birds besides those recorded on this survey may occur in the area.

Feral Mammals:

One feral pig (*Sus scrofa*) was seen on the survey. Tracks of pigs and areas where they had made trails and rooted up the ground were observed. The tracks of cats (*Felis catus*) and dogs (*Canis familiaris*) were also seen. No rats or mice were found but these ubiquitous species likely occur on the property. The native, endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) can be found in a variety of habitats on Kauai. None were discovered on the survey. This species roosts in trees. It is impossible that it may roost or even forage in this area. Tomich (1974) and Jacobs (1991) provide information on the habits of this species.

SUMMARY AND CONCLUSIONS

This property and nearby lands were thoroughly investigated and the usual array of introduced species of birds and mammals were recorded. No native, migratory or endangered or threatened species were found. The habitat and its location make it unlikely that these native or migratory birds would make extensive use of the site. The

native and endangered Hawaiian Hoary Bat may occur on or near the property. This is consistent with its distribution and behavior on Kauai. No unique or special natural resources important for native or migratory birds were found on the site. The proposed development will not have a significant impact on the populations of birds and mammals in this region of Kauai.

TABLE ONE

Introduced birds found on a field survey of property proposed for a reservoir and booster pump at Kalaheo, Kauai. Relative abundance estimates were determined on the basis of the following: A=Abundant (10+ on census counts); C=Common (5-10 on census counts); U=Uncommon (less than 5 on census counts); R=Recorded (number which follows is the total tallied for the entire survey).

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Red jungle Fowl	<i>Gallus gallus</i>	U
Spotted Dove	<i>Streptopelia chinensis</i>	U
Zebra Dove	<i>Geopelia striata</i>	C
White-rumped Shama	<i>Copsychus malabaricus</i>	R=3
Hwamei	<i>Garrulax canorus</i>	R=4
Common Myna	<i>Acridotheres tristis</i>	C
Japanese White-eye	<i>Zosterops japonicus</i>	A
Northern Cardinal	<i>Cardinalis cardinalis</i>	U
House Finch	<i>Carpodacus mexicanus</i>	C

SOURCES CITED

- Hawaii Audubon society. 1993. Hawaii's Birds. Fourth Edition. Hawaii Audubon Society, Honolulu.
- Honacki, J.H., K.E. Kinman and Koepl ed. 1982. Mammal species of the World: A taxonomic and geographic reference. Allen Press, Inc., and the Association of Systematic Collections, Lawrence, Kansas.
- Jacobs, D.S. 1991. The distribution and abundance of the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), on the island of Hawaii. Unpubl. report submitted to University of Hawaii, Department of Zoology.
- Johnson, O.W., P.M. Johnson and P.L. Bruner. 1981. Wintering behavior and site-faithfulness of Golden-Plovers on Oahu. 'Elepaio 41(12):123-130.
- Johnson, O.W., M.L. Morton, P.L. Bruner and P.M. Johnson. 1989. Winter range fat cyclicity in Pacific Golden-Plovers (*Pluvialis fulva*) and predicted migratory flight ranges. Condor 91:156-177.
- Johnson, O.W., P.L. Bruner, J.J. Rotella, P.M. Johnson, and A.E. Bruner. 2001. A long term study of apparent survival in Pacific Golden-Plovers at a wintering ground on Oahu, Hawaiian Islands. Auk (in press).
- Pratt, H.D., P.L. Bruner and D.G. Berrett. 1987. A field guide to the birds of Hawaii and the tropical Pacific. Princeton Univ.Press.
- Pyle, R.L. 1997. Checklist of the birds of Hawaii – 1997. 'Elepaio 57(7):129-138.
- Tomich, P.Q. 1974. The Hawaiian hoary bat. National Parks Conservation Magazine 48 :10-13.

APPENDIX C

"Final" Archaeological Inventory Survey Report for
State Sites 50-30-10-406 and 50-30-10-485
for the
Proposed Improvements to the Kalaheo Water System

Cultural Surveys Hawai'i, Inc., March 2001

DOCUMENT CAPTURED AS RECEIVED

Jan. 16. 2002 1:57PM

CULTURAL SURVEY HI. 808-262-4950

No. 2168 P. 2/3

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LAND
STATE PARKS

LOG NO: 27346 ✓
DOC NO: 0106NM13

August 3, 2001

Mr. Matt McDermott
Cultural Surveys Hawaii
733 N. Kalaheo Avenue
Kailua, Hawaii 96734

Dear Mr. McDermott:

SUBJECT: Historic Preservation Review – Archaeological Inventory Survey Report Proposed Improvements to the Kalaheo Water System, Kalaheo Well Site, Kalaheo Auhupua'a, District of Kona, Kaua'i, TMK: 2-4-04: 5

This letter reviews this inventory survey report submitted May 8, 2001 (Perzinski et al. 2001. Archaeological Inventory Survey Report for State Sites 50-30-10-406 and 50-30-10-485 for the Proposed Improvements to the Kalaheo Water System, Kalaheo Well Site, Kalaheo Auhupua'a ... Cultural Surveys ms.).

The survey seems to have acceptably covered the project area, finding two historic sites. These sites are acceptably described and interpreted. Site 406 is a set of agricultural features. Excavation in one platform found a horse burial, suggesting the entire site was likely associated with pineapple and truck crop farming. Site 485 is a water diversion feature likely associated with truck crop farming. Oral informants suggested that the sites were associated with early 1900s Spanish and Portuguese settlers.

We agree that both sites are significant solely for their information content (criterion D).

The report indicates that only one feature of site 406 will be impacted by construction and that has been adequately recorded and needs no further work. We agree. We also agree that if any of the work is done outside the proposed grading limits and will impact other features of these sites, then the mitigation recommendations will have to be re-evaluated.

The report is acceptable. As long as the project stays within the proposed grading limits, no mitigation is needed for this project, and the historic preservation review process is completed.

Jan. 16. 2002 1:57PM CULTURAL SURVEY HI-808-262-4950

No. 2168 P. 3/3

2

If you have any further questions, please contact Nancy McMahon of our office at 742-7033.

Aloha,



**DON HIBBARD, Administrator
State Historic Preservation Division**

NM:amk

c. Dee Crowell, County of Kauai

DOCUMENT CAPTURED AS RECEIVED

ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR STATE SITES
50-30-10-406 and 50-30-10-485 FOR THE PROPOSED IMPROVEMENTS
TO THE KALĀHEO WATER SYSTEM, KALĀHEO WELL SITE,
KALĀHEO, AHUPUA`A OF KALĀHEO, DISTRICT OF KONA,
KAUA`I, HAWAI`I (TMK 2-4-04: 5)

by
Mary Perzinski, B.A.
Matt McDermott, B.A.
David Perzinski, B.A.
Ka`ohulani McGuire, B.A.
and
Hallett Hammatt, Ph.D.

Prepared for
Park Engineering

DRAFT

Cultural Surveys Hawai`i, Inc.
March 2001

ABSTRACT

Under contract with Park Engineering, Inc., Cultural Surveys Hawai'i, Inc. (CSH) carried out an archaeological inventory survey with subsurface testing of the site proposed for the Kalāheo Water System Expansion Area, Kalāheo, Kauai (TMK 2-4-04:5). Informal interviews were also conducted with a few elders of Kalāheo concerning the historic land use of the project area. None of the local informants had any information regarding traditional Native Hawaiian land use of the area.

Two historic sites were identified, State Sites 50-30-10-406 and -485. Site -406 consists of numerous agricultural features including: terraces, rock mounds, platforms and walls. Four test units and four auger holes were excavated throughout Site -406. A horse burial was found beneath one of the platforms obviously indicating a historic age. The excavation results indicate that site -406 is a historic construction, most likely related to historic pineapple and truck crop agriculture. There are no subsurface indications of traditional Hawaiian land use within the features of the site. The stratigraphic relationship of the features to the modern land surface indicates the fairly recent construction of all the tested features. Site -485 was determined to be a historic water diversion feature likely constructed for truck crop irrigation.

This evidence, like that obtained from the historic background research and oral interviews, is not conclusive proof that the features of site -406 and -485 are historic in age. However, all available evidence combined makes a fairly strong argument for the historic construction of the site.

Both sites are considered significant under Criterion D. Sites -406 and -485 have yielded data contributing to an overall understanding of spatial relationships, probable age, and likely function, though it is believed that these sites could yield varying types of scientific data which would further contribute to some or all of the following analysis: (1) material culture; (2) architecture and/or function; (3) chronology and (4) settlement patterns.

The historical documentation, interviews and excavation results all suggest that State Sites 50-30-10-406 and -485 are historical, likely built in the early 1900s by European settlers. The proposed excavations for the new Kalāheo well site may only disturb the most southern extent of site -406 Feature 26, an historic agricultural terrace; site -485 will not be disturbed. Based on the relative recent date of this feature, Cultural Surveys Hawai'i recommends no further historic preservation work for the proposed construction activities. If any work is done further north outside the currently proposed construction limits, this recommendation should be re-evaluated at that time.

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I. INTRODUCTION

A. Project Background

Cultural Surveys Hawaii, Inc., was contracted by Park Engineering to perform an archaeological inventory survey of the site of the proposed improvements and expansion of the Kalāheo Well Site in Kalāheo, *Ahupua`a* of Kalāheo, District of Kona, Island of Kaua`i (TMK 2-4-04:5) (Figures 1 and 2). The proposed improvements include the construction of a 0.5 million gallon reservoir, a booster pump station, and connection pipelines at the existing Kalāheo well site.

In an April 1st, 1999 letter from the State Historic Preservation Division (SHPD) to Mr. Keith Uemura, Project Manager for Park Engineering, SHPD stated that:

"State site number 50-30-10-406, agricultural terraces, existing behind the existing Kalāheo Well site. We recommend that a qualified archaeologist conduct a field inspection to determine if significant historic sites exist in the area. A report on this work should be submitted to our office for review and acceptance. If historic sites do exist, plans can be made to adjust the project location and preserve the historic site(s)." (LOG NO: 23152 DOC NO: 9903NM20)

The initial field inspection was carried out on June 2nd, 2000 by Matt McDermott, B.A. Mr. Keith Fujimoto of the Kauai Board of Water Supply accompanied Mr. McDermott to the project site, oriented Mr. McDermott to the existing Kalāheo well site features, and provided a map of the proposed improvements of the well site. The land area to be affected by the proposed well site expansion and improvements was subjected to systematic pedestrian inspection.

A letter report was prepared documenting the field inspection (McDermott and Hammatt 2000). Based on field inspection results, and in consultation with Ms. Nancy McMahan, the Kauai Island archaeologist, it was determined that the southwestern-most features of the site 50-30-10-406 complex will be adversely affected by the proposed expansion. As a result, an archaeological inventory of the entire site 50-30-10-406 was initiated.

B. Project Area Description

The project area is located on the western slope of Papapaholahola at approximately 950' elevation amid the undulating topography of the Kalāheo hills, at the end of Poohiwi Road (see Photograph Appendix, Figures 17 and 18). The slope of Papapaholahola hill in the vicinity of the project area is characterized by many basalt outcrops and large (up to 3 m diameter) boulders which have slumped off the exposed bedrock cliffs just above the project area. The area is comprised of a number of introduced species of flora including strawberry guava (*Psidium cattleianum*), bamboo (*Dendrocalamus sp.*), paper bark (*Melaleuca leucadendra*), swamp mahogany (*Eucalyptus robusta*), ti (*Cordyline terminalis*) and kukui (*Aleurites moluccana*). One indigenous species, moa (*Psilotaceae nudum*), was observed growing on many of the large boulders scattered over the site.

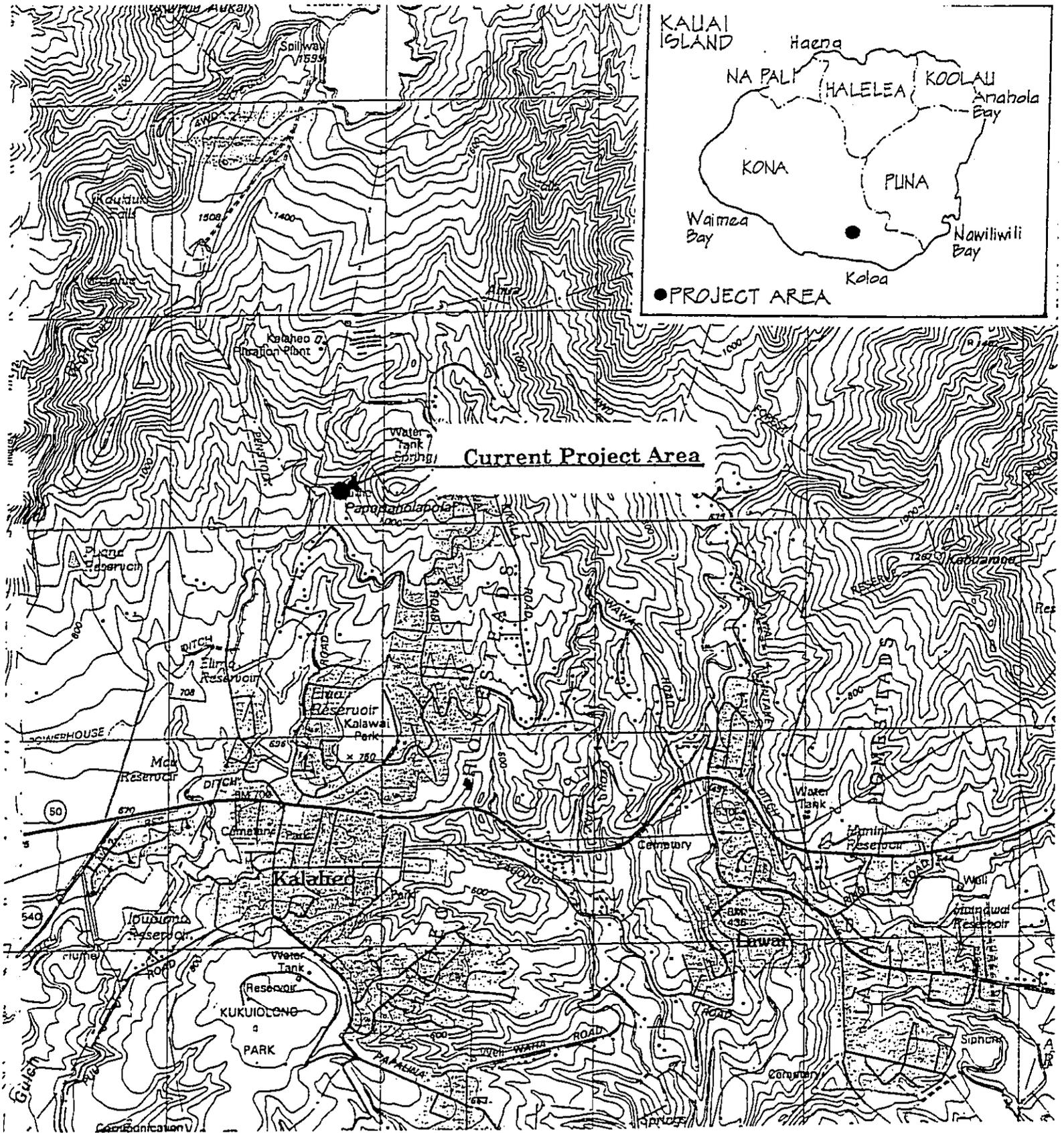


Figure 1 Portion of 1996 USGS 7.5 Minute Series, Koloa Quadrangle, Displaying Project Area, Note Location of Papapahalahola Hill and Kukuiohono Park; with Inset of Kauai Island.

Map No. 1 2834
 Source: Tax Map 21786 2834
 by: F.K. S.A.L. July 1936

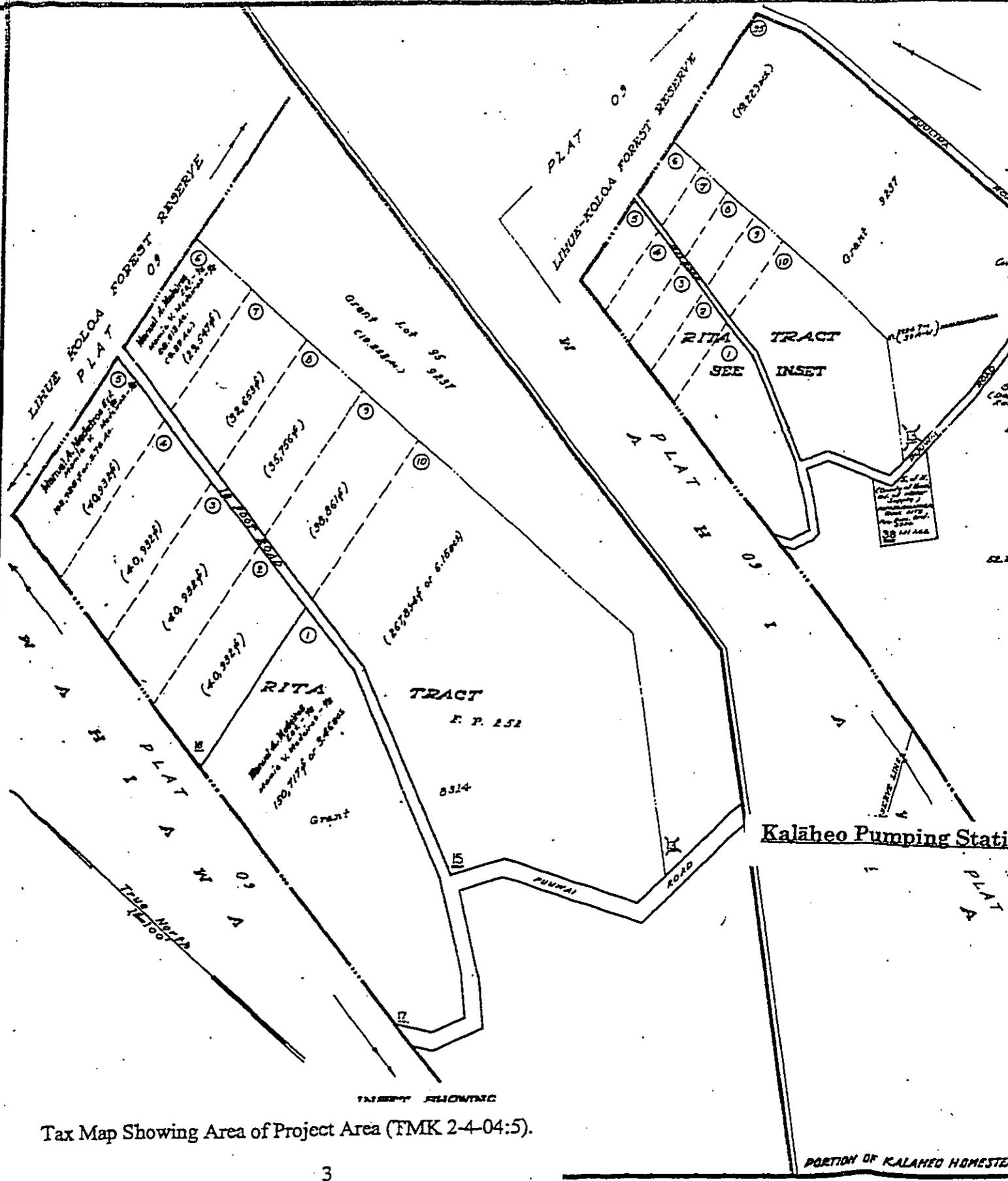
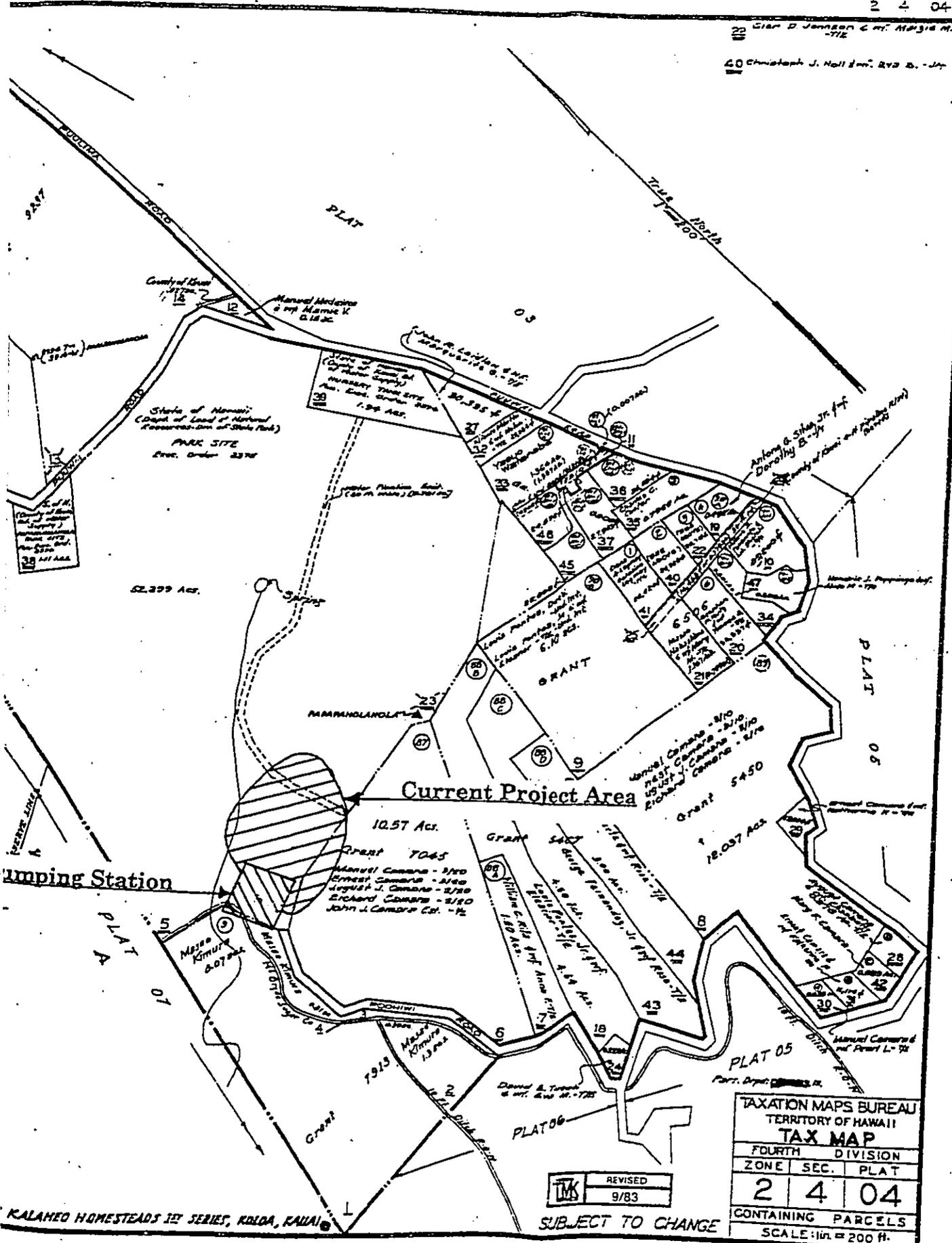


Figure 2

Tax Map Showing Area of Project Area (FMK 2-4-04:5).

20 Clara D. Johnson & Co. 11/3/18 M.
-71E

40 Christoph. J. Hall 2nd. 2/12 D. - Jay



TAXATION MAPS BUREAU		
TERRITORY OF HAWAII		
TAX MAP		
FOURTH DIVISION		
ZONE	SEC.	PLAT
2	4	04
CONTAINING PARCELS		
SCALE: 1 in. = 200 ft.		

REVISOR
9/83
SUBJECT TO CHANGE

KALAEHO HOMESTEADS III SERIES, KOLOA, KAUAI

The land in Kalāheo is a result of the Kōloa Volcanic Series - post-erosional lavas less than 1.5 million years old. Numerous vents including cinder and spatter cones and even a small shield volcano are located within Kalāheo *ahupua`a*. Rapid soil formation on these lavas is attributable to the warm humid climate acting on the volcanic ash as well as the frequent and often long quiet periods between eruptions at any particular place during the Kōloa Series (McDonald and Abbott, 1970). Numerous young intermittent and perennial streams bisect the Kalāheo hill slopes. Springs are noted on maps in the vicinity of the project area.

Mean annual rain fall in the vicinity of the project area is between 2000 and 3000 mm a year (Giamelluca et al. 1986:151). Vegetation consists predominately of introduced species. Both active re-forestation and natural dispersal of non-native species have created the floral diversity noted at the site. Banyan, small stands of bamboo, strawberry guava, swamp mahogany, octopus tree, and Cook pine were observed. Native vegetation observed consisted of *hau* and *ti*. Ground visibility was good as there was little undergrowth below the dense tree canopy. The ground surface has numerous basalt boulders of variable size, up to over two meters in diameter. Soils in the project area consist of Puhi silty clay loam (15-40 percent slopes). These soils are used for sugarcane, pineapple, orchards, pasture, woodland, wildlife habitat, and water supply (Foote et al. 1972:115).

The land form within the project area slopes generally to the southwest and west. To the north of the existing well site is a steep sided, but fairly shallow natural drainage. During the field inspection the only water that was trickling through this drainage was from a leak in one of the many Kauai Board of Water Supply pipelines that pass through this area. This intermittent drainage may have been a perennial stream before the water table was lowered by the water pumping at the well site. Further to the north of the existing well site, on the north side of the drainage, is a large stand of mature Cook pines, obviously the result of an extensive re-forestation project.

The existing site of the Kalāheo Well (Photograph Appendix, Figure 18) was bulldozed in the past to create the level surface the well facility rests on. Large boulders from this grading were pushed to the west and north of the existing well site. Amid these boulders is a fair amount of modern rubbish including automobile parts and tires. A 17-inch diameter iron pipe line extends to the northeast from the eastern corner of the existing well site. This pipeline runs above ground up-slope for approximately 85 meters until it intersects with several other apparent water pipelines that extend north-northwest/south-southeast.

C. Scope of Work

The inventory survey and its accompanying report documents all historic properties within the subject parcel and the associated State Site -406. The following archaeological inventory survey scope of work meets the State and County requirements:

1. A complete ground survey was conducted of the entire project area for the purpose of site inventory. All sites were located, described, and mapped with

evaluation of function, interrelationships, and significance. Documentation included photographs and scale drawings of selected sites and complexes. All sites were assigned State site numbers.

2. Limited subsurface testing was conducted in select features and feature areas to determine if subsurface deposits were located in the project area, and to evaluate their significance.
3. Research on historic and archaeological background was undertaken, which included a search of historic maps, aerial photographs, written records, Land Commission Award documents, and interviews with knowledgeable long-time local residents. This research focused on the specific area with general background on Kalāheo *ahupua`a* with an emphasis on settlement patterns.
4. Preparation of a survey report includes the following:
 - a. A topographic map of the survey area showing all archaeological sites and site areas;
 - b. Description of all archaeological sites with selected photographs, scale drawings, and discussions of function;
 - c. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the archaeological features;
 - d. A summary of site categories and their significance in an archaeological and historic context;
 - e. Recommendations were based on all information generated which specify what steps should be taken to mitigate impact of development on archaeological resources. These recommendations were developed in consultation with the client and the State agencies.

This scope of work included full coordination with the State Historic Preservation Division (SHPD), and Kauai County relating to archaeological matters. This coordination took place after consent of the owner or representative.

D. Methods

1. Background Research

Background research was conducted to better understand the historical land use of Kalāheo. This research included traditional Hawaiian folklore, historical maps, and missionary memoirs and written accounts. Research for aerial photographs was undertaken at the Hawaii State Archives, but yielded no useful photographs or maps.

2. Local Informant Interviews

On December 5th and 6th, 2000 CSH archaeologist Ka'ohulani McGuire, B.A., conducted informal interviews with local long-time Kalāheo residents. McGuire met Kalāheo Neighborhood Senior Citizens which meet at the Kalāheo Community Center. The interviews were conducted to better understand the land-use history of Kalāheo and the current project area, in particular.

These interviews are significant because none of the residents attribute the features at sites -406 and -485 to a Hawaiian community. The informants told McGuire that the features of site -406 and -485 are credited to the Spanish and later Portuguese settlers that arrived here in the early 20th century. According to the interviewees, Kalāheo settlers ranched and grew dryland taro, pineapple, sugarcane, and grapes. Atop the hillside, above the project area, is an abandoned World War II communications station. The following informants and their paraphrased interviews are related below:

Aeko Kimura:

Mrs. Kimura is in her late seventies. The Kimura family operates a nursery (Kalāheo Flower and Garden) and own the last house on the *makai* side of Po'ohiwi Road, just before the end of the road where the current project area is located. Mrs. Kimura came from Kamakani/Makaweli Plantation and considers herself an "outsider" because she didn't grow up in Kalāheo. She says her husband, Norman, who passed away last year, would have been the one to talk to; the one who might have known about the area. She says she is too old and can't remember the things her husband used to talk about. She was able to give only a very general background of the Kimura parcel. According to her, the Kimura family bought the property around 1932-33. Prior to that it was owned by the Martins. Her husband Norman grew up in the area and his family was one of the first Japanese families to move to Kalāheo. Mrs. Kimura moved to Kalāheo in 1941, when she married her husband. Prior to 1941, the Kimura land was used to grow sugarcane which they sold to McBryde Sugar plantation. In 1941, the Kimura's stopped growing sugar and began growing truck crops. Mrs. Kimura remembers that Kalāheo was predominantly a Portuguese community who did mostly ranching.

Lorraine Moniz:

Mrs. Moniz is 75 years old. She says to talk to the Medeiros family. Their father (Frank Medeiros) used to own 40-50 acres of the Camara's land before the Camara's bought it (Camara's land is adjacent to the current project area). Lorraine's father was from Kōloa. He was the first one to move to Kalāheo, before the homestead opened up. He worked for McBryde Sugar in Kōloa. When McBryde began growing sugar in Kalāheo, he moved there to keep an eye on the crops, check irrigation, etc. Soon afterward, Mr. Gonsalves and Mr. Nishimoto moved to Kalāheo. The homestead opened up soon after, in the early 1900's, she thinks. She doesn't remember any Hawaiians living in or near Kalāheo, much less the current project area. According to Moniz, the Hawaiians all lived in Wahiawa.

Medeiros Family:

Carol (Medeiros) Souza and her brother Bernard Medeiros were both interviewed. Carol didn't know anything about the history of the current project area. Her brother, Bernard, remembers being back there and seeing archaeological sites in the project area, but said he never heard anything about them.

Mary Shimogawa:

Shimogawa remembers the Spanish lived in the area before the Portuguese. Some of the Spanish family names include: Vilche, Pontes, Fernandez, Lara, and Parraga. In the early 1900's, the Vilche family grew grapes. Mary's mom was Rose Vilche.

Sharon & Johnny Villanida:

Sharon Villanida is the daughter of Ernest Camara. The Camara's own the land bordering the project area on the mauka side of Po'ohiwi Road (across from the Kimura's), southeast of the project area. There is a fence dividing the Camara's land from the current project area. As a child, Sharon remembers that their land was a farm with cattle, pigs, horses. There were only a few (two to three) houses on the street. Near the forested area bordering their land [current project area], the military used to have a radio communications center during WW II in a cement building. From what she remembers about the history of the area, the Spanish lived there first, before the Portuguese. She heard the Spanish grew dryland taro and pineapple (this was before the 1940's she thinks). She thinks the large platform/wall [Site -406, Feature 16] was built by the early farmers who first lived in the area or the military during the war. Johnny Villanida remembers the old way to break stones was to set a fire to heat the rocks and then pour cold water on top to crack the rocks. The rock piles close to the fence line on their property were cleared and stacked by family members. Sharon remembers her father and uncle bulldozing some of the rocks.

3. Pedestrian Inspection and Surface Feature Recording

The archaeological inventory survey was carried out over four days from December 3rd to December 6th, 2000, by Mary Perzinski, B.A., Ka'ohulani McGuire, B.A., Ian Masterson, and David Perzinski, B.A., under the field direction of Matt McDermott, B.A., and the overall direction of Hallett H. Hammatt Ph.D. The surface survey coverage of the project area was 100%. Sweeps were conducted to ascertain the boundaries of sites -406 and -485 and to see if any new, previously unrecorded, features were present.

Archaeologists were stationed approximately 5 to 10 m apart during the sweeps depending on the ground cover and vegetation. The sweeps began at the base the Board of Water pumping station to the top of Papapaholahola Hill, where the WWII radio tower is located. All features located during the sweeps were flagged with yellow tape. Features were labeled during the mapping portion of the survey. All features encountered were measured, described and photographed. Detailed plan view maps were generated for all feature complexes. A site map of the project area was generated which includes both sites and every feature (Figure 3).

4. Excavation

Limited test excavations were undertaken at site -406 primarily for the purpose of recovering datable samples and assisting in functional interpretations. No dateable samples were encountered. The excavations included three test unit excavations at State Site -406, Features 1, 16 and 17, and four auger holes, excavated throughout Site-406. Site -485 was not tested. Excavation findings can be found in Chapter VI Excavation Results.

a. Auger Excavations

Four auger excavations were conducted within soil areas between features of Site -406. Auger excavations were placed to provide a rough transect through site -406. The purpose of the augering was to evaluate the variability of stratigraphy across site -406 and to look for cultural material within the site. A 15 cm diameter rotary auger bucket was used in the excavations. The depth of the excavations varied between 25 and 50 cmbs. All sediments removed were screened through 1/8th inch mesh. See Figures 7 and 9 for auger hole locations.

b. Test Units

Four hand excavations, totaling 7.9 m², were made within three different boulder and cobble constructed features. The feature types tested included a rectangular platform (Feature 1), a terrace retaining wall (Feature 17), and the large multi-tiered terrace (Feature 16). Hand excavation recording procedures followed standard archaeological practices. Photographs, written sediment descriptions, and drawn excavation profiles recorded the excavation stratigraphy. All excavated sediment was screened through 1/8th inch mesh and recovered cultural materials were labeled with their specific provenience.

II. KALĀHEO AHUPUAʻA CULTURAL AND HISTORICAL DOCUMENTATION

A. Pre-Contact to 1848

Historical references to Kalāheo are scarce, though suggest to the importance of Kalāheo as both a center for agriculture and religious activities. Mythical accounts place a Kalāheo pond "Nōmilu" as the foci for numerous traditional stories. Wichman (1998:35) states

On one side of the pond is a spring called Ka-Kalua, "sinkhole," where shrimp were caught. These shrimp were a light pink and had a white spot in front of the head and sometimes a white tail. The Menehune were especially fond of these shrimp, which were not always to be found here.

Another account details a meeting between the goddess Pele and her sister Namakaokahaʻi at Nōmilu:

The site of the fishpond was once a small hill. Pele, before she found her home in the volcano of Mauna Loa on Hawaiʻi, searched all of Kauaʻi for a suitable place to live. When she came here, Namakaokahaʻi caught up to her. Namakaokahaʻi was Pele's older sister and greatest enemy. During the battle, Pele kicked up a lot of dirt into a pile, which turned into the hill Kāpeku, "to splash water by kicking the feet." Then Pele cause the hill she and her sister were fighting on to erupt, which covered the plains of Wahiawa with stones the size of coconuts. Namakaokahaʻi flooded the new crater, forming the pond. Pele fled to Oʻahu, followed by Namakaokahaʻi. The cape at Nōmilu is named Na-maka-ō-Kahaʻi, in memory of she who put out the volcano.

Before Pele left, she turned two supernatural eels, Puhī-ʻula, "red eel," and Puhī-pakapaka, "scaly eel," into stone as guardians of the pond. They are still there. (Wichman, 1998:35-36)

Very little historical documentation exists on physical descriptions of Kalāheo. One vivid description of the uplands between Hanapēpē and Kilohāna by Rev. Hiram Bingham is cited by Ethel Damon in her recollections of Nawiliwili:

In 1824, when walking around the island from Waimea to counsel the people after the wreck of The Cleopatra's Barge, Rev. Hiram Bingham crossed from Hanapēpē, as has been seen, over the old upland trail back of Kilohana, and wrote of it as 'a country of good land, mostly open, unoccupied, and covered with grass, sprinkled with trees, and watered with lively streams that descend from forest-covered mountains and wind their way along ravines to the sea, -a much finer country than the western part of the island.' (1931:401)

The earliest documentation of the population of the district of Koloa (including

Kalāheo) appears in the 1850s when missionary censuses recorded a total population of 1,296 (Schmitt 1977:12). Population totals in the entire island of Kaua'i prior to 1850 had shown rapid decline, suggesting that similar trends likely occurred in Koloa and Kalāheo. By 1878 the population of Koloa bottomed out at 1,008, and then began steadily increasing to 1,500 in 1884, 1,835 in 1896 and 4,564 by 1900 (Schmitt 1977:13). Other nearby *ahupua`a* of Kaua'i demonstrate similar trends.

B. 1848-1851

The Organic acts of 1845 and 1846 initiated the process of the *Mahele* - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the *ali`i* (royalty) received their land titles. The common people received their *kuleana* (individual parcels) in 1850. It is through records for Land Commission Awards (LCAs) generated at the *Mahele* that the first specific documentation of life in Kalāheo *Ahupua`a*, as it had evolved up to the mid-19th century, come to light. On the following page is a table listing the records associated with these awards and illuminating the character of the settlement within Kalāheo *Ahupua`a* at the time.

In describing the conditions of Wahiawa (the adjacent *ahupua`a*, directly west of Kalāheo) prior to the use of irrigation, Ida Elizabeth Knudsen Von Holt (1985) writes of her father's (Valdemar Knudsen's) hardships during the 1850's and 60's:

In those early days, land was very cheap. There was no way of watering or irrigating the fields, and the grass became absolutely parched and dead during the dry months. Cattle often died for want of food and water.....

By the 1930s when E.S. Craighill and Elizabeth Handy were collecting ethnographic and ethnobotanical data for their monumental works on the Hawaiian planter (Handy, 1940; and Handy and Handy, 1972), the character of the land unit (*ahupua`a*) of Kalāheo had become an obscure memory. Kalāheo *Ahupua`a*, though it had been retained in the 19th century by Kamehameha III as Crown Lands (Indices of Awards, 1929) in the *Mahele* of 1848, is described by the Handys in this century as:

...little more than a gulch formed by an insignificant stream which probably never had a constant flow. Kukui-o-Lono (Lono's-kukui-trees) was a famous place in this section [land division] for sweet potato culture. (1972:428)

This description seems hardly adequate for an *ahupua`a* formerly reserved for the *ali`i nui*, especially as Lawa`i and Wahiawa, adjoining *ahupua`a* to the east and west of Kalāheo, both described glowingly by the Handys, were awarded to the lesser *ali`i* James Young Kanehoa and Moses Kekuaiwa (respectively). Kalāheo, Lawa`i and Wahiawa share essentially identical environmental parameters of topography, rainfall, temperature, and abundant spring and stream water in close association with substantial arable land. Thus we premise that if additional informants from Kalāheo had been available to them, the Handys' description of Kalāheo would be as exuberant as this for Wahiawa:

Table 1: Land Commission Awards Summary

03394B	Kaneiki	Kapaeli	House, Cultivation	1 apana, 1 loi,
03395B	Keoua	Puuhalulu, Kalaukiela, Onomilu	House, Cultivation	4 apana, 30 loi, 1 house lot, 2 salt lands, 1 oranges
03396B	Kiheii, Samasona	Punipoi, Waiapuka, Kaawa	Cultivation	3 apana, 34 loi, 1 oranges
06345	Kaneiki	Kalāheo (ahupua`a)		Not awarded
06346	Keoua	Kalāheo (ahupua`a)		Not awarded
06347	Kanenehakuole	Kalāheo (ahupua`a)		Not Awarded
06520	Waipa	Umiumihale	Cultivation	1 apana, 12 loi
06535	Haia, wahine	Lonohale		Not Awarded
06584	Paele	Omomilu	House lot, Cultivation	4 apana, 1 house lot, 5 salt lands, sweet potatoes
06647	Una	Kolau	House lot, Cultivation	3 apana, 1 loi, 2 house lots
06688	Laa	Koali	Cultivation	1 apana, 17 loi, 1 Kula
06745	Ohule	Haleopai, Makaalaea, Omomilu	House lot, Cultivation	3 apana, 17 loi, 1 kula, 1 house lot, 5 salt lands, 1 sweet potatoes
03044	Alauka	Paele, Holeikamaina	House lot, cultivation	3 apana, 14 loi, 1 kula, 4 salt lands
08840	Kanenehakuole	Kaawa	Cultivation	2 apana, 15 loi, 4 salt lands

...the taro terraces extended all the way down the valley to the muliwai (inlet). A short distance above the present highway bridge was a spring named Ka`ulūpaniau, which watered a small group of terraces. Inland from this was Kawaikapulalo [The-sacred-water-below], and here were terraces and wauke (paper mulberry) plantations. Above this was kula land named Kawaikapuluna [The-sacred-water-above], on which were the houses and sweet-potato plantations. Continuing upstream to a point opposite Pu`u Aukai there were other terraces in the stream bed, with houses and sweet-potato plantations on kula land above...Of this upper area Bennett (1931, p. 115) remarks that "the remains of terraces" were observed to be "remarkable in places for their number on a small area of land". (Handy and Handy 1972:428)

Research, conducted by the Folk and Hammatt (1991:10-22 and Appendices I and II), has revealed that the traditional Hawaiian agricultural and habitation related land use patterns just cited for Wahiawa are equally valid for the lands of Kalāheo. An abundance of springs, small streams, alluvial terraces, and *kula* lands in Kalāheo, probably not reported to the Handys during their fieldwork, is evident in data from several sources: 19th century maps of the *ahupua`a* boundary survey (Gay, 1872; and later Monsarrat, 1896-R.M.1842) including field notes of the survey and native testimony presented to the Boundary Commission (1873); an Hawaii Territory Survey map of the Crown Lands of Kalāheo showing Rights of Way for constructed and proposed irrigation and transportation systems of McBryde Sugar Co. Ltd. (Miller, 1902, R.M. 2131); a map of Kalāheo Homestead grants (Harvey, 1906; Jay, 1913); and modern Kaua`i County property tax maps - for locating Land Commission Awards. Native Register and Native and Foreign Testimony associated with Land Commission Awards also furnish evidence supporting the premise that Kalāheo *Ahupua`a* was fully as rich agriculturally and demographically as neighboring Lawa`i and Wahiawa--see Folk and Hammatt (1991).

C. Post-1850

Historical documentation of late 19th and early 20th century Kalāheo is scarce. Early in the 20th century land use and the population density changed dramatically in Kalāheo. The uplands were subdivided in homesteads and ranching became the primary land use. At lower elevations sugar cane cultivation became the major activity, with irrigation water collected from the uplands by means of an extensive system of ditches and reservoirs. These reservoirs are visible on the 1919 U.S.G.S. map of the vicinity, see Figure 3. McBryde Plantation Mill, built *circa* 1899, is located approximately 2.5 miles southwest of Kalāheo. Plantation camps are scattered around the south of Kalāheo and Wahiawa *ahupua`a*, which were generally segregated by ethnicity. A map of the McBryde Sugar Company (Figure 4) shows the northern extent of sugar train tracks in the Kalāheo Homestead vicinity (Condé and Best 1973:193).

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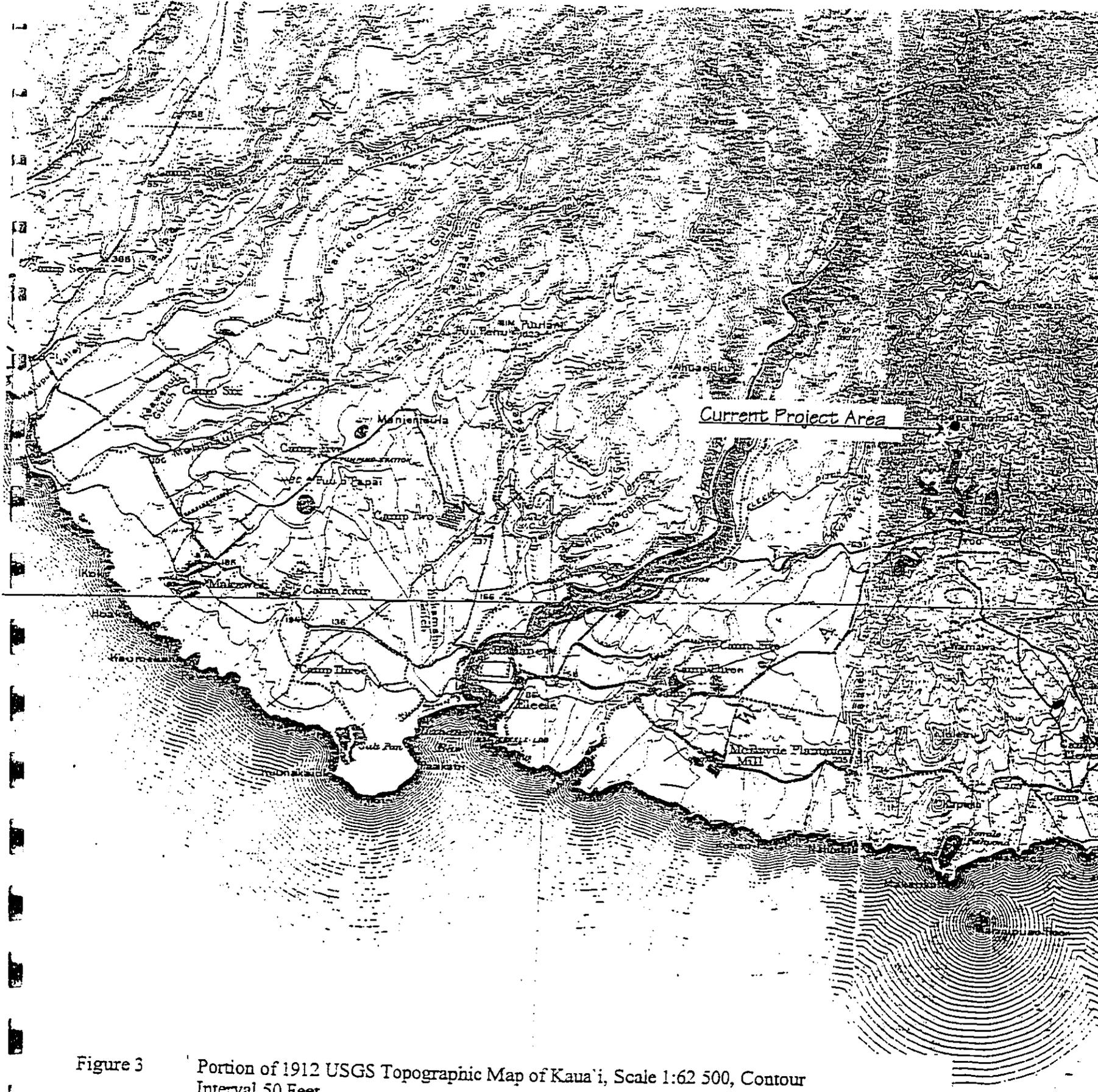


Figure 3 Portion of 1912 USGS Topographic Map of Kauai, Scale 1:62 500, Contour Interval 50 Feet.

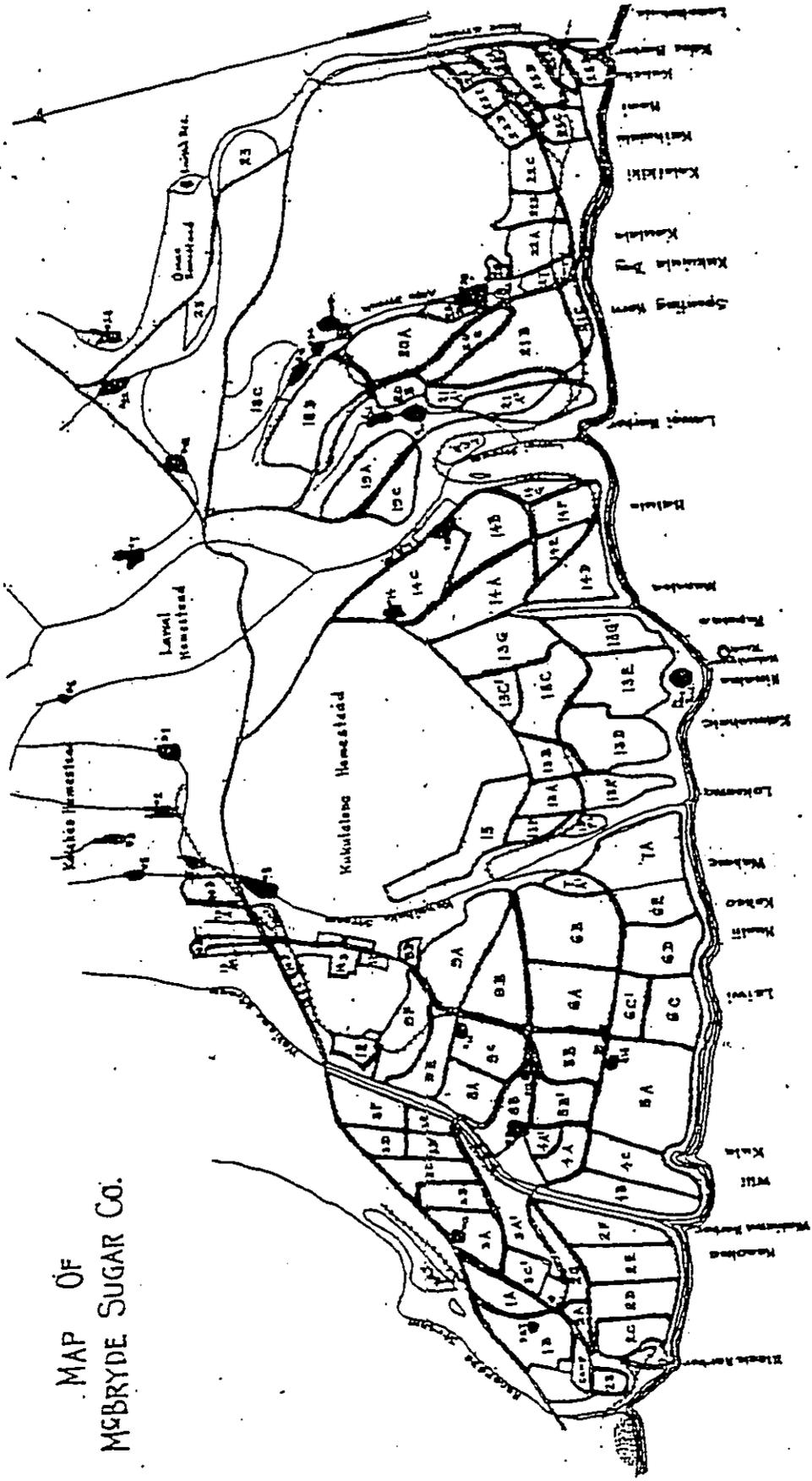
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C O C E A N

MAP OF
McBRYDE SUGAR CO.



1888/91
S. H. B.
D. H. B.

Figure 4 Map of McBryde Sugar Company Lands (Condé and Best 1973:193).

According to long-time Kalāheo residents, Kalāheo was first populated by the Spanish and later Portuguese settlers in the early 1900s. Truck crops, dryland taro, pineapple, sugarcane, and grapes were grown in the project area vicinity. Ranching also became an integral part of the Kalāheo community. During World War II, military personnel constructed a communication structure at the top of Papapaholahola Hill, which still stands today.

From 1980 to 1990, Kalāheo grew in population from 2,500 to 3,592 (Juvik and Juvik 1998:306). Today, Kalāheo is a small community with a hotel, restaurants, post office and grocery store. Pasture land is still visible along the surrounding hillsides.

III. PREVIOUS ARCHAEOLOGICAL RESEARCH

The findings of early 20th century archaeological studies on Kaua'i - including sites in the *ahupua`a* of Kalāheo - were reviewed and many sites were revisited as part of his fieldwork in the 1920s by Wendell C. Bennett who published his results in *Archaeology of Kauai* (1931). In Kalāheo Bennett (1931:115-116) lists five archaeological sites numbered 64 to 68. Three of these are located at or near the coast and include: "Site 64. House sites, in Kalāheo [Kawaihaka] gulch at the sea"; "Site 67. Fish pond, salt pans, and taro terraces, at Nomilu"; and "Site 68. Kapoho *heiau*, inland from the fish pond at Nomilu, Kalāheo." The other two sites are located further *mauka* and consist of "Site 66. Kukuilono *heiau*, once located on Kukuilono hill but now destroyed." and "Site 65. Kahalekii *heiau*, on the western slope of Kukuilono hill."

The *ahupua`a* of Kalāheo is dominated by a large cinder cone "Kukui-o-Lono" (light of Lono) on top of which stood Kukuilono *heiau*. The *heiau* is believed to have been the largest of Kaua'i, though is now destroyed. Thrum (1907:37) describes it as:

A large three terraced *heiau*, east section being 95 x 112 feet, mid-section 105 x 51 feet, giving a total length of 246 feet straight on the seaward side. Near east end is a large oven; near the division wall is the *kahua* of the oracle house 32 x 30 feet, and on north side of mid-section are foundations of two houses which measure 15 x 42 feet. The sacrifices for this *heiau* were executed at some distance from it and the bodies then brought and placed on the altar that the temple be not polluted with blood.

It was not until 1961 that Kalāheo again became the subject of archaeological study during a survey of the Kona District of Kaua'i Island, from Hanapēpē to Māhā`ulepū, under the direction of William K. Kikuchi (1963). The survey located twenty-three (23) archaeological sites in Kalāheo *Ahupua`a* and field numbers were assigned to them. In Kalāheo the archaeological sites begin with No. 25: a shelter cave at the shore at Lokoawa, near the west *ahupua`a* boundary. Five more sites - numbers 26 through 30 - including a shelter cave, stone walls, house sites, a spring, and an historic tunnel are recorded by Kikuchi (1963:27-29) in the shoreward reaches of Kawaihaka Stream valley. Among these sites, in all probability, is Bennett's Site 64. Five more sites (numbers 31 through 35) recorded by Kikuchi for the first time, at Kalu`uahole (Kaluaahole) and Papapua`a (Paapuaa) along the shore between Kawaihaka and Nōmilu, include a fishing shrine, house sites, and shelter caves. At Nōmilu (Nomilo) Kikuchi records seven sites - numbers 36 through 42 - including Nōmilu (Nomilo) fishpond, walls, salt pans, an historic tunnel, and Kapoho (Kapono ?) *heiau*. Kikuchi's sites include Bennett's site 67 and 68. Three more sites - numbers 43 through 45 - are recorded for the first time by Kikuchi in the vicinity of Manoloa (Manuloa), a point at the shore at the eastern *ahupua`a* boundary. These sites include an enclosure, walls and a fishing shrine.

Further upland, closer in proximity to the present study area, Kikuchi, like Bennett, records only Kukui-o-Lono *heiau* (Kikuchi site 46; Bennett site 66; Bishop Museum site KA-B6-3; and Hawaii State site no. 50-30-10-66) and Kahaleki`i (Kahakekii)

heiau (Kikuchi site 47; Bennett site 65; Bishop Museum site KA-B6-4; and Hawaii State site no. 50-30-10-65).

Kalāheo is neglected as a site of archaeological research, for another twenty-seven years until November 1988. In 1988 Nancy McMahan, a State Historic Preservation Division staff archaeologist, conducted a field inspection of a proposed water pipeline through State of Hawaii property - TMK 2-4-04:5 - on the slope of Papapaholahola Hill. During the inspection, McMahan (1988) identified a historic property consisting of a stone wall associated with terraces and a paved platform. This site was assigned Hawaii State site no. 50-30-10-406, and the site was posited to be a remnant of Kakaianahoa or Kahalekii *heiau*, both of which were described by Thomas Thrum in 1906 as having been destroyed. McMahan's recommendations for site -406 were: 1) detailed mapping for better protection and 2) relocation of the water pipeline outside of the site. State Site 50-30-10-406 and its general vicinity are the focus of the current investigations.

An archaeological study, conducted by Jeffrey Pantaleo and Scott Williams (1990) for Kauai Electric Division, Citizens Utilities Company, involved inspection of portions of a proposed powerline corridor from Port Allen to Wainiha. Although the corridor passes through Kalāheo ahupua`a, studies were not conducted there because the corridor is "located in areas that have been modified by pasture or sugar cane cultivation" (Pantaleo and Williams 1990:1-2).

In May 1991 Nancy McMahan, a State Historic Preservation Division staff archaeologist, conducted an archaeological survey (Hibbard, 1991) of an approximately 10-acre lot - TMK 2-4-01:12 - located in Kalāheo *mauka* of Kaumuali`i Highway near Kuli Road. Many earthen terraces were identified by McMahan and found to be remnants of "pineapple era fields." No additional work was recommended.

In December of 1991, Folk and Hammatt reported on the archaeological survey and subsurface testing of Land Commission Award 6647 at Kalāheo. No archaeological surface features were found. Subsurface testing found no cultural deposits. This absence of cultural features/deposits resulted from land disturbance from the attempted but never completed construction of a reservoir feature, to encompass all of L.C.A. 6697, at the turn of the last century (Folk and Hammatt 1991).

In June 2000, Matt McDermott, B.A. carried out an archaeological field inspection within the current project area to assess the impact of proposed improvements to the Kalāheo Well site. McDermott conducted pedestrian sweeps through the area and relocated State Site 50-30-10-406 which includes numerous terraces, wall segments, platforms, and a large two-tiered terrace. A likely historic water diversion feature (State site 50-30-10-485) was also identified to the north-northeast of the current Kalāheo Well site. Through consultation with SHPD/DLNR, documentation through an inventory survey of site -406 complex was recommended (McDermott and Hammatt 2000).

IV. PREDICTIVE MODEL

From previous archaeological studies, historic documents, and cultural documentation, it is apparent that land use in the vicinity of the current project area is long and varied, extending from pre-contact times into the modern era. The vast majority of the previous archaeological research in Kalāheo *ahupua`a* has been significantly *makai* of the current project area. However, through comparisons of the more abundant and detailed accounts of the Wahiawa and Lawai *ahupua`a* on either side of Kalāheo, it appears that the land use within Kalāheo *ahupua`a* during prehistoric and early historic times is in keeping with a thriving, well populated, traditional land unit. Traditional Hawaiian activities in the vicinity of the current project area would have included agriculture, habitation, transportation/pathways, possibly religious activities, and resource gathering. From the limited documentation of State site 50-30-10-406 (McDermott and Hammatt 2000; McMahan 1988) we know that abundant stacked stone features, including terraces, platforms, and wall alignments, are extant in the project area. The age and function of these features had yet to be determined.

During the later historic period, with the advent of extensive commercial agriculture in the lands *makai* of the current project area, the upper elevations of Kalāheo became important collection areas of irrigation water. It is possible that historic ditches, flumes, pipelines, and other features related to collection of irrigation water exist within the current project area. Historic homesteads and ranching may have also left physical remains within the current project area. Barbed wire fences, wooden or stacked stone enclosures, water troughs, and historic habitation deposits, including structure foundations and refuse dumps, could potentially be found within the project area.

V. FIELD RESULTS

Figure 5 shows a map of State Site 50-30-10-406, Features 1-26, and the proposed expansion of the water system. Table 2 identifies and describes each feature within sites -406 and -485. Because of the similarity of feature types and specific concentrated areas of features, groups of features are discussed together. Seven separate discussions include: 1) platforms and enclosure at base of Papapaholahola; 2) terrace concentration; 3) large two-tiered terrace, Feature 16; 4) mounds and filled crevice; 5) concentration of field clearing mounds at an upper elevation; 6) an historic terrace on the N side of the 17 cm diameter water line, Feature 26; and 7) the water diversion dike, Site -485. Specific feature information can be found in Table 2.

- 1) Two platforms (Features 1 & 2) and an agricultural feature (Feature 3) are located at the east end of the project area, at the base of Papapaholahola (Figure 6). Both platforms are similar in shape, size, and construction style. The roughly rectangular platforms were constructed of rounded-subangular basalt boulders stacked 2-4 courses high along the perimeter and filled with cobbles and small boulders. A 1 by 1 m test unit was excavated in the eastern corner of Feature 1 which unearthed a horse skull at 60-75 cmbs (see Photograph Appendix, Figures 19 and 20). Although at the base of a steep hill, no sediment accumulation along the up-slope of the feature was apparent which may be further evidence of recent construction. Feature 3 consists of a single course, semi-circular alignment just south of Feature 2. Features 2 and 3 were not excavated. The excavation results of Feature 1 clearly indicate an historic construction which is also probable for Features 2 and 3.
- 2) A concentration of agricultural terraces, mounds and a terrace/enclosure (Features 4-12 & 17-21) is located just east of Features 1-3 (Figure 7). These thirteen features are all within 15-20 m radius of each other (see Photograph Appendix, Figures 21, 22, 23, 24, 27, and 28). Natural bedrock outcrops are also prevalent in this area and the majority of the features have been constructed atop these outcrops. Modern pig trap walls which guide pigs through areas with traps have been constructed throughout the site, evidence of some modern land use (see Photographic Appendix, Figures 29 and 30).

Feature 17 is a terrace/enclosure constructed for agriculture purposes or temporary habitation. One test unit was dug to bisect the terrace retaining wall of Feature 17 to document the feature's construction style and to search for cultural material associated with the feature. The terrace retaining wall is constructed of rounded-subangular basalt boulders stacked 3-4 courses high along the perimeter and core-filled. An iron nail was recovered from Stratum II at a depth of 27-72 cm below the platform surface. No traditional Hawaiian cultural material was encountered. There was also a lack of sediment accumulation on the up-slope of the terrace retaining wall which is further evidence of recent construction.

Three auger holes (# 2, 3, & 4) were also excavated within this area. The

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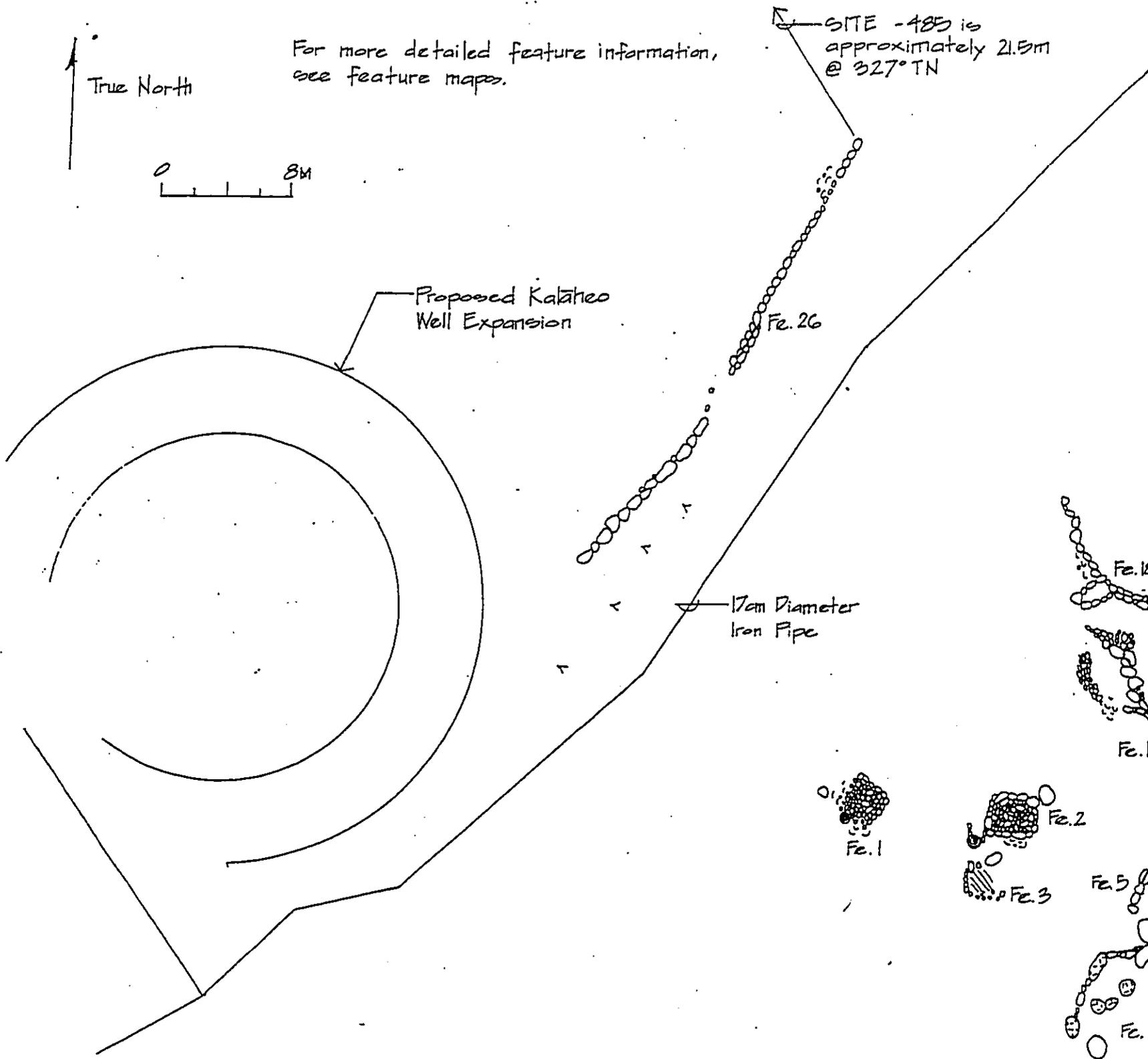
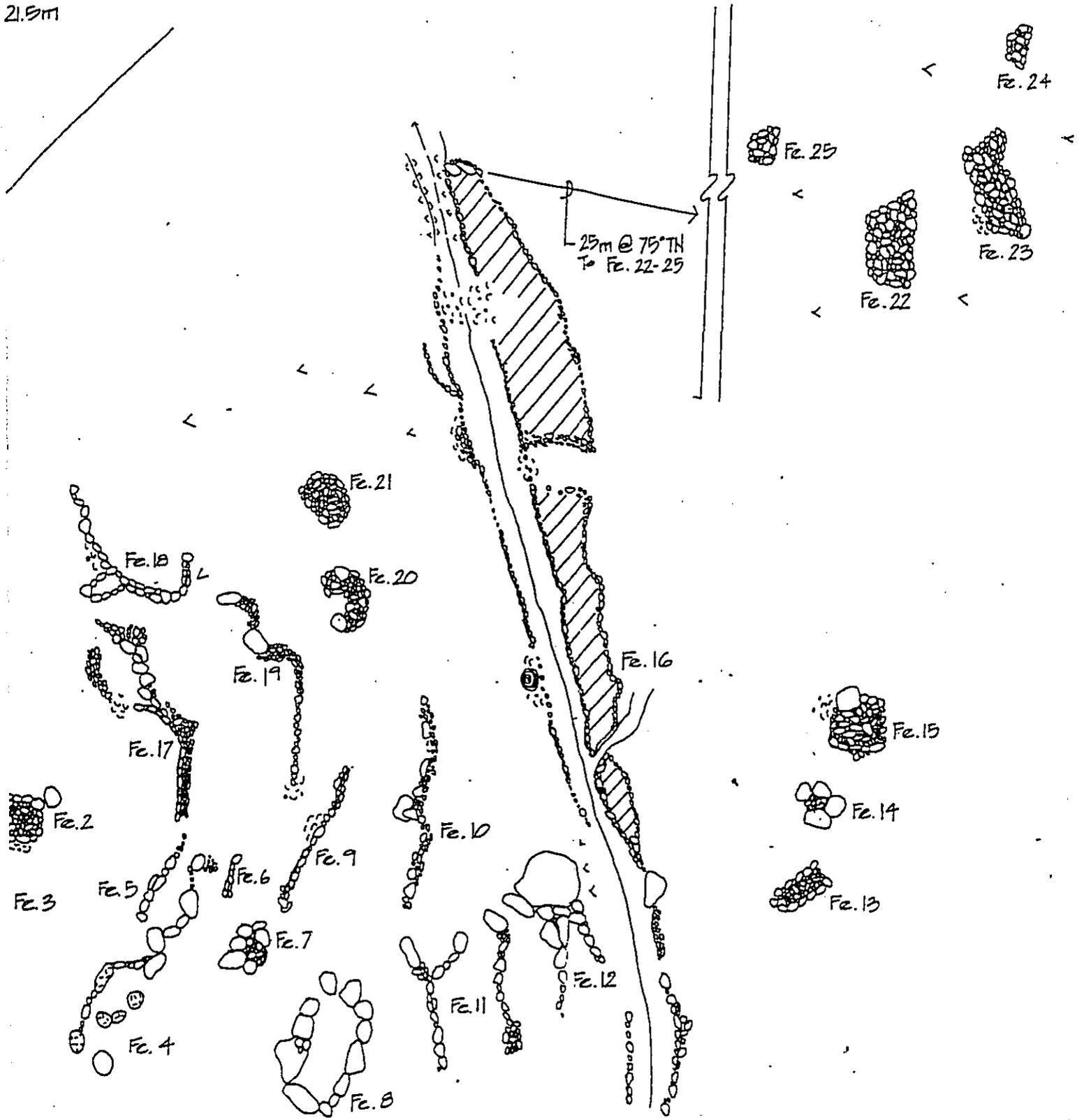


Figure 5 Map of State Sites 50-30-10-406 and -485 Showing Features 1-26 and Proposed Water System Expansion.

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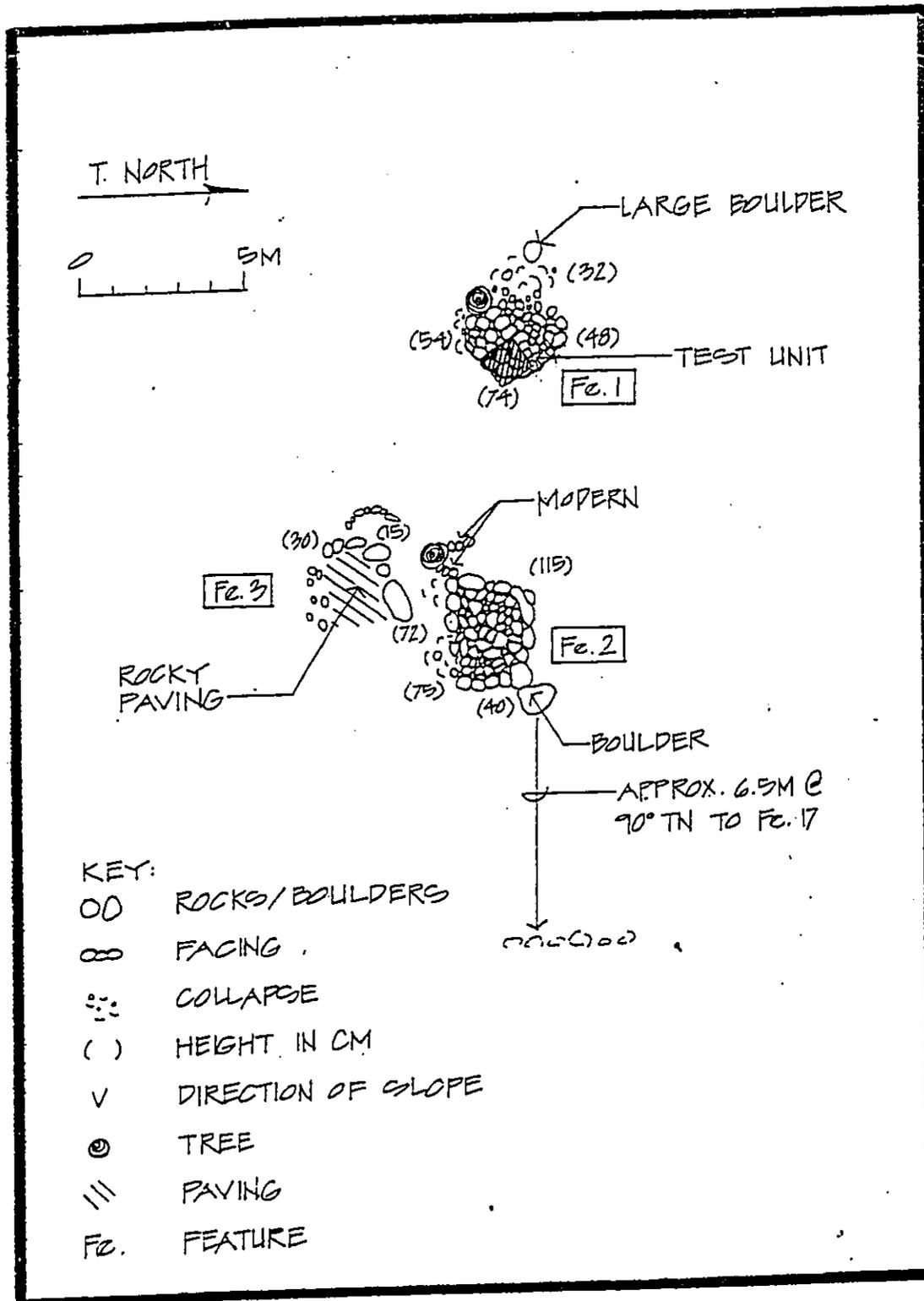


Figure 6 Close-Up of Site 50-30-10-406 Showing Platforms and Agricultural Feature, Features 1, 2, and 3.

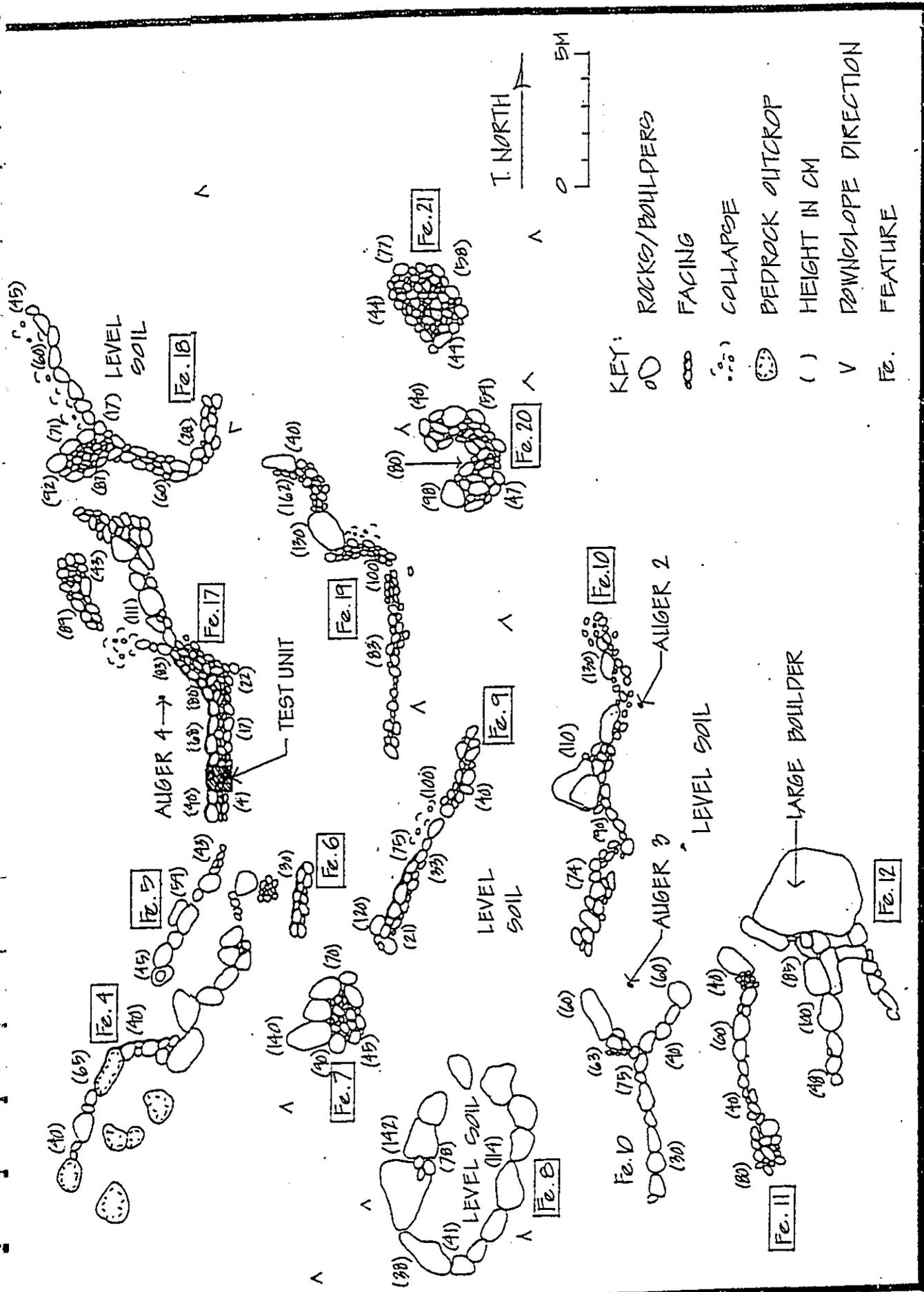


Figure 7 Close-Up of Site 50-30-10-406 Showing Agricultural Features, Features 4-12 and 17-21.

stratigraphy of all three auger holes was consistent with the stratigraphy of Feature 17. No cultural material was encountered in any of the auger excavations. Two of the three mounds (Features 20 & 21) were field clearing rock piles and consisted of a mix of boulders and cobbles. The third mound (Feature 7) consists of a bedrock perimeter filled with rounded-subangular basalt boulders. Feature 7 may have been a field clearing mound or an agricultural mound.

No evidence of traditional Hawaiian land use was observed in any of the excavated units within this agricultural area, therefore, this feature concentration is attributed to the European settlers in the early 20th century.

- 3) Feature 16 is the most prominent feature within the project area and consists of a large two-tiered terrace (Figure 8). The terrace is located up-slope of the features discussed above. The lower tier is 1-3 courses high with three iron water lines running across the top, at the base of the upper tier (see Photograph Appendix, Figures 31-34). Two of the pipes are deteriorated and in very poor condition. The up-slope tier is constructed of skillfully stacked basalt boulders 3-9 courses high. The basalt boulders are remarkably heavy which stresses the intense labor investment for this structure. Two test units were excavated into the up-slope of the feature in order to better determine the age and function of the large terrace structure. The stratigraphy and excavation results from these two test units are similar. No cultural material was encountered in either unit. A lack of any traditional Hawaiian cultural material and an apparent lack of sediment accumulation on the up-slope side of the structure indicate an historic age.
- 4) Features 13, 14, and 15 include two mounds and a filled crevice located on the east side of the southern end of Feature 16 (Figure 9). Feature 13 consists of a basalt boulder mound with a bedrock base (see Photograph Appendix, Figures 25 and 35). The perimeter of the mound consists of rounded-subangular basalt boulders stacked 4 courses high. The interior is cobble filled. Feature 15 is a roughly rectangular mound which consists of a basalt boulder perimeter stacked 1-3 courses high with a cobble-filled interior. Feature 15 has been disturbed by tree roots which have dislodged some of the boulders. Feature 14 consists of a basalt cobble and boulder filled crevice within a natural bedrock outcrop (see Photograph Appendix, Figure 36). An auger hole (#1) was excavated on the west side of Feature 15 which revealed small pieces of opaque sheet plastic at a depth of 0-15 cmbs. The material may be related to historic pineapple or truck crop agriculture. Therefore, Features 13-15 were likely used for historic agriculture or clearing.
- 5) Features 22-25 consists of a cluster of rock clearing mounds within the upper elevation area, 25 meters east-northeast of Feature 16's northern extent (Figure 10). No test units were conducted. The rock mounds all appeared to be agricultural clearing piles, likely constructed by European settlers in the early 1900s. Features 22 and 23 were better constructed mounds/platforms (see Photograph Appendix, Figure 37). Feature 23 displayed facing on its western side. No cultural material was observed.

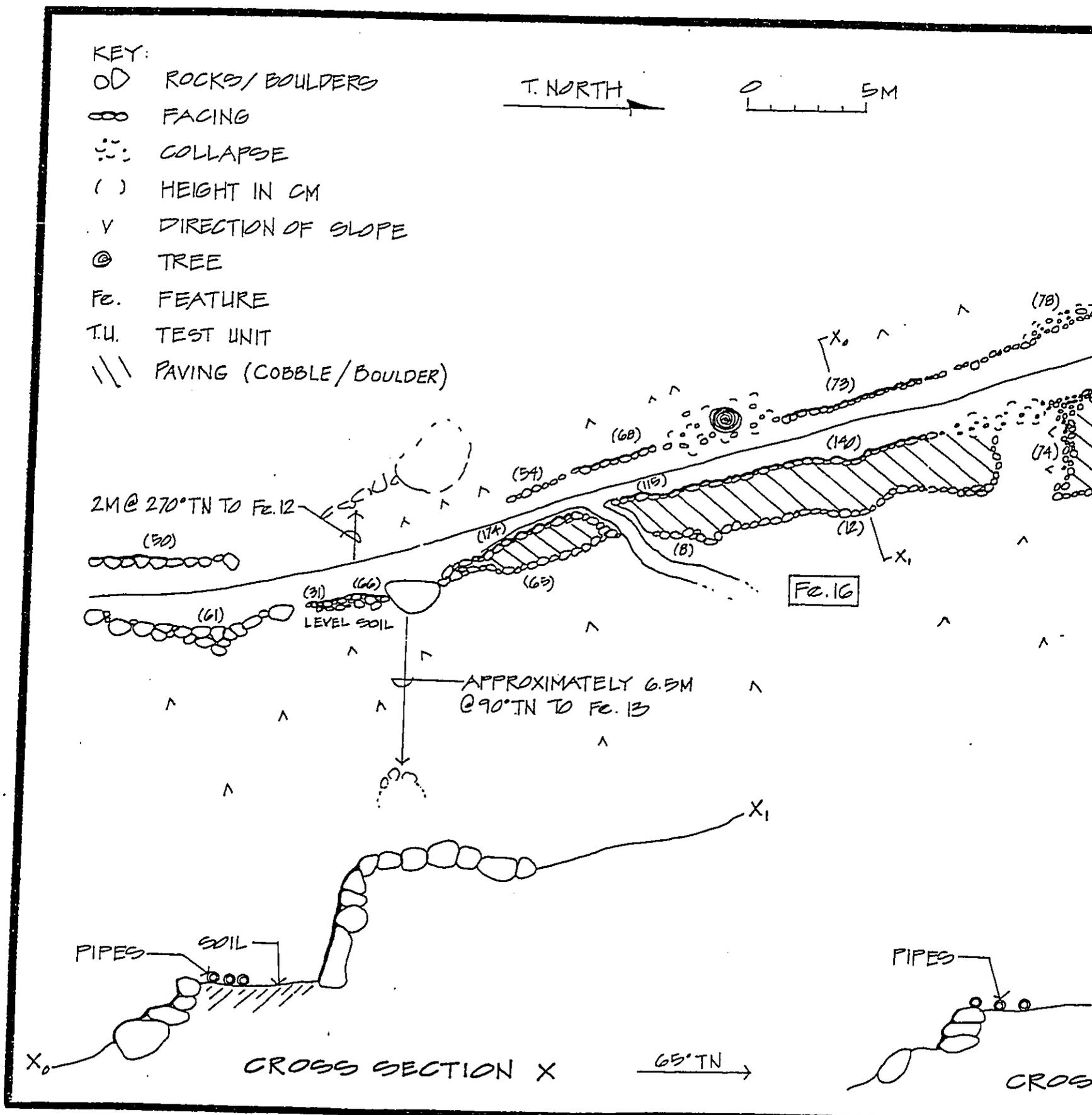
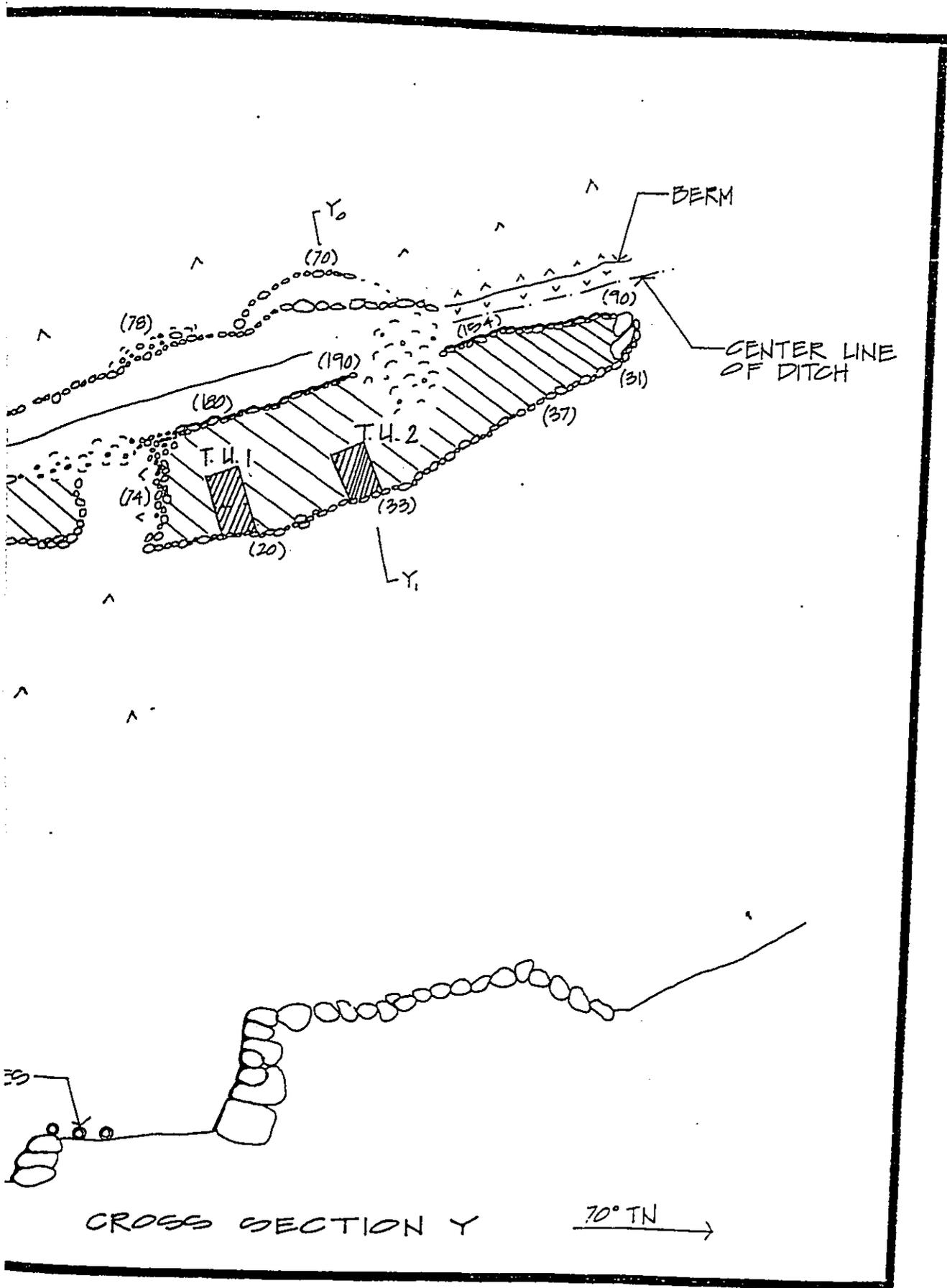


Figure 8 Map of State Site 50-30-10-406 Showing Multi-Tiered Terrace, Feature 16, Test Units, and Cross Sections.



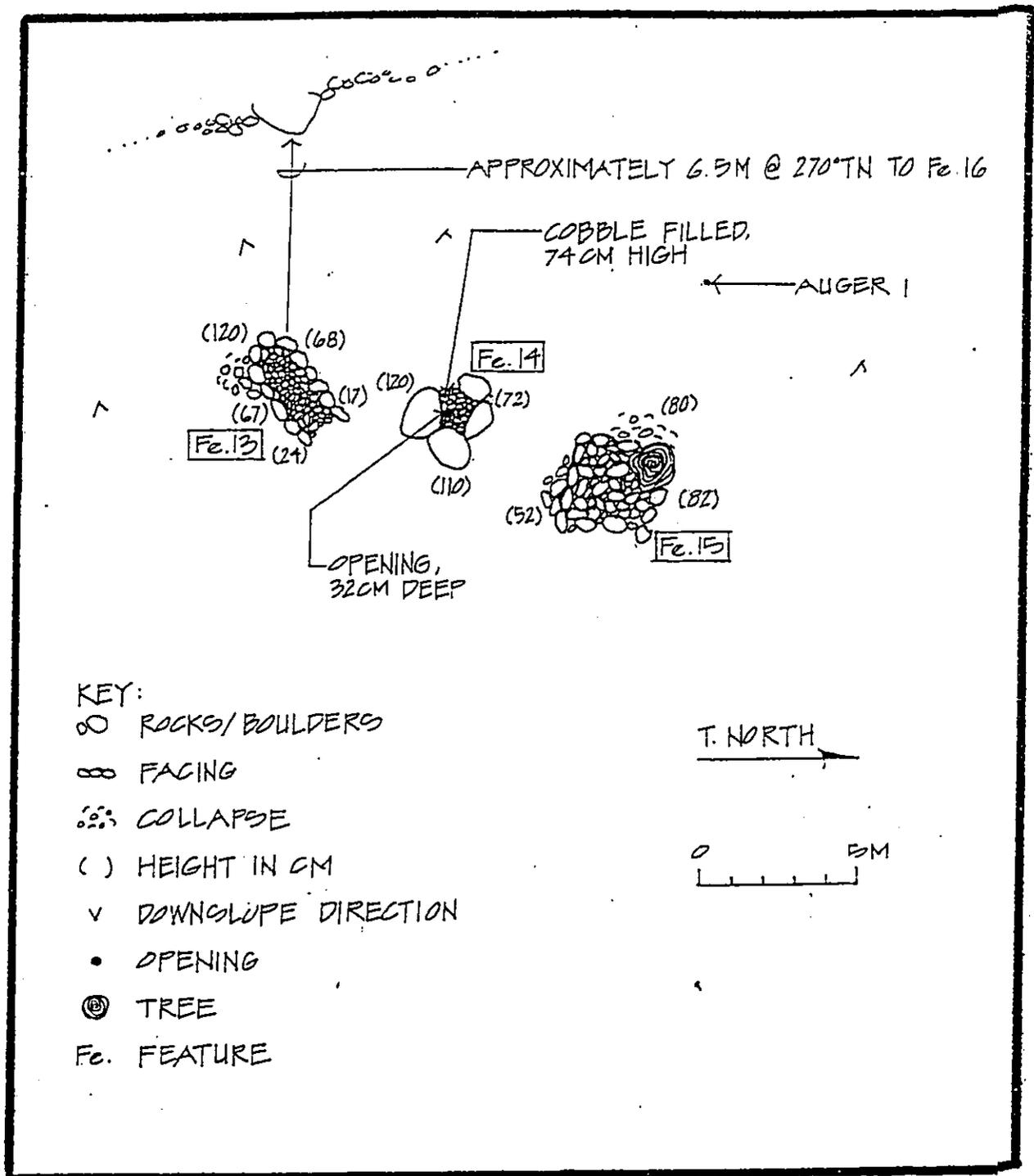


Figure 9 Map of State Site 50-30-10-406 Showing Mounds and Filled Crevice, Features 13, 14, and 15.

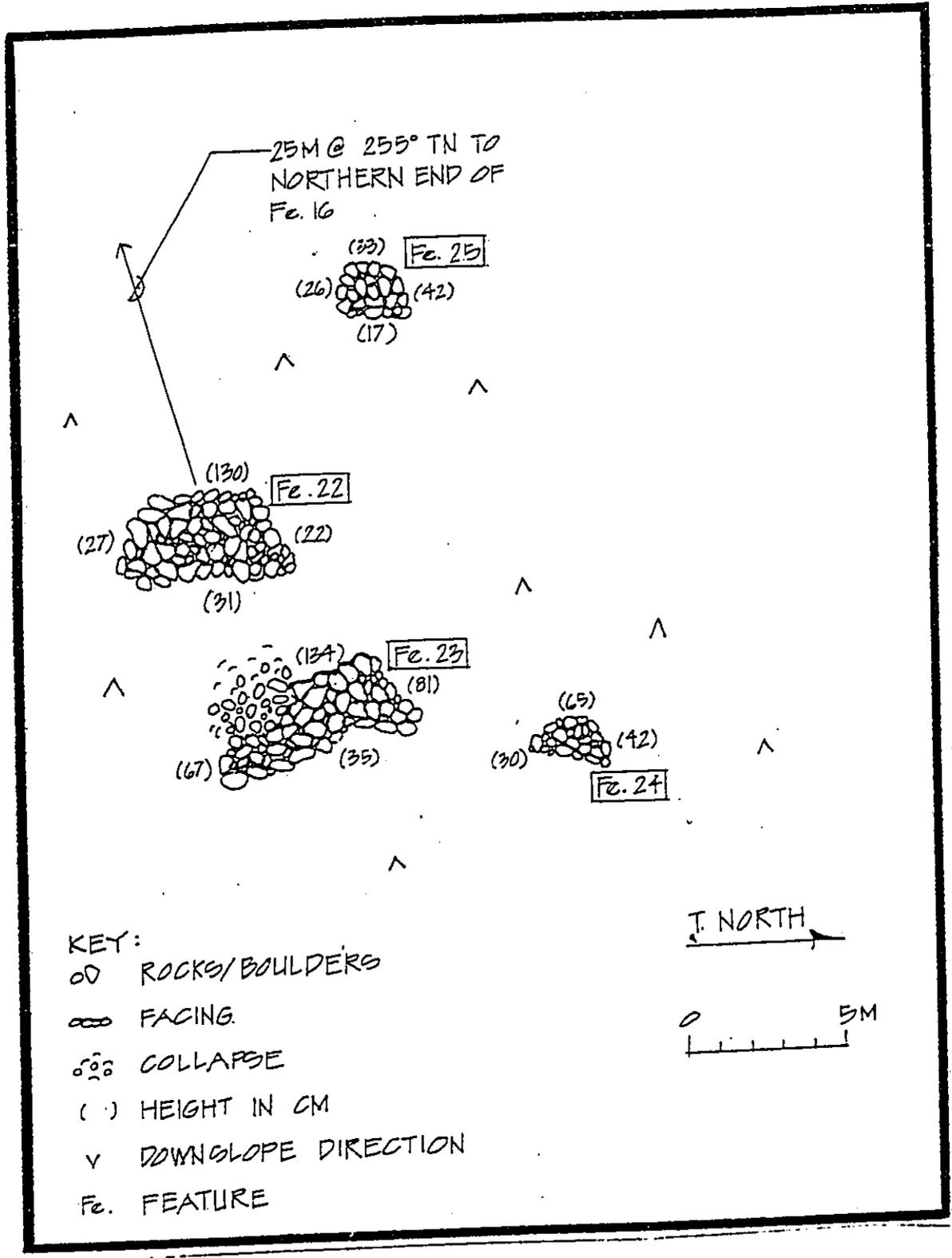


Figure 10 Map of State Site 50-30-10-406 Showing Boulder Clearing Mounds and Platforms, Features 22, 23, 24 and 25.

- 6) Feature 26 consists of a historic terrace retaining wall located on the west side of the functioning 17 cm diameter iron water pipe which transects the project area (Figure 11). The terrace measures 31 meters long in an NE/SW alignment. The terrace is in poor condition and truncated in several places (see Photograph Appendix, Figure 38). No test units were conducted. Due to crude, informal construction techniques this feature is likely historic and functions to minimize erosion to drainage canal. No artifacts or cultural material was observed.
- 7) State Site 50-30-10-485 consists of a single water dike feature located on the north end of the project area, west of site -406 (Figure 12). The historic water dike consists of a 7.6 meter long dike shaped slightly concave to the flow of the water. The max width of the feature is 2.7 meters and is faced on the down-flow side of the feature. The northeast, or up-flow, side consists of a 3.5 meter long, straight, single course of subangular basalt boulders. The faced side consists of subangular basalt boulders stacked 1-2 courses high. The up-slope side of the feature is concave-shaped to form a small pool, although it is currently filled in with accumulated sediment and organic refuse. A low 80-100 cm high berm extends off of the terminus of the dike further constricting the flow of water. The area surrounding site -485 is heavily vegetated with guava, eucalyptus, swamp mahogany, and young Norfolk pines.

No artifacts, either historic or prehistoric were observed in association with the feature. Based on observations it is likely that the feature is historic. This determination is based on the conditions within the natural drainage. During heavy rains, this drainage is undoubtedly very active. It seems unlikely that this water diversion feature, located at the base of the drainage, would have survived hundreds of years of periodic flooding. Although it cannot be conclusively documented based on the available evidence, site -485 is believed to be related to water collection for historic commercial agriculture.

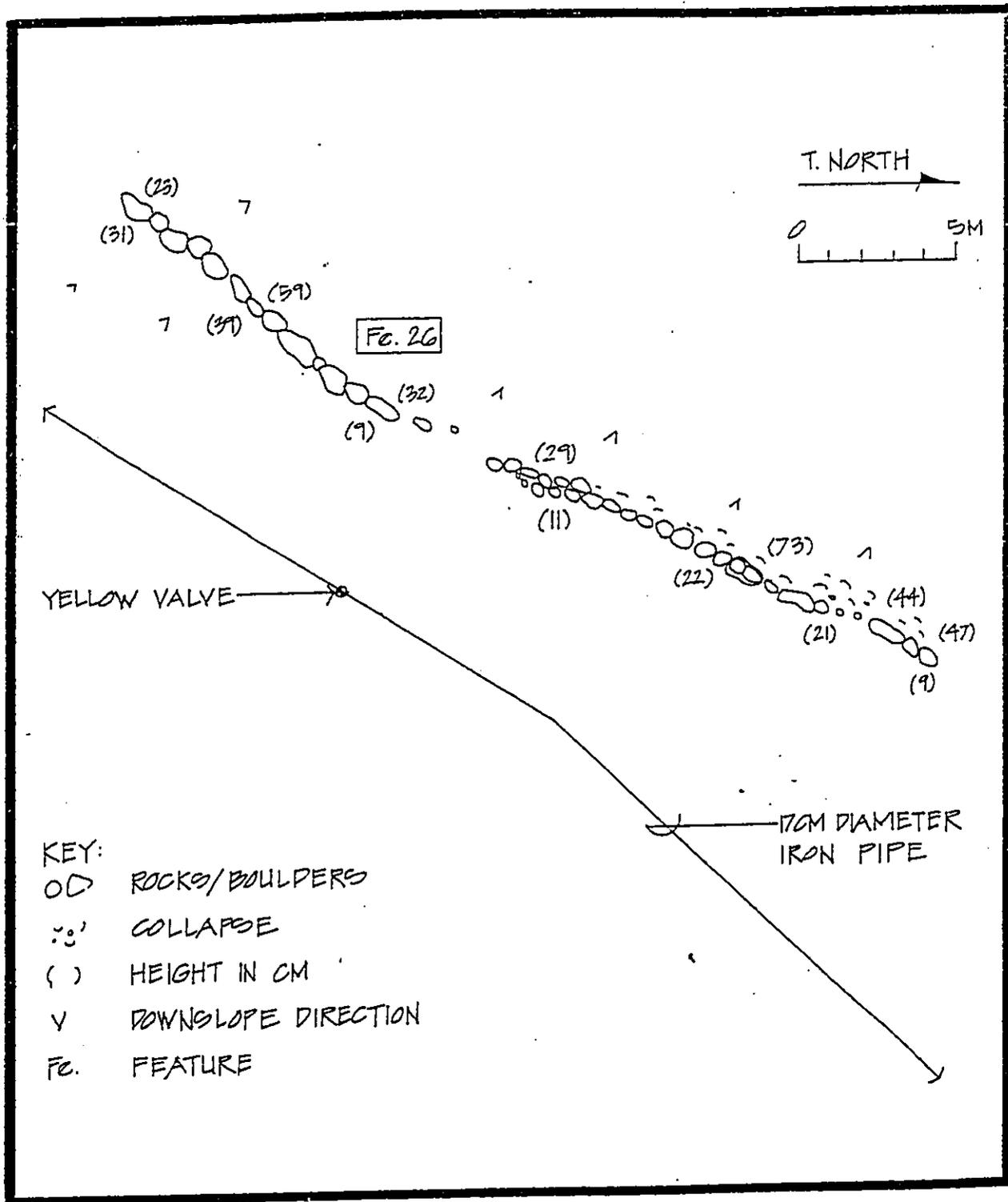


Figure.11 Map of State Site 50-30-10-406 Showing Agricultural Terrace, Feature 26.

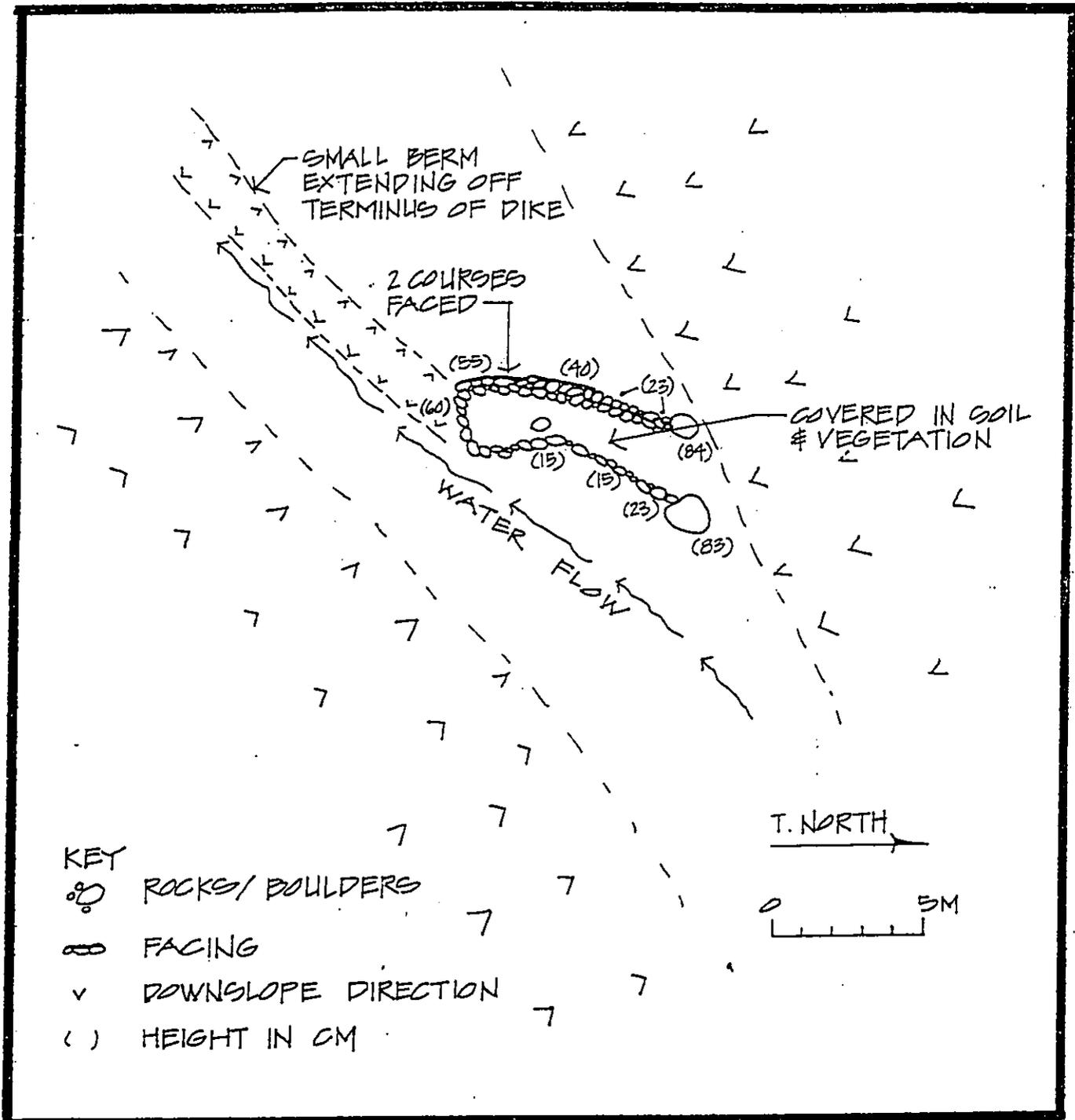


Figure 12 Map of State Site 50-30-10-485 Showing Agricultural Water Dike and Surrounding Topography.

Table 2: Summary of Sites 50-30-10-406 and -485

1	Platform	Horse burial platform	2.5 m NE/SW by 2.8 m NW/SE	89 cm	Platform filled with naturally rounded basalt cobbles.				
2	Platform	Clearing	2.4 m N/S by 3.2 m E/W	106 cm	Similar in construction style to Feature 1				
3	Enclosure	Agricultural	3 m N/S by 2.4 m E/W	30 cm	Single course, semi-circular alignment, just south of Feature 2				
4	Terrace	Agricultural	12.1 m long N/S 1.7 m max width	65 cm	1-2 courses; base is modified bedrock				
5	Terrace	Agricultural	6.2 m long N/S 1.75 m max width	52 cm	Modified bedrock terrace with gaps filled in with basalt cobbles				
6	Terrace	Agricultural	2.8 m long N/S 80 cm wide	97 cm	Base consists of bedrock outcrop; 2-3 courses constructed atop bedrock				
7	Mound	Agricultural	3.1 m N/S by 2.15 m E/W	1.4 m	Base consists of modified bedrock with 1-3 course boulder perimeter; interior filled with basalt cobbles				
8	Terrace	Agricultural	8.4 m N/S by 4.8 m E/W	1.42 m	Consists of a natural terrace; gaps filled in with basalt cobbles				
9	Terrace	Agricultural	9.6 m N/S by 75 cm wide	1.2 m	2-5 courses high with large basalt outcrop at southern end; construction style is not uniform (mixture of cobbles and boulders); south half of terrace wall is faced; middle section is partially collapsed				

Feature ID	Feature Type	Context	Dimensions	Height	Description
10	Terrace	Agriculture	13.7 m N/S by 1.4 m wide	1.3 m	1-4 courses high; follows natural contour of slope
11	Terrace	Agriculture	8.3 m N/S by 65 cm wide	75 cm	1-2 courses high; southern end connects with southern end of Feature 10; north end connects to north end of Feature 12; terrace in poor condition
12	Terrace	Agriculture	9.1 m long N/S	80 cm	1-2 courses high; eastern (rear) extent of terrace is bounded by natural terrace wall; northern extent of rear wall meets large outcrop; small mound at north end of lower wall
13	Mound	Indeterminate	2 m NW/SE by 4.2 m NE/SW	1.2 m	Boulder mound atop bedrock outcrop on SW end; 4 courses high of rounded to subangular basalt boulders; interior filled with basalt cobbles; WSW end is partially collapsed
14	Filled crevice	Indeterminate	90 cm N/S by 1.8 m E/W	1.2 m	Cobble and boulder filled natural crevice between naturally occurring boulders
15	Mound	Clearing	4.2 m N/S by 3.3 m E/W	82 cm	1-3 courses high; roughly rectangular with collapse at west and SE walls; interior is cobble filled
16	Terrace	Indeterminate	58.5 m N/S by 4.3 m max width	1.8 m	Two tiered; Upper tier consists of 3-9 courses of basalt boulders and cobbles; collapse has occurred in several places; width varies depending on slope; wall is faced where collapse has not occurred; Lower tier is 1-3 courses high; has three pipes running on top; northern end turns into ditch to keep pipes level with slope

Feature ID	Type	Function	Dimensions	Orientation	Material	Description
17	Terrace/ Enclosure	Agriculture / Temporary habitation	12.6 NW/SE	111 cm		Terrace is 3-4 courses, core filled and is 6.1 m long; rectangular enclosure at north end measures 5.2 m N/S by 3.2 m E/W and is partially collapsed
18	Terrace	Agriculture	10 m - "J" shaped	90 cm		"J" shaped terrace with boulder mound attached in center of terrace wall; wall comprised of 2-3 courses; mound is 3-5 courses
19	Terrace	Agriculture	8.8 m N/S; extends an additional 4.3 m to the NW	83 cm		Crudely constructed; 1-4 courses with several large boulders; NW extension follows contour of slope; pig scapula and tibia observed on NW end (modern)
20	Mound	Clearing	4 m NW/SE by 2 m NE/SW	98 cm		C-Shaped mound; crude construction; mix of boulders and cobbles
21	Mound	Clearing	3.2 m NW/SE by 2.3 m NE/SW	77 cm		Built atop bedrock outcrop; 3-5 courses high; mix of boulders and cobbles
22	Mound/ Platform	Clearing	5.6 m N/S by 2.7 m E/W	1.3 m		2-6 courses; mix of cobbles and boulders; located on steep slope
23	Mound/ Platform	Clearing	6.8 m N/S by 2.5 m E/W	1.34 m		3-7 courses; mix of cobbles and boulders; located on steep slope
24	Mound	Clearing	2.6 m N/S by 1.4 m E/W	65 cm		1-3 courses; crude pile; mix of cobbles and boulders
25	Mound	Clearing	2.4 m N/S by 1.8 m E/W	42 cm		1-3 courses; crude pile; mix of cobbles and boulders

26	Terrace	Agriculture	31 m NE/SW	73 cm	Long, 1-2 stones wide; follows contour of slope; truncated in several places; located just NE of functioning pipeline
Site 50-30-10-485	Water Dike	Agriculture	7.6 m N/S by 2.7 m E/W	84 cm	1-2 courses; slightly concave shape to form a small pool; W side is faced with subangular basalt boulders; an 80-100 cm high berm extends off the SW terminus of the dike further constricting the water flow

VI. EXCAVATION RESULTS

Excavations were undertaken to add to the information obtained from surface survey, historic literature search, and oral interviews. Excavations were carried out to better determine the age of construction and function of the many features that make up site -406. The test unit locations are shown on their corresponding feature plan-views.

Four hand excavations, totaling 7.9 m², were made within three different boulder and cobble constructed features. The different feature types tested included a rectangular platform (Feature 1), a terrace retaining wall (Feature 17), and the large multi-tiered terrace (Feature 16). Excavation was by natural stratigraphic levels. Hand excavation recording procedures followed standard archaeological practices. Photographs, written sediment descriptions, and drawn excavation profiles recorded the excavation stratigraphy. All excavated sediment was screened through 1/8th inch mesh and recovered cultural materials were labeled with a specific provenience.

Four auger excavations were also made within soil areas between features. Auger excavations were placed to provide a rough transect through site -406. The purpose of the auger excavations was to evaluate the variability of stratigraphy across site -406 and to look for cultural material within the site. A 15 cm diameter rotary auger bucket was used in the excavations. All sediments removed were screened through 1/8th inch mesh. Excavation stratigraphy was documented.

A. Hand Excavations

Site -406, Feature 1 (Figures 6 and 13, Photograph Appendix Figures 19 and 20)
Test unit 1

- | | | |
|-------------|-------------|--|
| Stratum I | 0-45 cmbs* | Subangular basalt boulders and cobbles used to construct stacked stone features. This fine grained basalt material is remarkably dense and heavy. |
| Stratum II | 45-55 cmbs* | (Dry) 7.5YR 3/2 dark brown; slightly hard to hard; sandy loam; strong, coarse, granular structure; contains abundant roots and rootlets, is heavily organically enriched, a few fragments of large mammal bone that are most likely horse, many kukui-nut endocarps, one possible macadamia nut endocarp, small charcoal fragments, and opaque plastic; smooth/clear lower boundary; organically enriched O/A-horizon. |
| Stratum III | 55-75 cmbs* | (Dry) 7.5YR 3/4 dark brown; hard; sandy loam; strong to moderate, coarse, granular structure; contains abundant roots and rootlets and at least the partial skull of a horse, including teeth, some charcoal fragments, no other cultural material observed; A/B-horizon. |

*Depths are below platform surface

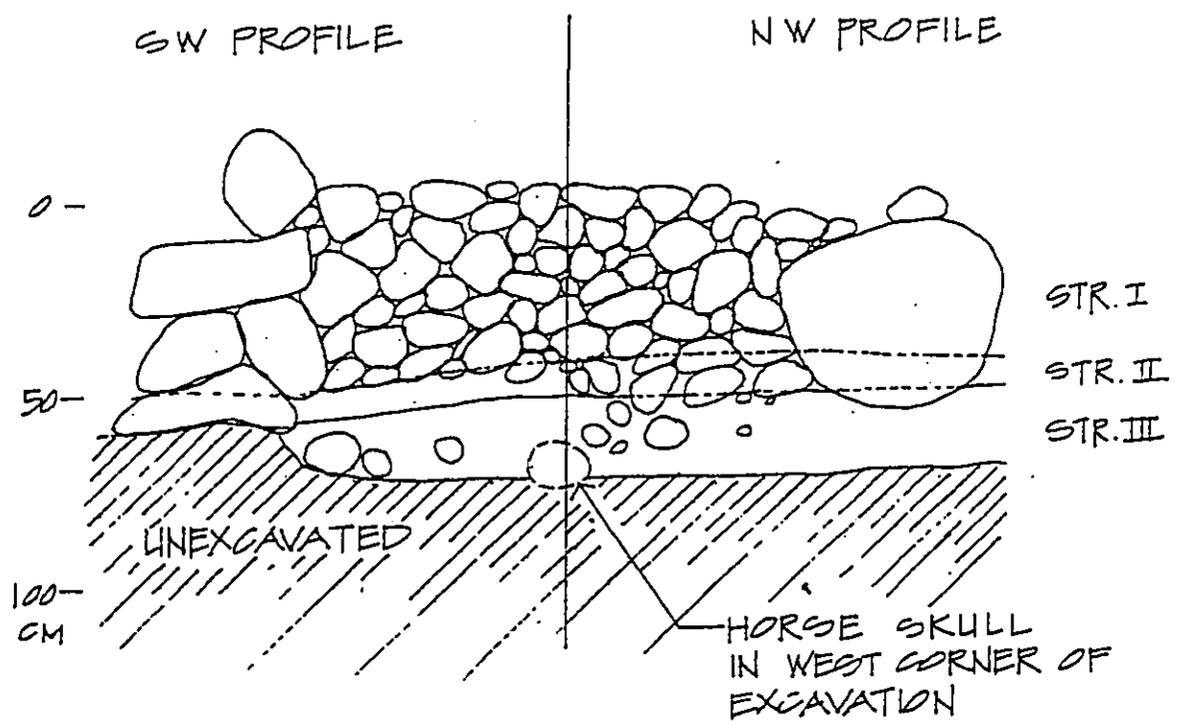


Figure 13 Southwest and Northwest Profile of Site -406 Feature 1, Unit 1, Post-Excavation.

Test unit 1 (1 by 1 m) was excavated in the eastern corner of the Feature 1 platform. Feature 1 is a well constructed, roughly rectangular, platform consisting of a perimeter of large basalt boulders, 2-4 courses high, with an interior fill of smaller boulders and cobbles. The platform has the appearance of a traditional Hawaiian burial feature, but may also have been constructed for agricultural land clearance. Based on surface observations, the age of construction for the platform was not apparent. No artifacts or midden were visible on the platform surface, or in the immediate vicinity. Test unit 1 was excavated to better determine the function of the mound, its age of construction, and to investigate the mound's stratigraphic relationship to the surrounding land surface.

Stratum I is the basalt boulder and cobble construction material of the platform itself. This basalt material is subangular, dense, fine-grained, and remarkably heavy. The cliff face immediately up slope of site -406 is a large exposure of this same type of basalt. As this layer of basalt was removed the "core-filled" construction style of the platform became more apparent. In the excavation profiles the perimeter of larger boulders with the fill of smaller boulders and cobbles is clear. In between the cobbles and boulders were abundant, black-stained, clearly rat-chewed, kukui-nut endocarps. There was also a mix of decomposing organic material comprised predominantly of leaves. No artifacts or midden were recovered from Stratum I.

Stratum II is a relatively thin (10 cm thick) layer of sediment that has become heavily organically enriched from plant material that has filtered down through the platform surface. This sandy loam is the modern O/A-horizon that has developed subsequent to the platform construction. Stratum II is clearly historic and contains plastic and bone material from a historically introduced large mammal (most likely horse). It may also contain the endocarp of the historically introduced *Macadamia* nut. No traditional Hawaiian cultural material were observed in this stratum.

The upper boundary of Stratum III is the former land surface prior to the construction of the platform. It is an A/B horizon--very similar to the stratigraphy observed in the auger excavations that were done throughout site -406. The boulders and cobbles that make up the feature construction all rest directly on top of this upper boundary of Stratum III. The remains of a horse, including skull fragments and teeth, as well as other unidentifiable bone fragments, were found in the west corner of the excavation at a depth of 60-75 cms. This is directly beneath the center of the platform. The bone was poorly preserved. This is an indication that Stratum III is at least slightly acidic. A few small charcoal fragments were also found in Stratum III.

Based on excavation results, platform Feature 1 of site -406 is clearly an historic construction. The horse skull that was found in Stratum III beneath the center of the platform is unequivocal evidence. The basalt boulders and cobbles that make up the platform construction rest directly on the current land surface--represented by the boundary of Strata II and III. This indicates the structure is fairly recent in age, as there has been no accumulation of alluvial sediments along the upslope side of the feature. Considering the fairly steep relief immediately upslope from the feature, it is rather remarkable that more alluviation has not occurred along the upslope side of the structure.

This may be an indication of the recent construction of the feature. Or it could be that the steep slope is stable and is not actively eroding.

The excavation was terminated with the exposure of the horse skull and the clear indication that the platform structure rests directly on the current land surface. Stratum II contained opaque sheet plastic fragments that may have been used in pineapple or truck crop agriculture. The testimony of numerous local residence confirm that pineapple and truck crops were grown in this area. Based on this evidence and the construction style of the feature, it is more likely that the platform is an agricultural clearing feature related to historic truck crops. It most likely dates to the homesteading period after the turn of the 20th century. It could date as recently as the 1940s or 1950s.

Site -406. Feature 16 (Figures 8, 14 and 15, Photograph Appendix Figures 33 and 34)
Test units 1 and 2

Stratum I	see profile	Subangular basalt boulders and cobbles used to construct stacked stone features. This fine grained basalt material is remarkably dense and heavy.
Stratum II	see profile	(Dry) 7.5YR 3/2 dark brown; slightly hard; sandy loam; strong, coarse, granular structure; contains abundant roots and rootlets, many kukui-nut endocarps, and is heavily organically enriched; Wavy/Clear lower boundary; organically enriched O/A-horizon.

Feature 16 of site -406 is a massive multi-tiered terrace located up-slope from most of the features that make up the site. Feature 16 represents a substantial labor investment. The large boulders that make up most of the feature construction are very dense and heavy and are skillfully stacked. The terrace's largest tier has a well constructed vertical face measuring between 1 and 1.9 m in height. The boulders on the surface of the structure are moss covered and show no scarring or other marks from mechanical earth moving equipment or chain dragging. Based on this evidence, the boulder and cobble construction material appears to have been collected and placed by hand.

The age and function of the terrace was not readily apparent based on surface observations. The feature's large size, general morphology, construction style, and setting with a broad view plain adjacent to a natural spring, are all consistent with the feature being a traditional Hawaiian religious structure (*heiau*). However, these are merely circumstantial indications. The feature may also have been a historic construction related to homesteading agriculture, although it is unclear why such a massive stacked stone structure would be constructed on this relatively steep slope. The sheer size and location on the steep slope are indications that the terrace did not serve as a clearing mound or loading platform, two common functions for stacked stone features related to historic agricultural pursuits. Oral testimony from long time Kalāheo residents is, however, more indicative that the structure is indeed related to historic agriculture. No specific recollections for this large terrace were available. However, interviewees pointed out that they did have stories

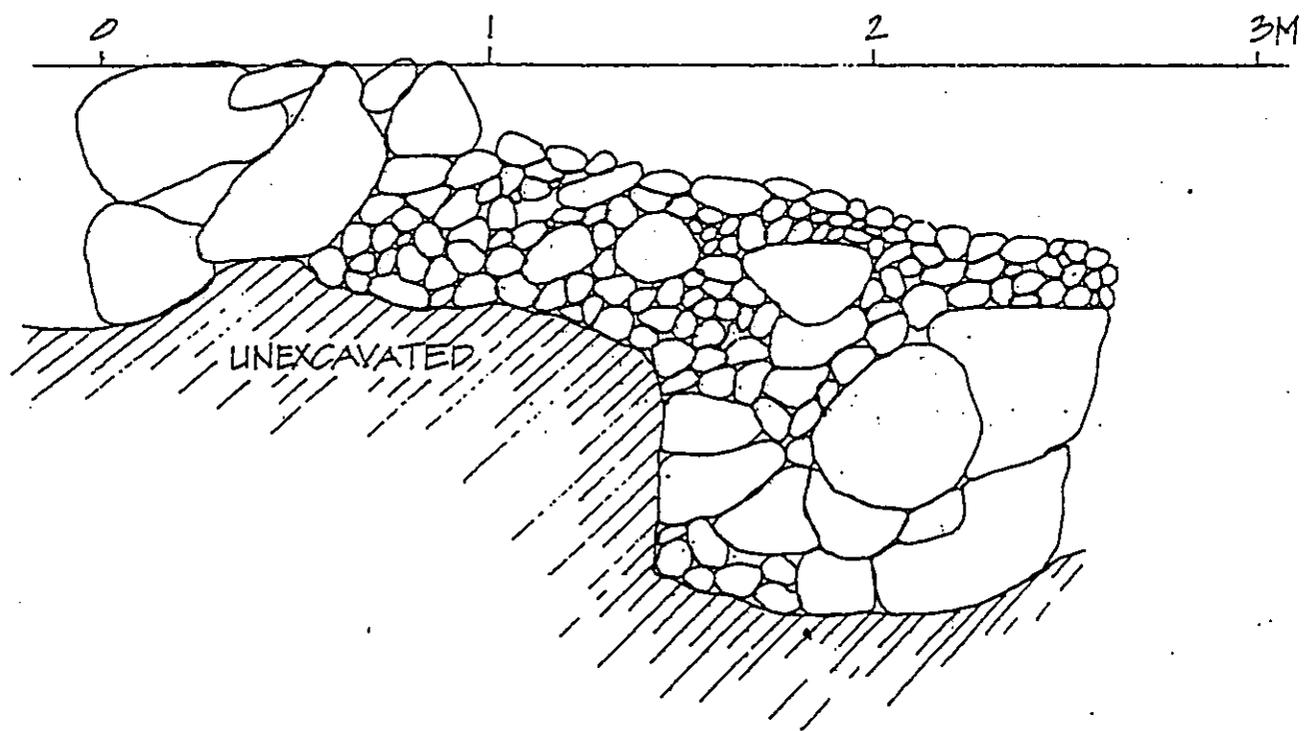


Figure 14 South Wall Profile of Site -406, Feature 16, Test Unit 1.

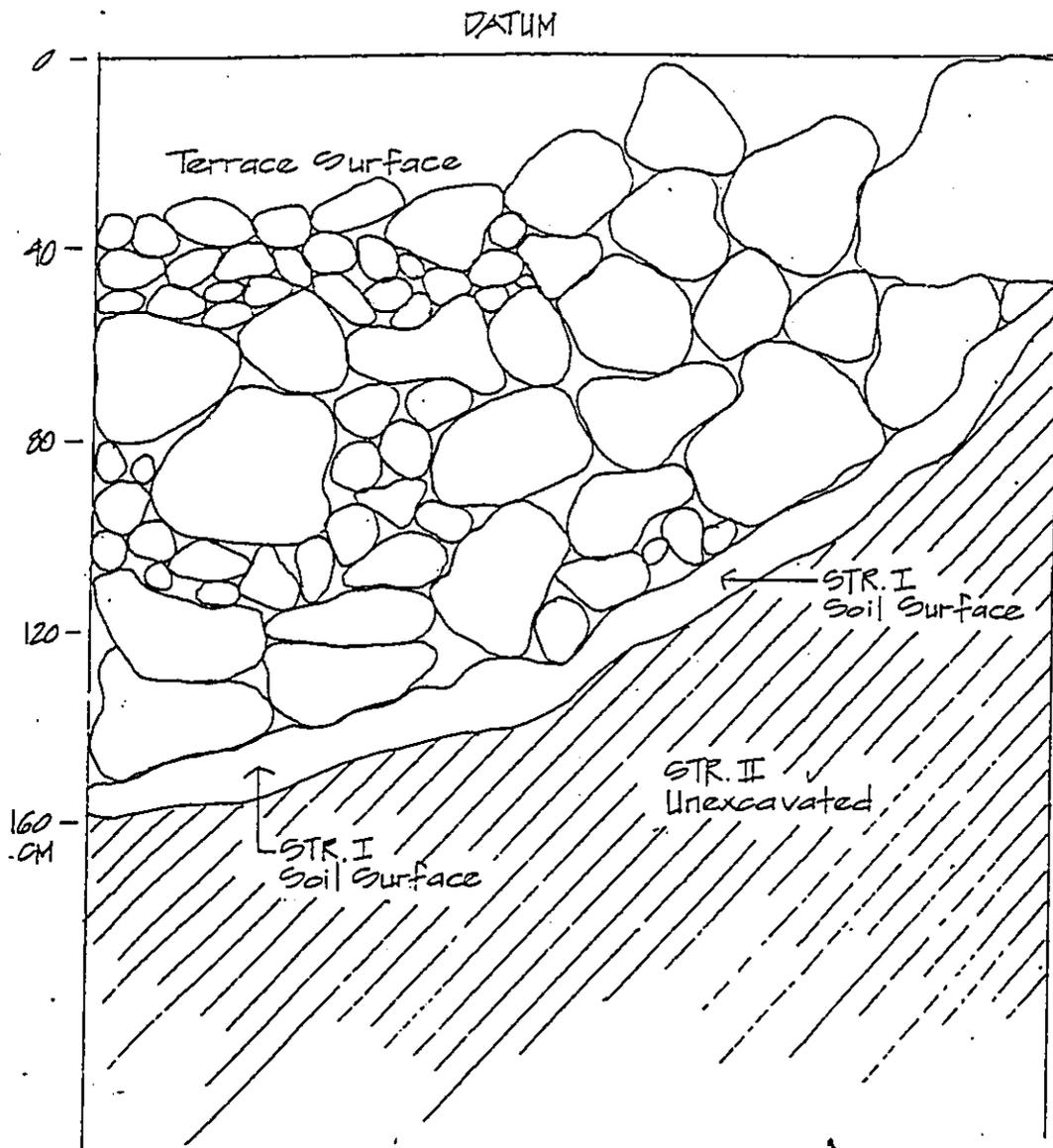


Figure 15 North Wall Profile of Site -406, Feature 16, Test Unit 2.

and information related to other traditional Hawaiian sites in the vicinity. Yet, they had no information for Site -406. Considering the large size of Feature 16, it would seem more likely that if it was a traditional Hawaiian religious structure, there would be some information that would have survived. The information available for the general vicinity of site -406 indicated that the area was used for pineapple and truck crop agriculture by first Spanish, then Portuguese homesteaders. This historic land use began at approximately 1900.

Test units 1 and 2 were excavated into the up-slope side of Feature 16 in order to better determine the age and function of the large terrace structure. These two excavations were conducted to better understand the cultural deposits associated with the structure. They were also made to assess the stratigraphic relationship between the terrace construction and the surrounding land surface. Test unit 1 consisted of a 2.6 by 1.3 m excavation that reached a maximum depth of 145 cm below the platform surface. Figure 14 is the southern profile of test unit 1. Test unit 2 was excavated to the north of test unit 1 and consisted of a 2.0 by 1.25 m excavation that reached a maximum depth of 160 cm below the platform surface. Figure 15 is the northern profile of test unit 2. The stratigraphy and excavation results from these two excavations are similar and will be discussed together.

Stratum I consists of the boulders and cobbles that make up the terrace construction. This basalt is remarkably heavy, but locally plentiful from the surrounding ground surface and the pronounced basalt outcrop immediately up-slope from Feature 16. Based on the profiles of both test units 1 and 2 (Figures 14 and 15) it is apparent that large and medium sized boulders, along with cobbles were used in the platform construction. These boulders and cobbles were interlocked to create a stable construction. The large size of the boulders hampered the excavation of the test units; especially in test unit 2 where several large boulders were encountered that were nearly a meter in diameter and could not be removed. The sheer size and weight of these boulders further stress the labor investment represented by Feature 16. Numerous kukui-nut endocarps were found in the spaces between the boulders and cobbles. Nearly all were rat-chewed and there was no indication that they were the result of human activity. Decomposing leaves and other organic material were filtering down through Stratum I. No cultural material was found.

Stratum II consisted of the heavily organically enriched, sandy loam O/A horizon that is developing at the base of the terrace construction from material that is filtering down through the boulders and cobbles. This layer contained abundant rat-chewed kukui-nut endocarps and no cultural material.

Excavation in both test units 1 and 2 was halted by the exposure of large boulders that could not be removed from the excavation. Where possible, sediment was removed from between these boulders, however, this amounted to only a few tens of liters of sediment that could be screened. Based on available evidence it appears that both test units 1 and 2 did expose the former land surface on top of which Feature 16 was constructed. The original land surface is comprised of an irregular boulder and soil surface that slopes steeply to the southwest. The boulder and cobble terrace construction rests

directly on this former land surface. It is apparent from the profiles of test units 1 and 2 that, to create the relatively level surface of the Feature 16 terrace, a substantial amount of boulders and cobbles had to be collected and set in place.

That no cultural material whatsoever was found in either excavation is another indication of the historic construction of the terrace feature. A prehistoric construction of this size would usually be associated with some sort of cultural deposit, including charcoal, bone, marine shell, or lithic reduction debitage. Another indication of the more recent construction of the terrace is the apparent lack of sedimentation along the up-slope side of the structure. There is a fairly steep soil covered slope immediately up-slope from Feature 16. Over time, erosion from this slope is inevitable. However, in both test units 1 and 2 there is no indication of the accumulation of sediment along the up-slope portion of the feature, or within the lower courses of cobbles and boulders that were exposed. It is unlikely that this large structure could have existed at this site for centuries with no apparent sediment accumulation along its up-slope margins.

Site -406, Feature 17 (Figures 7 and 16)

Test unit 1

Stratum I	0-80 cmbs*	Subangular basalt boulders and cobbles used to construct stacked stone features. This fine grained basalt material is remarkably dense and heavy.
Stratum II	27-72 cmbs*	(Dry) 7.5YR 3/2 dark brown; slightly hard; sandy loam; weak to moderate, medium, granular structure; contains abundant roots and rootlets and an iron nail, is organically enriched; smooth/abrupt lower boundary; organically enriched A-horizon.
Stratum III	40-78 cmbs*	(Dry) 7.5YR 3/4 dark brown; slightly hard to hard; sandy loam; strong, coarse, granular structure; contains fairly abundant roots and rootlets, no cultural material observed; B-horizon.
Stratum IV	71-84 cmbs*	(Dry) 7.5YR 3/4 dark brown; hard; sandy loam; moderate, medium, granular structure; contains abundant roots and rootlets and no cultural material; C-horizon.

*Depths are below platform surface, see test unit profile.

Test unit 1 in Feature 17 was excavated to bisect the terrace retaining wall, to document the feature's construction style, and to search for cultural material associated with the feature. The excavation was intended to help establish the age of construction and function of the retaining wall. The retaining wall is constructed of stacked boulders three to five courses high on the up-slope side and two to six courses high on the down-slope side. The retaining wall clearly has a core-fill of cobbles, see Figure 16. Based on general morphology, the retaining wall appeared to be an agricultural retaining wall that

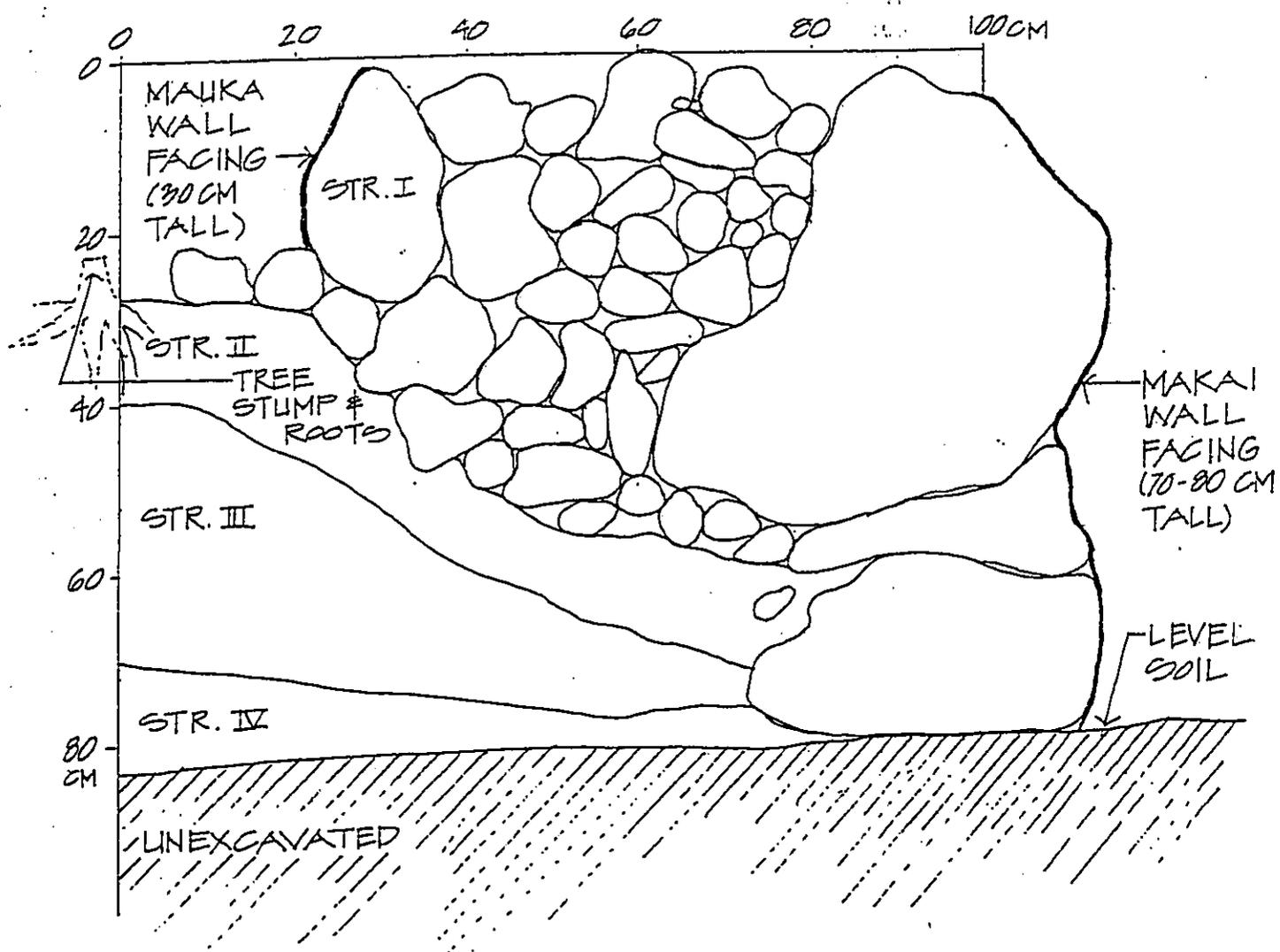


Figure 16 South Wall Profile of Site -406, Feature 17, Test Unit 1.

functioned for both land clearance and the retention of a relatively level soil area up-slope from the feature. Based on surface observations it was unclear whether the feature was prehistoric or historic in age. Oral testimony of long-time Kalāheo residents was more indicative that all the features of site -406 were related to historic agriculture.

The only cultural material recovered from the excavation consisted of an iron nail. This nail was found in Stratum II, the modern A-horizon, immediately up-slope of the retaining wall. This nail is bent almost in a "U"-shape, with the nail head almost touching the nail point. This is reminiscent of nails that have been used for fencing and that were driven part way into a post and then bent to hold up wire. The nail is most likely less than 100 years old. This historic artifact was found within the modern A-horizon that clearly underlays the terrace retaining wall construction. This indicates that the wall is a historic construction. The complete lack of associated traditional Hawaiian cultural remains, such as charcoal, bone, marine midden, or lithics, is another indication of the historic age of the feature. (However, it is possible to have traditional Hawaiian agricultural features that appear to contain no cultural deposits.) A further indication of the terrace's recent construction is the lack of accumulated sediment on the up-slope side of the terrace retaining wall. It is clear from the test unit profile that the terrace construction rests directly on the A-horizon with no sediment accumulation.

Based on the available evidence, the Feature 17 terrace retaining wall is most likely a historic agricultural feature. It functioned both as a retaining wall and as a repository location for boulders and cobbles collected during land clearance.

B. Auger Excavations

The stratigraphy observed in the four auger excavations was consistent in all tested areas. This was the same stratigraphy that was observed in test unit 1 of Feature 17:

Stratum I	0-8 cmbs	(Dry) 7.5YR 3/2 dark brown; slightly hard; sandy loam; weak to moderate, medium, granular structure; contains abundant roots and rootlets and is organically enriched; smooth/abrupt lower boundary; organically enriched A-horizon.
Stratum II	8-25 cmbs	(Dry) 7.5YR 3/4 dark brown; slightly hard to hard; sandy loam; strong, coarse, granular structure; contains fairly abundant roots and rootlets and some basalt cobbles, no cultural material observed; B-horizon.
Stratum III	below 25 cmbs	(Dry) 7.5YR 3/4 dark brown; hard; sandy loam; moderate, medium, granular structure; contains abundant roots and rootlets, basalt cobbles and boulders, and no cultural material; C-horizon.

Auger #1 was located between Features 15 and 16, see Figure 9. The only cultural material observed in the excavation consisted of small pieces of opaque sheet plastic,

similar to that observed in test unit 1 of Feature 1. Small amounts of this material was found between the surface and 15 cm below surface (Strata I and II). This material may be related to historic pineapple or truck crop agriculture. No evidence of traditional Hawaiian land use was observed. Auger #1 was terminated at a depth of 45 cmbs when the auger encountered a large basalt boulder.

Auger #2 was located downslope of Feature 16 within a relatively level soil area immediately up-slope of a terrace retaining wall, see Figure 7. No cultural material was observed in this excavation. Auger #2 was terminated at 25 cmbs when the auger encountered a large basalt boulder.

Auger #3 was located approximately 10 m south of Auger #2, immediately up-slope of the same terrace retaining wall, see Figure 7. No cultural material was observed in this excavation. Auger #3 reached a depth of 50 cmbs before the excavation was terminated by a large basalt boulder.

Auger #4 was located immediately downslope of the retaining wall that makes up Feature 17, see Figure 7. The stratigraphy observed was the same as in the previous three auger excavations. No cultural material was observed. The auger excavation reached a depth of 50 cmbs before encountering a large basalt boulder.

C. Summary of Excavation Results

The stacked stone construction style of the features of site -406 is similar to that of traditional Hawaiian stacked stone constructions. Furthermore, the size, general morphology, and geographic setting are all similar to native Hawaiian constructions. However, based on oral interviews and historic background information, it appears less likely that these features are indeed traditional Hawaiian. The current excavations were undertaken to gather further evidence regarding the age and function of these features.

The excavation results indicate that site -406 is a historic construction, most likely related to historic pineapple and truck crop agriculture. There are no subsurface indications of traditional Hawaiian land use within the features of the site. The stratigraphic relationship of the features to the modern land surface indicates the fairly recent construction of all the tested features.

This evidence, like that obtained from the historic background research and oral interviews, is not conclusive proof that the features of site -406 are historic in age. However, all available evidence combined makes a fairly strong argument for the historic construction of the site.

VII. SUMMARY AND INTERPRETATIONS

Two historic properties were identified during the inventory survey, sites 50-30-10-406 and 50-30-10-485. Site 50-30-10-406, is a concentration of 26 agricultural features, first described by McMahon (1988). Site 50-30-10-485, previously unrecorded, consists of one historic water diversion structure within a gulch in the northwestern portion of the project area. Based on historical evidence, informal interviews and excavation results, State Sites 50-30-10-406 and -485 are interpreted as historic agriculture features erected in the early 1900's by Spanish and/or Portuguese settlers.

The terraces are generally situated along the slope of Papapaholahola, following the natural contours of the hill. The terraces range from 52 cm to 1.8 m in height and tend to utilize the natural bedrock outcrops and/or large boulders which have naturally settled on the slope face. Based on oral interviews with long time residents of the Kalāheo area, the area in the vicinity of the project area was at one time a Portuguese/Spanish community which grew sugar cane, pineapple and various truck crops. Agricultural pursuits believed to have taken place in the project area appear to have utilized the natural terraces when available, with modifications carried out to further shore-up the bedrock walls for erosion protection. Terraces in which little or no exposed bedrock or boulders were available for a base course appeared to follow different construction styles. Feature 17, of Site -406, for example, was well constructed with boulder facing and cobble fill, which appeared to have been constructed in a traditional native Hawaiian construction technique. Many others, however, appear to have been constructed in a more haphazard and less formal style. These terraces, Features 4-6, 8-12, 18, 19, and 26 of Site -406, are generally a single stone width with no interior fill, and have suffered more collapse than the more substantially built terrace walls.

Feature 16 is the largest, most substantial feature of site -406. It consists of a well-constructed multi-tiered terrace retaining wall with a paved platform surface on the uppermost tier. Three water pipes run along the narrow, level terrace of the down-slope tier. The terrace walls run perpendicular to the slope of Papapaholahola Hill. Feature 16 represents a substantial labor investment. The terrace's dimensions are 58.5 m N/S by 4.3 m maximum width.

Determining a function for this structure requires a careful weighing of all the available evidence. In Hawaiian archaeology, terraces of this size have sometimes been given the functional designation as a religious structure (*heiau*) or an agricultural feature. These most probable functional designations were weighed against the available evidence and are described below.

The structure was not considered a *heiau* based on the available evidence and previous archaeological reports. The construction technique and size of the structure may suggest a religious structure function, although physical characteristics of *heiau* are imprecise and variable. Valeri writes in his synthesis of ethnohistorical data regarding traditional ritual and society in ancient Hawai'i:

The word *heiau* or *haiau* designated any place of worship and thus the places where sacrifices are offered. The second form, *haiau*, shows more clearly than the first that they both derive from the word *hai*, "a sacrifice," "to sacrifice" . . . The temple is the place of sacrifice, in short. It is therefore defined by its function, not its material aspect (Valeri 1985:173).

Based on this definition, the physical remains of a *heiau* could take many forms. From ethnographic sources we know that *heiau* can consist of little or no structural components. Stone outcrops, flat stretches of land, and caves served as *heiau* (Valeri 1985; Bennett 1930:3). More commonly, *heiau* consisted of stacked stone constructions, enclosures, platforms, terraces and a combination of these three basic forms (Bennett 1930: Chapter 1; Stokes and Dye 1991:21). McAllister states:

Classifying the heiaus remaining on Oahu into types is an arbitrary and unsatisfactory procedure. Not only are there too few of these structures, but no two heiaus, furthermore, are alike. They may be classified generally as walled structures, . . . terraced structures, . . . and terraced and walled structures (McAllister 1933:9).

When first identified, Feature 16 of Site -406, was described by McMahon (1988) as a possible remnant of Kakaianahoa or Kahalekii *heiau*, both of which were described by Thomas Thrum in 1906 as having been destroyed. Kahalekii *heiau* was located on the western slope of Kukuilono hill which is approximately 1.5 miles south of the current project area. The location of Kakaianahoa *heiau* was not recorded by Thrum.

The feature's large size, general morphology, construction style, and setting with a broad plain view adjacent to a natural spring, are all consistent with the feature being a traditional Hawaiian religious structure. However, these are merely circumstantial indications. Although Feature 16 may fit the physical characteristics of a *heiau*, no other evidence was found to substantiate this position. CSH determined that Feature 16 is not a *heiau* based on the following three things: 1) lack of subsurface evidence, i.e. midden, artifacts, cultural remains; 2) lack of sediment accumulation on the up-slope side of the structure; and 3) local informant interviews.

- 1) The two test units yielded naturally deposited decomposing leaves and kukui nut endocarps. That no cultural material whatsoever was encountered in either excavation is more indicative of the historic construction of the terrace feature. A prehistoric construction of this size would likely be associated with some sort of cultural deposit, including charcoal, bone, marine shell, or lithic reduction debitage.
- 2) Another indication of the relatively recent construction of the terrace is the apparent lack of sediment accumulation along the up-slope side of the feature. There is a fairly steep soil covered slope immediately up-slope from Feature 16. Over time, erosion from this slope is inevitable. However, in both test units 1 and 2, there was no indication of sediment accumulation along the up-slope portion of the feature, or within the lower courses of cobbles and boulders that were exposed. It is

very unlikely that this large structure could have existed at this site for centuries with no apparent sediment accumulation within or along its up-slope margins.

- 3) The local Kalāheo residents interviewed had no discrete knowledge of this particular feature. The general consensus was that the Spanish and later Portuguese settlers built the features which comprise site -406 in the early 1900s. Lorraine Moniz, 75 years old, says that she doesn't remember any Hawaiians living in Kalāheo, much less the current project area; Hawaiians generally lived in Wahiawa, just west of Kalāheo. Sharon Villanida thinks the large platform/wall was built by the early farmers who first lived in the area or the military during the war.

Based on these three criteria, there is no clear evidence which suggests that Feature 16 is a traditional Hawaiian religious structure (*heiau*). The feature may have been related to homesteading agriculture, although it is unclear why such a massive stacked stone structure would be constructed on this relatively steep slope. The sheer size and location on the steep slope are indications that the terrace did not serve as a clearing mound, a common function for stacked stone features related to historical agriculture pursuits. Another common function of a stacked stone structure of the same magnitude of Feature 16 is a ramp type of structure used for loading pineapple crops. According to local informants, pineapple was one of the agricultural endeavors by early homesteaders. In *Sites of Oahu*, Sterling and Summers (1978: 96-97) describe a "modern hōlua slide" at Kaena Point. In actuality, the "slide" was a historic agricultural feature

built only about ten years ago or so previously by a group of pineapple people in order to get some tractors on to the plateau above.... The slide then is modern and so far as it goes would serve splendidly as a model of the stone-built slide such as was made on rocky lands. It was laid up with lava blocks to a width of 10 to 12 feet and like a railroad bed, but on a grade twice as steep as Wilhelmina Rise. Ioane, S. As told to J. F. G. Stokes, *Pana* Waialua, Honolulu Advertiser, Feb. 12, 1933.

Therefore, there are historical explanations for large boulder structures which appear to be traditional Hawaiian features. For example, it is documented that the McBryde Sugar Plantation, which extended into properties just south of the current project area, was "plagued with rocky soil" and consequently adhered to the common practice of piling rocks in the fields and then using them to "fill in under rail trestles, culverts and the like" (Condé and Best 1973:192). According to local informant, Sharon Villanida, the rock piles close to the eastern extent of the project area were cleared and stacked by family members in the first half of the 20th century.

The nine boulder mounds identified within the project area were generally considered to be agricultural clearing mounds rather than mounds constructed for the purpose of burials or cultivating plants. Features 22-25 of Site -406 are located in the northeastern portion of the site and are quite removed from the main concentration of terrace features. The mounds were generally neatly stacked, most likely for maximizing the viable land.

One filled crevice, Feature 14 of Site -406, was identified during the inventory survey. Feature 14 consisted of cobbles and boulders filled between four large *in situ* boulders. The purpose was likely to level the ground surface for easier access, possibly by the early homestead farmers.

Site 50-30-10-485 consists of a water diversion structure at the base of the gulch, east of site -406. This semi-circular structure was built extending from the east side of the gulch and extends approximately half way across the natural drainage channel. Water flowing into the drainage would have pooled up slope of this feature and been diverted into the ditch.

It is difficult to determine the age of Site -485, although it is likely associated with the other historic agricultural features to the southeast. No artifacts were observed, either historic or prehistoric in the vicinity of the feature. Based on observations, it is more likely that this feature is historic. This determination is based on the conditions within the natural drainage. During heavy rains, this drainage is undoubtedly very active. It seems unlikely that this water diversion feature, located at the base of the drainage, would have survived hundreds of years of periodic flooding. Therefore this feature is believed to be related to water collection for historic commercial agriculture.

In summary, there are many functional possibilities for Site -406, but the site is most likely associated with historic agricultural practices of the early 1900s. Feature 16, of Site -406 has physical characteristics of a traditional Hawaiian structure, but our analysis points to a historic rather than prehistoric construction date. This conclusion is based on field observations, test excavations, comparisons to other similar feature types and their functions, and local informant interviews.

VIII. SIGNIFICANCE

A total of two sites are present in the project area (Table 2). Sites were evaluated for significance according to the broad criteria established for the National and State Registers of Historic Places. The five criteria are:

- A Site reflects major trends or events in the history of the state or nation.
- B Site is associated with the lives of persons significant in our past.
- C Site is an excellent example of a site type.
- D Site may be likely to yield information important in prehistory or history.
- E Site has cultural significance; probable religious structures (shrines, *heiau*) and/or burials present.

Significance assessments are based on functional interpretations of the sites, site types, and varieties found within the project area and correlations to other sites in the Kalāheo area. Both sites within the project area are considered significant under Criterion D. These sites have yielded data contributing to an overall understanding of the spatial relationships, probable age, and likely function of historic agricultural features in Kalāheo.

IX. RECOMMENDATIONS

Historical documentation, interviews and excavation results all suggest that State Sites 50-30-10-406 and -485 are historic, likely built in the early 1900s by European settlers.

Based on the current grading plans for the proposed Kalāheo Well site improvements, only Feature 26 of Site -406 will be disturbed by the proposed construction. The information contained in this feature, a historic agricultural terrace, has been adequately recorded during these inventory survey investigations. This information has been recorded with photographs, a tape and compass map, and a written description. No further historic preservation work is recommended for this feature. As the remainder of Site -406, and Site -485, will not be affected by the proposed well site improvements, the proposed improvements will have no adverse affect on significant historic properties.

If any work is to be done outside the currently proposed grading limits, these recommendations will have to be re-evaluated.

X. REFERENCES

- Armstrong, Warwick, Ed.
1973 *Atlas of Hawaii*, University of Hawaii Press, Honolulu.
- Bennett, Wendell C.
1930 *Hawaiian Heiau*, Ph.D. Dissertation, Univ. of Chicago, Chicago.
1931 *The Archaeology of Kaua'i*, Bishop Museum Bulletin 80, Honolulu.
- Condé, Jesse C. and Gerald M. Best
1973 *Sugar Trains, Narrow Gauge Rails of Hawaii*, Glenwood Publishers, Felton, CA.
- Damon, Ethel M.
1931 *Koamalu*, Privately Printed, Honolulu.
- Folk, William H. and Hallett H. Hammatt
1991 *Archaeological Survey and Subsurface Testing of Land Commission Award 6647 at Kalāheo, Kaua'i, Hawai'i (TMK 4-2-3-02:22)* Cultural Surveys Hawai'i
- Foote, Donald E., et al.
1972 *Soil Survey of the Islands of Kaua'i, Oahu, Maui, Molokai and Lanai, State of Hawaii*. U.S. Dept. of Agriculture. U.S. Government Printing Office, Washington, D.C.
- Gay, Francis
1873 *Kauai Place Names*, Copied by Mary Pukui, Bishop Museum Unpublished Papers.
- Gay, J.
1872 Map of Kalāheo, Kona, Kauai. Registered Map Number 162. Hawaii State Survey Office.
- Handy, E.S. Craighill
1940 *The Hawaiian Planter, Volume 1*, Bishop Museum Bulletin No. 161., Bishop Museum, Honolulu.
- Handy, E.S., Craighill and Elizabeth G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*, Bishop Museum Bulletin No. 233, Bishop Museum, Honolulu.
- Handy E.S. and M. Pukui
1958 *The Polynesian Family System in Ka'u, Hawai'i*, Charles E. Tuttle Company, Tokyo, Japan.

- Harvey, Fred E.
1906 Hawaii Territory Survey: Kalāheo Homesteads Kona Kaua'i, Registered Map Number 2378, Hawaii State Survey Office.
- Hawaii State Archives
1864 Record of Commission of Boundaries for the Island of Kauai. V.1
- Hibbard, Donald
1991 Hawaii State Department of Land and Natural Resources Letter from Don Hibbard to Keith Nitta. May 30, 1991. Re TMK: 2-4-01:12
- Indices of Awards
1929 Star-Bulletin Press, Honolulu.
- Jay, S. W.
1913 Kalāheo Homesteads, 2nd Series, Registered Map No. , Hawaii State Survey Office.
- Kikuchi, William K.
1963 *Archaeological Survey and Excavations on the Island Kauai, Kona District Hawaiian Islands.*
- MacDonald, G.A. and Abbott, A.T.
1970 *Volcanoes in the Sea.* University of Hawaii Press, Honolulu.
- MacDonald, G.A., D.A. Davis, and D.C. Cox
1960 *Geology and Ground-Water Resources of the Island of Kaua'i, Hawaii.* Hawaii Division of Hydrography, Honolulu; Archaeological Research Center Hawaii, Inc., Honolulu.
- McAllister, J. G.
1933 *Archaeology of O'ahu,* Bishop Museum Bulletin 104, Honolulu, HI.
- McMahon, Nancy
1988 State of Hawaii, Department of Land and Natural Resources Letter to File from Nancy McMahon Job No. 87-9, TMK: 2-4-04:5.
- Miller, C.H.
1902 Map of Crown Land, Kalāheo, Kōloa District, Kauai, H.T. Registered Map Number 2131, Hawaii State Survey Office.
- Monsarrat, M.D.
1896 Map of Kalāheo, Kona, Kauai, Registered Map Number 1842, Hawaii State Survey Office.

- Pantaleo, Jeffrey and Scott S. Williams
 1991 *Archaeological Reconnaissance Survey of Selected Portions of the Port Allen-Wainiha Transmission Line Corridor, Kaua'i Island, Hawai'i*, Bishop Museum, Honolulu.
- Sterling, Elspeth P. and Catherine C. Summers (comp.)
 1978 *Sites of O'ahu, Ko'olauloa Portion Only*, Dept. of Anthropology, B.P. Bishop Museum, Honolulu, HI.
- Stokes, John F.G., and Tom Dye (Editor)
 1991 *Heiau of the Island of Hawai'i: A Historic Survey of Native Hawaiian Temple Sites*, ed. Tom Dye, Bishop Museum Press, Honolulu, HI.
- Valeri, Valerio
 1985 *Kingship and Sacrifice: Ritual and Society in Ancient Hawaii*, University of Chicago Press, Chicago, IL.
- Von Holt, Ida Elizabeth Knudsen
 1985 *Stories of Long Ago Niihau, Kauai, Oahu*. Daughters of Hawaii, Honolulu, HI.

PHOTO APPENDIX

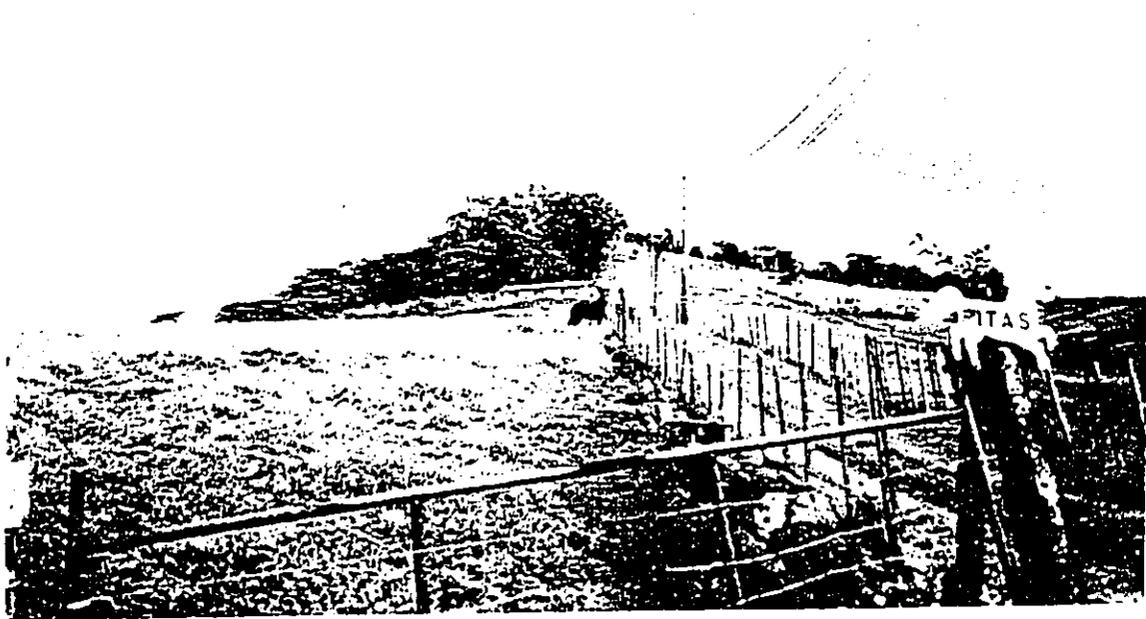


Figure 17 Photograph Showing Location of Site-406 Within Wooded Area, View North from Poohiwi Road.

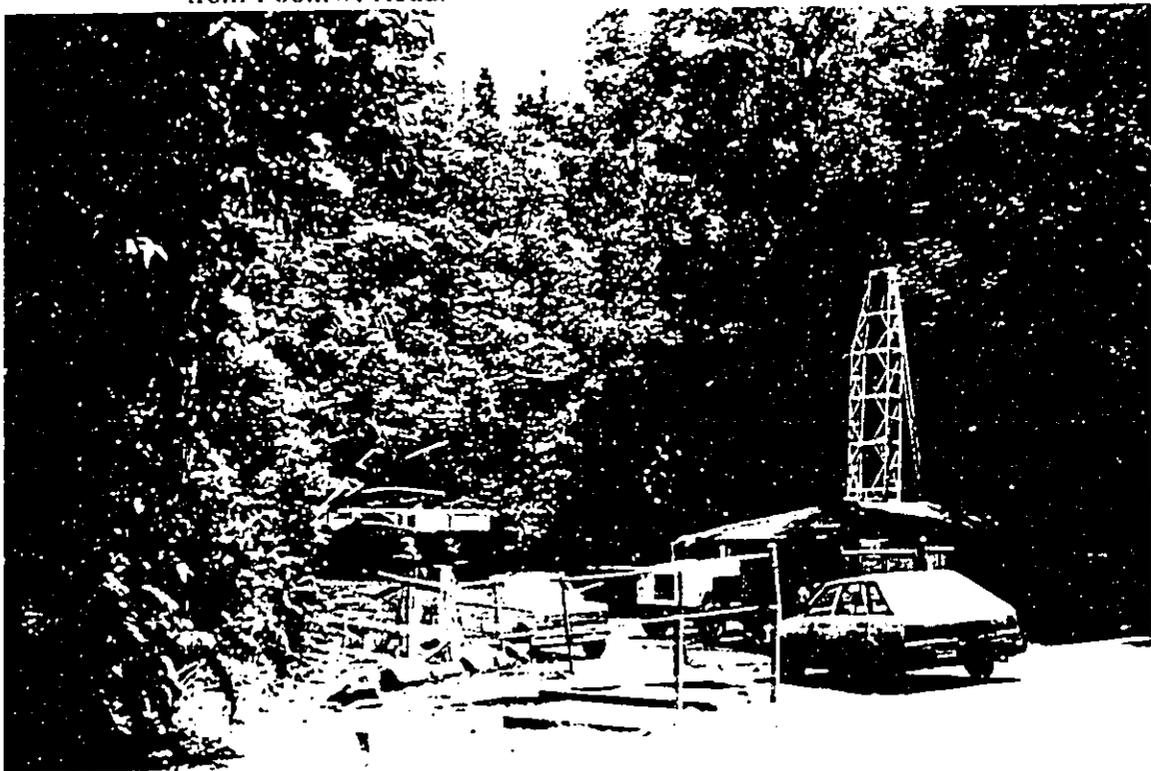


Figure 18 Photograph of Present Kalaheo Well Site at End of Poohiwi Road. View to North-West.



Figure 19 Photograph Showing Site-406, Feature 1. Pre-excavation of Horse Burial Platform. View South.



Figure 20 Photograph of Site -406, Feature 1. Post-excavation of Test Unit #1. View to West.

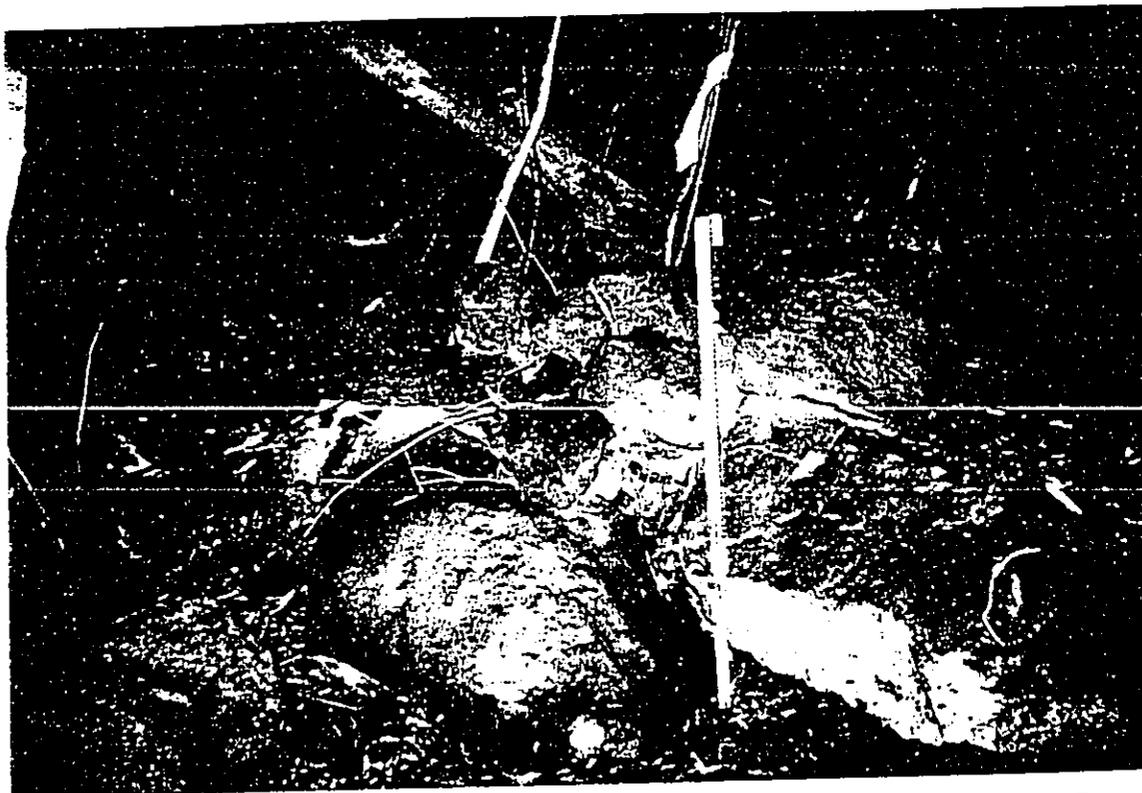


Figure 21 Photograph Showing Site -406, Feature 6, Agricultural Terrace, View East.



Figure 22 Photograph of Site -406, Feature 9, Southern Portion of Agricultural Terrace, View to South-East.

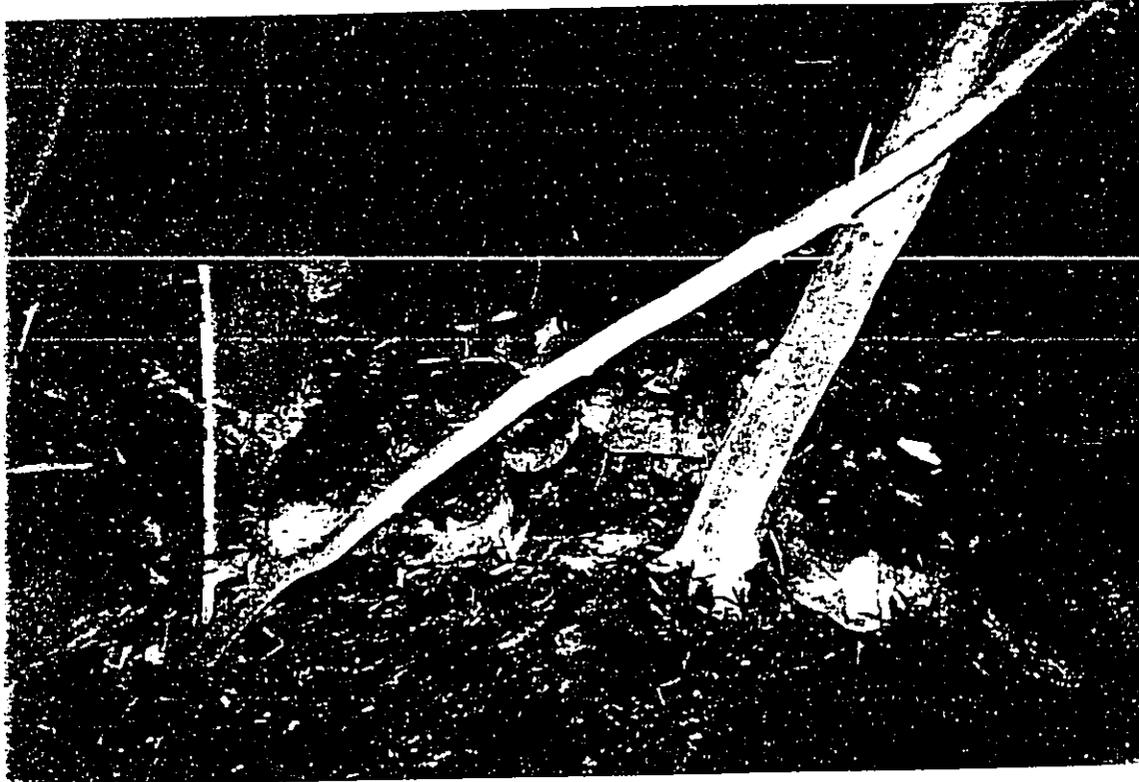


Figure 23 Photograph Showing Site-406, Feature 10, Central Portion of Agricultural Terrace, View East.

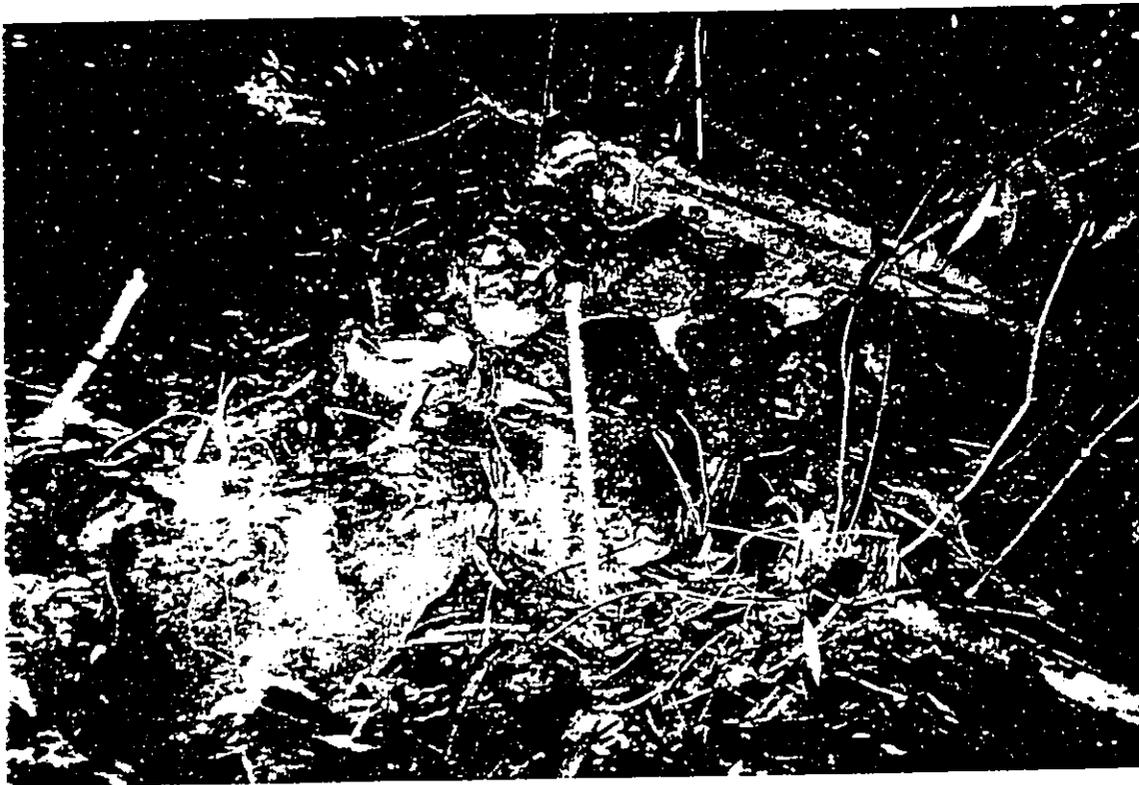


Figure 24 Photograph of Site -406, Feature 12, Agricultural Terrace, View to South-East.



Figure 25 Photograph Showing Site-406, Feature 13, Mound, View East.



Figure 26 Photograph of Site -406, Feature 15, Showing Cobble-Filled Surface of Mound, View to East.



Figure 27 Photograph Showing Site-406. Feature 17. Mound Portion of Terrace/Enclosure. View to East.



Figure 28 Photograph of Site-406. Feature 21. Rock Mound. View to North-NorthWest.



Figure 29 Photograph Showing Site-406. Modified Pig Trap Wall. South of Feature 20. View South-East.



Figure 30 Photograph of Site -406. Modified Pig Trap Wall off of Feature 16. View South.



Figure 31 Photograph Showing Site-406, Feature 16, Segment of Upper Tier, View East.



Figure 32 Photograph of Site -406, Feature 16, Upper and Lower Tier with Water Pipes at Base of Upper Tier, View to East.



Figure 33 Photograph Showing Site-406, Feature 16, East Profile of Test Unit #1. View East.



Figure 34 Photograph of Site -406, Feature 16. Base of Excavation of Test Unit #2. View to North-East.

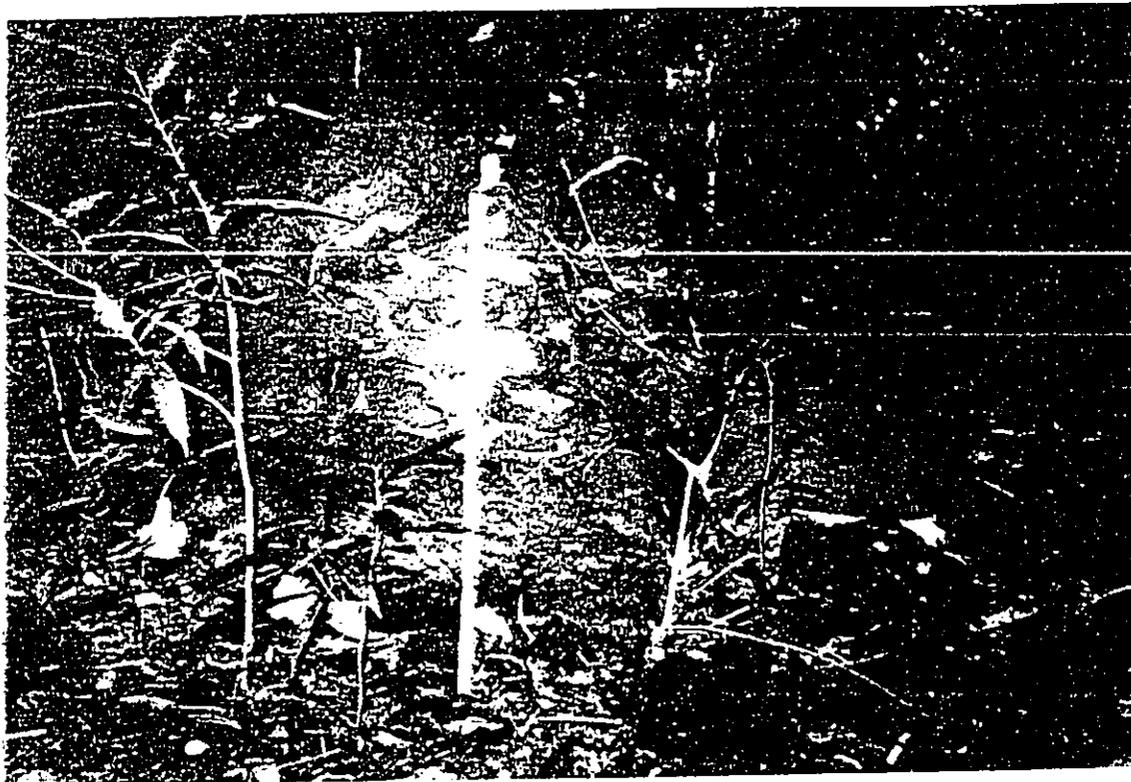


Figure 35 Photograph of Site-406, Feature 13, West-Southwest End of Feature Collapsed. View East.

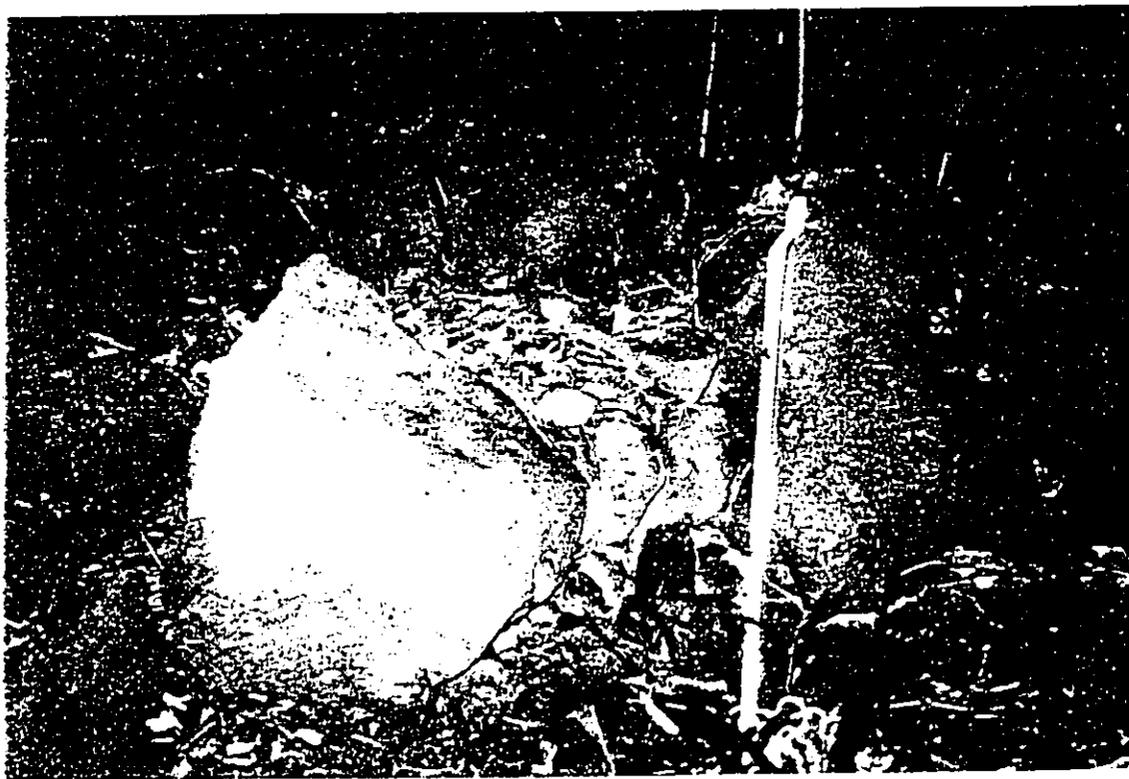


Figure 36 Photograph of Site -406, Feature 14, Filled Crevice. View East.



Figure 37 Photograph of Site-406, Feature 22. Mound/Platform. View to East.



Figure 38 Photograph of Site -406, Feature 26. Southern Portion of Terrace Retaining Wall. View North-Northeast.

APPENDIX D

Copies of Agencies' Correspondences Received during the 30-Day Draft EA Comment Period

<u>FEDERAL:</u>	<u>DATE COMMENTS RECEIVED:</u>
Department of Army - Civil Works Technical Branch	September 20, 2001
<u>STATE OF HAWAII:</u>	
Office of Environmental Quality Control	October 5, 2001
Department of Health Safe Drinking Water Branch Clean Air Branch Clean Water Branch	October 17, 2001
Department of Transportation	September 28, 2001
<u>COUNTY OF KAUAI:</u>	
Planning Department	September 13, 2001



DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT SHAFTER, HAWAII 96813-5440

AGENT TO
ATTENTION OF

September 20, 2001

Civil Works Technical Branch

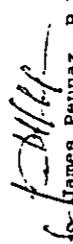
Mr. Keith S. Uemura, Vice President
Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Uemura:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment (DEA) for the Kalaheo Water System Reservoir, Koloa, Kauai (TMKs 2-4-1: por. 5 and 49). We do not have any additional comments to offer beyond those previously provided in our letter dated June 9, 1999.

Should you require additional information, please contact Mr. Farley Watanabe of our Regulatory Branch at (808) 438-7701 and refer to file number 990000221.

Sincerely,


James Pennaz, P.E.
Chief, Civil Works
Technical Branch

BEAUCHAMPEL
GOVERNOR



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

SEP 28 2001

Mr. Keith S. Uemura
Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813

Dear Mr. Uemura:

Subject: Draft Environmental Assessment, Kalaheo Water System, Reservoir Tank, Booster Pump, and Pipe Lines, Kahaheo, Koloa, Kauai, TMK: 2-4-04: por. 5, 49

Thank you for providing a copy of the draft environmental assessment for the proposed project for our review.

The proposed construction of a 0.5 million gallon reservoir, booster pump, and connecting pipe lines will not impact our State highway facilities.

If there are any questions regarding our comment, please contact Ronald Tsuzuki, Head Planning Engineer, Highways Division, at 587-1830.

Very truly yours,


BRIAN K. MINAAI
Director of Transportation

BRIAN K. MINAAI
DIRECTOR
DEPUTY DIRECTORS
GLENN H. OKUNO
JONIE Y. LUKSANG

WHEN REPLY REFER TO:
HWY-PS
2-4302

BENJAMIN J. CAYETANO
Director



GENEVIEVE SALMONSON
Director

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
316 SOUTH BERTAN ALBERT
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 548-1113
FACSIMILE (808) 548-1188

October 5, 2001

Mr. Ernest Lau
Department of Water
County of Kauai
4398 Pua Lake Street
Lihue, Hawaii 96766

Dear Mr. Lau:

Subject: Draft Environmental Assessment for the Kalaheo Water System 0.5 Million Gallon Reservoir,
Booster Pump and Connecting Pipelines, Kauai

Thank you for the opportunity to review the subject document. We have the following comments.

1. Please illustrate the visual impacts of the proposed reservoir from public places such as roads and lookouts. Photos of existing conditions taken from public view points are helpful in evaluating visual impacts. Renderings of future structures superimposed on photos of existing views should be provided. We recommend constructing and painting the reservoir with materials and colors that blend with the surroundings and screening the facility with native vegetation.
2. Please list all the mitigation measures that will be implemented to minimize impacts of spills from the diesel fuel storage tank.

Should you have any questions, please call Jeyan Thiruganam at 586-4185.

Sincerely,

Genevieve Salmonson
Genevieve Salmonson
Director

c. Park Engineering



586 South King Street, Honolulu, Hawaii 96813-3008 □ Telephone (808) 531-1876 □ FAX (808) 535-5366

January 9, 2002

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Attention: Mr. Jeyan Thiruganam

Dear Ms. Salmonson:

Subject: Kalaheo Water System
T.M.K. 4-2-4-04: 5 and 49

Thank you for your comments in your letter of October 5, 2001 regarding the Draft Environmental Assessment (EA) for the subject project. The following has been prepared in response to your comments.

Visual Impacts

Although the proposed project site is situated on a hill covered with tall trees, construction of the reservoir will result in limited visual impact from certain vantage points. A photo of the project site with the proposed reservoir superimposed on it will be included in the Final EA to illustrate the visual impact of the project from public viewpoints. The reservoir will be constructed and painted with materials that blend in with the surrounding area. We anticipate that reestablishment of native trees and vegetation will also assist in screening the facility.

Diesel Fuel Storage Tanks

The fuel storage tank shall be a double containment tank in full compliance with Department of Health (DOH) regulations. Routine inspections and maintenance will prevent the occurrence of unanticipated releases of diesel fuel.

We hope these responses adequately address your concerns for this project. If you have any questions, please contact me at 531-1876.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith Uemura
Keith Uemura
Vice President

cc:

Keim Fujimoto (Dept. of Water)

X X M W



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

DATE: 10/17/01
FILE: 01-116/epo

October 17, 2001

Mr. Keith S. Uemura
Vice President
ParEn, Inc.
dba Park Engineering
567 South King Street, Suite 300
Honolulu, Hawaii 96813-3036

Dear Mr. Uemura:

Subject: Kalaheo Water System

Thank you for allowing us to review and comment on the subject project. We have the following comments to offer at this time:

Safe Drinking Water Branch

We have reviewed the subject document which proposes to build a 500,000-gallon reservoir, control building, booster pump station, emergency generator and fuel storage facility connecting pipelines, appurtenances and site improvements and have the following comment.

We recommend that the reservoir have dedicated (from Kalaheo well) influent and effluent lines. This feature would help provide disinfectant (typically, chlorine) contact time, which may become important when the U.S. Environmental Protection Agency finalizes the Ground Water Rule.

Clean Air Branch

Control of Fugitive Dust:

Due to the nature of the project, there is a significant potential for fugitive dust to be generated during the removal of debris and during the grading, trenching, and construction activities that would impact nearby residents and thoroughfares. It is suggested that a dust control management plan be developed which identifies and addresses activities that have a significant potential for fugitive dust to be generated. Implementation of adequate dust control measures during all phases of the project is warranted.

Mr. Keith S. Uemura
October 17, 2001
Page 2

Construction activities must comply with provisions of Hawaii Administrative Rules 11-60.1-33 on Fugitive Dust. The contractor should provide adequate means to control dust from road areas and during the various phases of construction activities, including but not limited to:

- a. Planning the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing material transfer points and on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;
- b. Providing an adequate water source at the site prior to start-up of construction activities;
- c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;
- d. Controlling of dust from shoulders, project entrances, and access roads; and
- e. Providing adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities.

If you have any questions regarding fugitive dust, please contact Mr. Calen Miyahara at 586-4200.

Clean Water Branch

- 1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, Clean Water Branch;
- 2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:
 - a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation for projects equal to or greater than five acres;
 - b. Storm water discharges from industrial activities;
 - c. Construction dewatering activities;
 - d. Noncontact cooling water discharges less than one million gallons per day;
 - e. Treated groundwater from underground storage tank remedial activities;

Mr. Keith S. Uemura
October 17, 2001
Page 3

- f. Hydro testing water;
 - g. Treated effluent from petroleum bulk stations and terminals; and
 - h. Treated effluent from well drilling activities.
- Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State; and
3. After construction of the proposed facility is completed, an NPDES individual permit will be required if the operation of the facility involves any wastewater discharge into State waters.

Any questions regarding these comments can be directed to the Clean Water Branch at 586-4309.

Sincerely,



GARY GILL
Deputy Director
Environmental Health Administration



344 300 Hanalei Road P.O. Box 5001 King Street, Honolulu, Hawaii 96813-3006 Telephone (808) 531-1678 FAX (808) 536-5664

ParEn, Inc. dba park engineering

January 9, 2002

Mr. Gary Gill, Deputy Director
Environmental Health Administration
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

Dear Mr. Gill:

Subject: Kalaheo Water System
T.M.K. 4-2-4-04: 5 and 49

Thank you for your comments in your letter of October 17, 2001 regarding the Draft Environmental Assessment (EA) for the subject project. The following has been prepared in response to your comments:

Safe Drinking Branch

- The reservoir shall be designed with dedicated influent and effluent lines.

Clean Air Branch

- The Contractor shall be tasked to develop a Dust Control Management Plan that will minimize the impacts of fugitive dust generated during all phases of construction, as required by Hawaii Administrative Rules 11-80.1-33.

Clean Water Branch

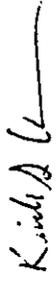
- The Department of Army - Regulatory Branch was consulted regarding the need for a Department of Army (DA) Permit. They determined that a DA is not required for this project.
- If discharges of hydrotesting water into State waters are required for this project a Notice of Intent will be filed with DOH in order to be covered by a National Pollutant Discharge Elimination System (NPDES) general permit.
- Operation of the facility will not involve any discharges of wastewater, therefore no NPDES individual permit will be required.

Mr. Gary Gill
Page 2
January 9, 2002

We hope these responses adequately address your concerns for this project. If you have any questions, please contact me at 631-1678.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING



Keith Uemura
Vice President

crs

c Keith Fujimoto (Dept. of Water)

MARYANNE W. KUSAKA
MAYOR



PLANNING DEPARTMENT

September 13, 2001

DEE M. CROWELL
PLANNING DIRECTOR
SHEILAH N. MIYAKE
DEPUTY PLANNING DIRECTOR
TELEPHONE (808) 241-4477
FAX (808) 241-4499

Keith S. Uemura
Suite 300, Kawahāho Plaza
567 South King Street
Honolulu, Hawaii 96813-3036

SUBJECT: Draft Environmental Assessment for Kalaheo Water System
TMK: 2-4-05: 5 and 49 por.

We have reviewed the Draft Environmental Assessment for the Department of Water's project to construct a 500,000 gallon reservoir, control building, booster pump, emergency generator building, diesel fuel storage facility, connecting pipelines, appurtenances and miscellaneous improvements and have no objections to the project. However, please note that the project sites are within the Conservation State Land Use District. As a result, the State Department of Land and Natural Resources should be contacted.

Should you have any questions, please feel free to contact Keith Nitta of my staff at 241-6677.

SHEILAH N. MIYAKE
Deputy Planning Director

cc: Water Department

Kapule Building • 4444 Rice Street, Suite 473 • Lihue, Kauai, Hawaii 96766
AN EQUAL OPPORTUNITY EMPLOYER



Suite 300, Alaniwaia Plaza □ 567 South King Street, Honolulu, Hawaii 96813-3036 □ Telephone (808) 531-1676 □ FAX (808) 536-5598
Park Engineering, Inc. □ dba park engineering

January 9, 2002

Ms. Sheilah N. Miyake, Deputy Planning Director
Planning Department
County of Kauai
4444 Rice Street, Suite 473
Lihue, Hawaii 96766

Attention: Mr. Keith Nitta

Dear Ms. Miyake:

Subject: Kalaheo Water System
T.M.K. 4-2-4-04: 5 and 49

Thank you for your comments in your letter of September 13, 2001 regarding the Draft Environmental Assessment (EA) for the subject project. We have contacted the Department of Land and Natural Resources and are presently preparing a Conservation District Use Application.

We hope these responses adequately address your concerns for this project. If you have any questions, please contact me at 531-1676.

Sincerely yours,

ParEn, Inc.
dba PARK ENGINEERING

Keith Uemura
Vice President

cms

cc: Keith Fujimoto (Dept. of Water)

ENGINEERS, SURVEYORS, PLANNERS

DRAFT & FINAL ENVIRONMENTAL ASSESSMENT CHECKLIST

Title: Kalaheo Water System

DRAFT ENVIRONMENTAL ASSESSMENT

Document Received: 8-27-01 DEA placed in nearest public library?

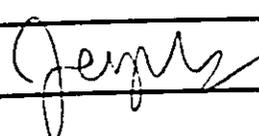
Was the "OEQC Publication Form" completed?

Is EA a complete and separate document?

Conditions which triggered the EIS Law. Check all that apply:

- Use of State or County Land or Funds
- Amendment to a County General Plan
- Use of Conservation District Lands
- Reclassification of Conservation Lands
- Use of Shoreline Setback Area
- Construction or Modif. of Helicopter Facilities
- Use of Historic Site or District
- City & County of Honolulu SMA
- Use of lands in the Waikiki Special District
- Other

Comments/Recommendation/Justification:

APPROVED FOR PUBLICATION: (sign) 

DATE OF PUBLICATION: _____

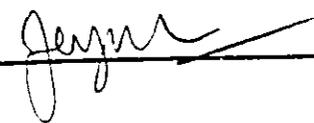
DRAFT EA COMMENT DEADLINE: _____

FINAL ENVIRONMENTAL ASSESSMENT (FONSI)

Document Received: _____

Was the "OEQC Publication Form" completed?

Comments/Recommendation/Justification:

APPROVED FOR PUBLICATION: (sign) 

DATE OF PUBLICATION: _____

DRAFT ENVIRONMENTAL ASSESSMENT

- (1) Agency submittal letter and anticipated determination;
- (2) Identification of applicant or proposing agency;
- (3) Identification of approving agency, if applicable;
- (4) Identification of agencies, citizen groups, and individuals consulted in making the assessment;
- (5) General description of the action's technical, economic, social, and environmental characteristics; time frame; funding/source
- (6) Summary description of the affected environment, including suitable and adequate regional, location and site maps such as Flood Insurance Rate Maps, Floodway Boundary Maps, or United States Geological Survey topographic maps;
- (7) Identification and summary of impacts and
- (8) Proposed mitigation measures;
- (9) Alternatives considered;
- (10) Discussion of findings and reasons supporting the agency anticipated determination;
- (11) List of all permits and approvals (State, federal, county) required; and
- (12) Written comments and responses to the comments under the early consultation provisions of sections 11-200-9(a)(1), 11-200-9(b)(1), or 11-200-15.

FINAL ENVIRONMENTAL ASSESSMENT

- (13) Agency submittal letter;
- (14) Agency determination;
- (15) Discussion of findings and reasons supporting the agency determination;
- (16) Written comments and responses to the comments under the statutorily prescribed public review periods.

3/13 original forthcoming by mail



Water has no substitute..... Conserve it

March 11, 2002

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

RECEIVED
02 MAR 13 09:24
OFFICE OF ENVIRONMENTAL
QUALITY CONTROL

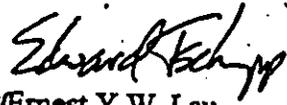
Dear Ms. Salmonson:

Subject: Finding of No Significant Impact for Kalaheo Water System –
0.5 Million Gallon Reservoir, Booster Pump and Connecting Pipelines
T.M.K. 2-4-04: por. 5 and 49
Kalaheo, Koloa, Kauai, Hawaii

The County of Kauai Department Water has reviewed the comments received during the 30-day public comment period, which began on September 8, 2001. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the March 23, 2002 OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final EA. Please call Mr. Keith Fujimoto (808) 245-5449 if you have any questions.

Sincerely,


Ernest Y. W. Lau
Manager and Chief Engineer

Enclosures

c: ParEn Inc. (Mr. Keith Uemura)