Appendices

Appendix A

Description of Materials Form for Affordable Units

UNITED STATES DEPARTMENT OF AGRICULTURE
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-FEDERAL HOUSING ADMINISTRATION
U.S. DEPARTMENT OF VETERANS AFFAIRS

FORM APPROVED
OMB NO. 0575-0042

☐ Proposed Construction

DESCRIPTION OF MATERIALS

No. ____________ (To be inserted by Agency)

☐ Under Construction

Property address ______________ City ______________ State ______

Mortgagor or Sponsor ______________ (Name) ______________ (Address)

Contractor or Builder ______________ (Name) ______________ (Address)

INSTRUCTIONS

1. For additional information on how this form is to be submitted, number of copies, etc., see the instructions applicable to the FHA Application for Mortgage Insurance, VA Request for Determination of Reasonable Value or other, as the case may be.

2. Describe all materials and equipment to be used, whether or not shown on the drawings, by marking an X in each appropriate check-box and entering the information called for in each space. If space is inadequate, enter "See misc," and describe under item 27 or on an attached sheet: THE USE OF PAINT CONTAINING MORE THAN THE PERCENT OF LEAD BY WEIGHT PERMITTED BY LAW IS PROHIBITED.

3. Work not specifically described or shown will not be considered unless required, then the minimum acceptable will be assumed. Work exceeding minimum requirements cannot be considered unless specifically described.

4. Include no alternates, "or equal" phrases, or contradictory items. (Consideration of a request for acceptance of substitute materials or equipment is not thereby precluded.)

5. Include signatures required at the end of this form.

6. The construction shall be completed in compliance with the related drawings and specifications, as amended during processing. The specifications include this Description of Materials and the applicable building code.

1. EXCAVATION:

Bearing soil, type Compacted soil to 95% proctor placed in 8" lifts, max.

2. FOUNDATIONS:

Footings: concrete mix 5 sack ; strength psi 2500 Reinforcing ASTM A-615 Grade 60
Foundation wall: material Sand & Cement Reinforcing ______
Interior foundation wall: material ______ Party foundation wall ______
Columns: material and sizes STR DF 4x4 Piers: material and reinforcing Cast in place
Girders: material and sizes ______ Sills: material ______
Basement entrance areaway ______ Window areaways ______
Waterproofing ______ Footing drains ______
Termite protection ground treat with approved termitacide
Basementless space: ground cover ______ ; insulation ______ ; foundation vents ______
Special foundations ______
Additional information ______

3. CHIMNEYS:

Material ______ Prefabricated *(make and size)* ______
Flue lining: material ______ Heater flue size ______ Fireplace flue size ______
Vents *(material and size)*: gas or oil heater ______ ; water heater ______
Additional information: ______

4. FIREPLACES:

Type: ☐ solid fuel; ☐ gas-burning; ☐ circulator *(make and size)* ______ Ash dump and clean-out ______
Fireplace: Facing ______ ; lining ______ ; hearth ______ ; mantel ______
Additional information: ______

5. EXTERIOR WALLS: Structural insulated panels (SIP) 6 1/2" thick (5 5/8" foam laminated with T/16" OSB each side)

Wood frame: wood grade, and species ______ ☐ Corner bracing. Building paper or felt 1 HR Contego each side
sheathing ______ ; thickness 6 1/2" ; width ______ ; ☐ solid; ☐ space ______ " o.c.; ☐ diagonal; ______
Siding ______ ; grade ______ ; type ______ ; size ______ ; exposure ______ "; fastening ______
Shingles ______ ; grade ______ ; type ______ ; size ______ ; exposure ______ "; fastening ______
Stucco ______ ; thickness ______ "; Lath ______ ; weight ______ lb.
Masonry veneer ______ Sills ______ Lintels ______ Base flashing ______
Masonry: ☐ solid ☐ faced ☐ stuccoed; total wall thickness ______ "; facing thickness ______ "; facing material ______
Backup material ______ ; thickness ______ "; bonding ______
Door sills ______ Window sills ______ Lintels ______ Base flashing ______
Interior surfaces: dampproofing, ______ coats of ______ ; furring ______
Additional information: ______
Exterior painting: material ______ ; number of coats ______
Gable wall construction: ☐ same as main walls; ☐ other construction ______

6. FLOOR FRAMING:

Joists; wood, grade, and species ______ ; other ______ ; bridging ______ ; anchors ______
Concrete slab: ☐ basement floor; ☐ first floor; ☒ ground supported; ☐ self-supporting; mix 2500OPSI ; thickness 4 ",
reinforcing ASTM A-185 6x6#10 WM ; insulation ______ ; membrane ______
Fill under slab; material Dirt ; thickness ______ ". Additional information: ______

7. SUBFLOORING: *(Describe underflooring for special floors under item 21.)*

Material: grade and species ______ ; size ______ ; type ______
Laid: ☐ first floor; ☐ second floor ☐ attic ______ sq. ft; ☐ diagonal; ☐ right angles. Additional information: ______

8. FINISH FLOORING: *(Wood only. Describe other finish flooring under item 21.)*

LOCATION	ROOMS	GRADE	SPECIES	THICK-NESS	WIDTH	BLDG. PAPER	FINISH
First floor							
Second floor							
Attic floor	sq. ft.						

Additional information: ______

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

9. PARTITION FRAMING: SIP panels 6 1/2" thick (5 5/8" foam laminated with 7/16" OSB each side)

Studs: wood, grade, and species ____ size and spacing ____ Other ____

Additional information: 2 x 4 framing with 7/16" OSB at plumbing wall

10. CEILING FRAMING: Over hall and baths

Joists: wood, grade, and species 2 x 4 framing Other ____ Bridging ____

Additional information: 1/2" GYP BD

11. ROOF FRAMING: SIP Panels (8 3/8" thick) (7 1/2" foam laminated with 7/16" OSB both sides)

Rafters: wood, grade, and species ____ Roof trusses (see detail): grade and species 1 HR Contego inside

Additional information: 2 x 8 spline at 48" O.C.

12. ROOFING:

Sheathing: wood, grade, and species ____ ; ☐ solid ☐ spaced ____ " o.c.

Roofing Fiberglass Shingle ; grade ____ ; size ____ ; type ____

Underlay #15 Asphalt Saturated Felt ; weight or thickness ____ ; size ____ ; fastening ____

Built-up roofing ____ ; number of plies ____ ; surface material ____

Flashing: material ____ ; gage or weight ____ ; ☐ gravel stops; ☐ snow guards

Additional information:

13. GUTTERS AND DOWNSPOUTS:

Gutters: material ____ ; gage or weight ____ ; size ____ ; shape ____

Downspouts: material ____ ; gage or weight ____ ; size ____ ; shape ____ ; number ____

Downspouts connected to: ☐ Storm sewer; ☐ sanitary sewer; ☐ dry-well. ☐ Splash blocks: material and size ____

Additional information:

14. LATH AND PLASTER:

Lath ☐ walls, ☐ ceilings: material ____ ; weight or thickness ____ Plaster: coats ____ ; finish ____

Dry-wall ☐ walls, ☐ ceilings: material ____ ; thickness ____ ; finish Skip trowel for wall & daub texture for ceiling

Joint treatment ____

15. DECORATING: *(Paint, wallpaper, etc.)*

ROOMS	WALL FINISH MATERIAL AND APPLICATION	CEILING FINISH MATERIAL AND APPLICATION
Kitchen	Washable enamel paint	daub texture & washable enamel paint
Bath		
Other	2 coats gloss or semi-gloss latex paint	Latex flat paint

Additional information: All washable paint

16. INTERIOR DOORS AND TRIM:

Doors: type Hollow core, flush panel ; material Mahogany Veneer ; thickness 1-3/8"

Door trim: type ____ ; material ____ Base: type ____ ; material ____ ; size ____

Finish: doors Wiping stains ; trim ____

Other trim *(item, type and location)* ____

Additional information: Provide door bumpers

17. WINDOWS:

Windows: type HQR Slide ; make Milgard ; material Vinyl ; sash thickness ____

Glass: grade ____ ; ☐ sash weights; ☐ balances, type ____ ; head flashing ____

Trim: type ____ ; material ____ Paint ____ ; number coats ____

Weatherstripping; type FIN ; material Polypropylene Storm sash, number ____

Screens: ☐ full; ☒ half; type Aluminum frame ; number all open screen cloth material Fiberglass mesh

Basement windows: type ____ ; material ____ ; screens, number ____ ; Storm sash, number ____

Special windows ____

Additional information:

18. ENTRANCES AND EXTERIOR DETAIL:

Main entrance door: material SC Mahogany ; width 36" ; thickness 1-3/4" Frame: material Mahogany ; thickness 3/4 "

Other entrance doors: material SC Mahogany ; width 32" ; thickness 1-3/4" Frame: material ____ ; thickness ____ "

Head flashing ____ Weatherstripping: type ____ ; saddles ____

Screen doors: thickness ____ "; number ____ ; screen cloth material ____ Storm doors: thickness ____ "; number ____

Combination storm and screen doors: thickness ____ "; number ____ ; screen cloth material ____

Shutters: ☐ hinged; ☐ fixed. Railings ____ , Attic louvers ____

Exterior millwork: grade and species ____ Paint ____ ; number coats ____

Additional information: Provide door bumpers

19. CABINETS AND INTERIOR DETAIL:

Kitchen cabinets, wall units: material Plywood ; lineal feet of shelves ____ ; shelf width ____

Base units: material DF Plywood ; counter top Formica ; edging Rolled Formica

Back and end splash Rolled Formica Finish of cabinets Factory finished ; number coats ____

Medicine cabinets: make Lawson recessed ; model ____

Other cabinets and built-in furniture Kitchen cabinets manufactured by MERILLAT INDUSTRIES carry the

Additional information: KCMA seal and meets or exceeds recommended minimum standards of ANSI/KCMA

20. STAIRS:

STAIR	TREADS		RISERS		STRINGS		HANDRAIL		BALUSTERS	
	Material	Thickness	Material	Thickness	Material	Thickness	Material	Thickness	Material	Thickness
Basement										
Main										
Attic										

Disappearing: make and model number ____

Additional information:

21. SPECIAL FLOORS AND WAINSCOT: (Describe carpet as listed in Certified Products Directory.)

	Location	Material, Color, Border, Sizes, Gage, Etc.	Threshold Material	Wall Base Material	Underfloor Material
Floors	Kitchen	3/32" thick sheet vinyl flooring		Vinyl	Plywood
	Bath	3/32" thick sheet vinyl flooring			
		carpet in living room, hallway, bedrooms -			
		refer to Item 27 MISCELLANEOUS, page 4			

	Location	Material, Color, Border, Sizes, Gage, Etc.	Height	Height Over Tub	Height in Showers (From Floor)
Wainscot	Bath				

Bathroom accessories: ☐ Recessed; material ______; number ____; ☐ Attached; material ______; number ______

Additional information: ______

22. PLUMBING

Fixture	Number	Location	Make	Mfr's Fixture Identification No.	Size	Color
Sink	1	Kitchen	Dayton	D-2331-3	33"x21"	SS
Lavatory	1	Bath	American Standard	3211	19"x16"	White
Water closet	1	Bath	American Standard	2111.058		White
Bathtub	1	Bath Tub & Shower combination, fiberglass, Make:				
Shower over tubΔ		LASCO, Model No. 2603SG			60"x72"31"	White
Stall showerΔ						
Laundry trays	1		Flat			

Δ ☒ Curtain rod Δ ☐ Door ☐ Shower pan: material ______

Water supply: ☒ public; ☐ community system: ☐ individual (private) system.*

Sewage disposal: ☐ public; ☐ community system: ☐ individual (private) system.*

** Show and describe individual system in complete detail in separate drawings and specifications according to requirements.*

House drain (inside); ☐ cast iron; ☐ tile; ☒ other ABS Pipe House sewer (outside): ☐ cast iron; ☐ tile; ☒ other ABS Pipe

Water piping: ☐ galvanized steel; ☒ copper tubing; ☐ other ______ Still cocks, number ______

Domestic water heater: type Circular Electric ; make and model American ; heating capacity 18.4

______ gph. 100° rise. Storage tank: material Glass line galvanized ; capacity ______ gallons.

Gas service: ☐ utility company; ☐ liq. pet. gas; ☐ other ______ Gas piping: ☐ cooking; ☐ house heating.

Footing drains connected to : ☐ storm sewer; ☐ sanitary sewer; ☐ dry well. Sump pump; make and model ______

______ ; capacity ______ ; discharges into ______

23. HEATING

☐ Hot water. ☐ Steam. ☐ Vapor. ☐ One-pipe system. ☐ Two-pipe system.

☐ Radiators. ☐ Convectors. ☐ Baseboard radiation. Make and model ______

Radiant panel: ☐ floor; ☐ wall; ☐ ceiling. Panel coil: material ______

☐ Circulator. ☐ Return pump. Make and model ______ ; capacity ______ gpm.

Boiler: make and model ______ Output ______ Btuh.; net rating ______ Btuh.

Additional information: ______

Warm air: ☐ Gravity. ☐ Forced. Type of system ______

Duct material: supply ______; return ______ Insulation ______ ; thickness ______ ☐ Outside air intake.

Furnance: make and model ______ Input ______ Btuh.;output ______ Btuh.

Additional information: ______

☐ Space heater; ☐ floor furnace; ☐ wall heater. Input ______ Btuh.; output ______ Btuh.; number units ______

Make, model ______ Additional information: ______

Controls: make and types ______

Additional information: ______

Fuel: ☐ Coal; ☐ oil; ☒ gas; ☐ liq. pet. gas; ☐ electric; ☐ other ______; storage capacity ______

Additional information: Provide for gas dryer, range, water heater (LP Gas)

Firing equipment furnished separately: ☐ Gas burner, conversion type. ☐ Stoker: hopper feed ☐ ;bin feed ☐

Oil burner: ☐ pressure atomizing; ☐ vaporizing ______

Make and model ______ Control ______

Additional information: ______

Electric heating system: type ______ Input ______ watts;@ ______ volts; output ______ Btuh.

Additional information: ______

Ventilating equipment: attic fan, make and model ______ ; capacity ______ cfm.

kitchen exhaust fan, make and model ______

Other heating, ventilating, or cooling equipment ______

24. ELECTRIC WIRING:

Service; ☒ overhead; ☐ underground. Panel: ☐ fuse box; ☒ circuit-breaker; make Westinghouse AMP's 100 No. circuits 6

Wiring: ☐ conduit: ☐ armored cable; ☒ nonmetallic cable; ☐ knob and tube; ☐ other ______

Special outlets: ☒ range; ☒ water heater; ☒ other 220V dryer outlet & GFI for bath, kitchen and outside outlets

☐ Doorbell. ☐ Chimes. Push-button locations. ______ Additional information: Direct wired alarm

25. LIGHTING FIXTURES: As Per Plan

Total number of fixtures ______ Total allowance for fixtures, typical installations, $ ______

Nontypical installation ______

Additional information: ______

26. INSULATION:

Location	Thickness	Material, Type, and Method of Installation	Vapor Barrier
Roof			
Ceiling			
Wall			
Floor			

27. MISCELLANEOUS: *(Describe any main dwelling materials, equipment, or construction items not shown elsewhere; or use to provide additional information where the space provided was inadequate. Always reference by item number to correspond to numbering used on this form.)* In the event owner changes electric water heater to gas, it is the owner's responsibility to make necessary arrangements with the gas company and pay for services.

Item 21 Flooring - "Versatility" by World Carpets, cut pile, 100% nylon, pile height 15/32". Gauge: 3/16", width: 12", primary backing: woven polypropyline, secondary backing: jute. This carpet meets FHA minimum requirements as outlined in UM44D, Type IF, Class 1. Sheet vinyl flooring: "Chambrey" by Armstrong which meets HUD, FHA requirements.

HARDWARE: *(make, material, and finish.)* Provide "Westlock" self-locking dead latch locks for exterior doors.

SPECIAL EQUIPMENT: *(State material or make, model and quantity. Include only equipment and appliances which are acceptable by local law, custom and applicable FHA standards. Do not include items which, by established custom, are supplied by occupant and removed when he vacates premises or chattles prohibited by law from becoming realty.)*
Smoke Detector - Direct wiring w/UL 212 label.

PORCHES:

TERRACES: None

GARAGES:

WALKS AND DRIVEWAYS:

Driveway: width ________ ; base material Dirt ________ ; thickness _____ "; surfacing material ________ ; thickness ______
Front walk: width 36" ____ ; material Gravel ______ ; thickness ___ ". Service walk: width ________ ; material ________ ; thickness ______
Steps: material ________ ; treads ______ "; risers ______ ". Check walls ________
Note: Driveway Approach and Concrete Driveway as per Plot Plan

OTHER ONSITE IMPROVEMENTS:

(Specify all exterior onsite improvements not described elsewhere, including items such as unusual grading, drainage structures, retaining walls, fence, railings, and accessor structures.)

Driveways over 7% grade shall not exceed 14% slope.

LANDSCAPING, PLANTING, AND FINISH GRADING:

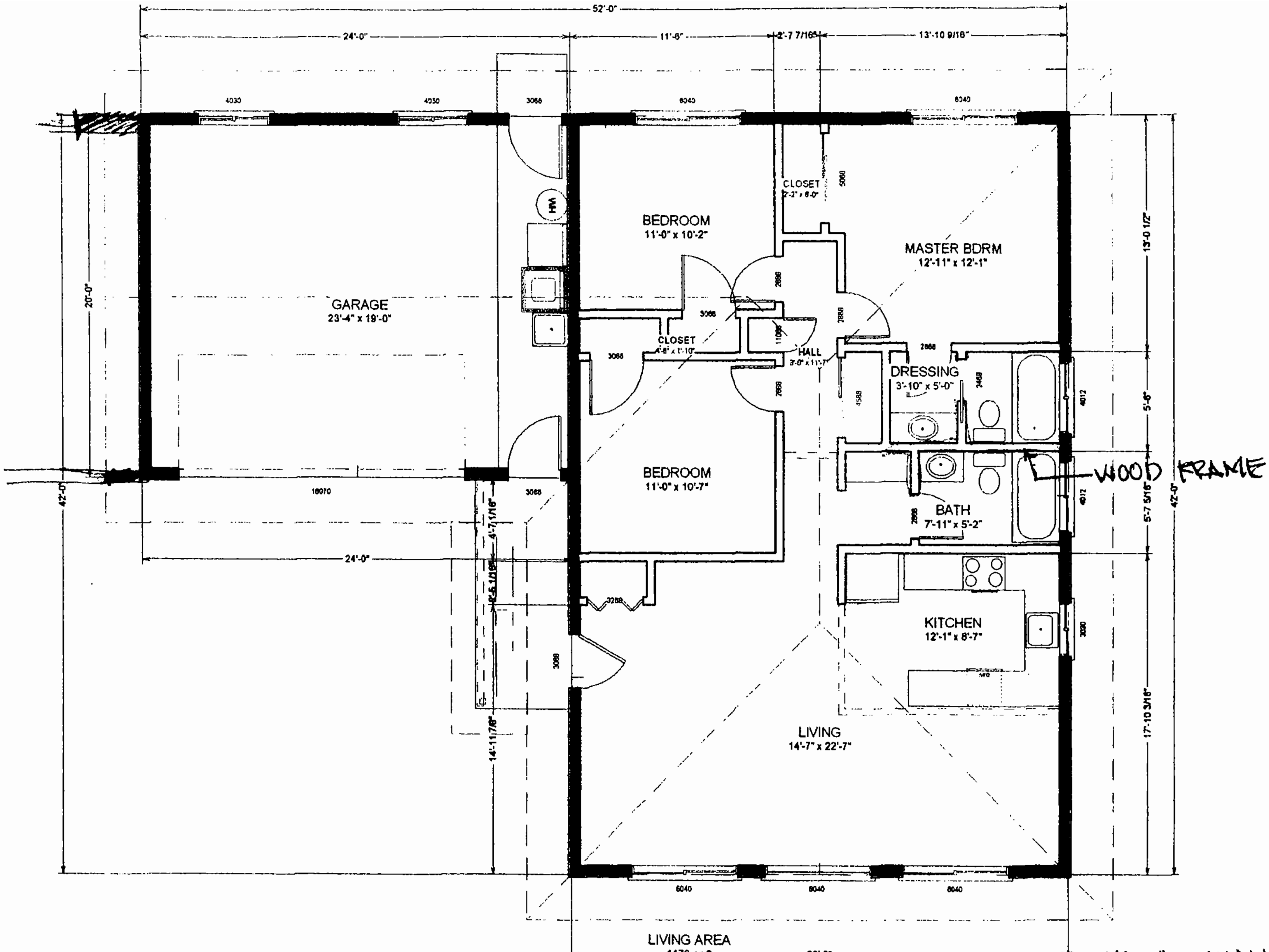
Topsoil _____ " thick: ☐ front yard: ☐ side yards; ☐ rear yard to ________ feet behind main building.
Lawns *(seeded, sodded, or sprigged)*:. ☐ front yard ________ ; ☐ side yards ________ ; ☐ rear yard ________
Planting: ☐ as specified and shown on drawings; ☐ as follows:

________ Shade trees, decidous. ______ " caliper.	________ Evergreen trees ________ ' to ________ ', B & B.
________ Low flowering trees, decidous. ________ ' to ________ '	________ Evergreen shrubs ________ ' to ________ ', B & B.
________ High-growing shrubs, decidous. ________ ' to ________ '	________ Vines, 2-years ________
________ Medium-growing shrubs, decidous, ________ ' to ________ '	
________ Low-growing shrubs, decidous. ________ ' to ________ '	

IDENTIFICATION. This exhibit shall be identified by the signature of the builder, or sponsor, and/or the propsed mortgagor if the latter is known at the time of application.

Date ________________ Signature ________________

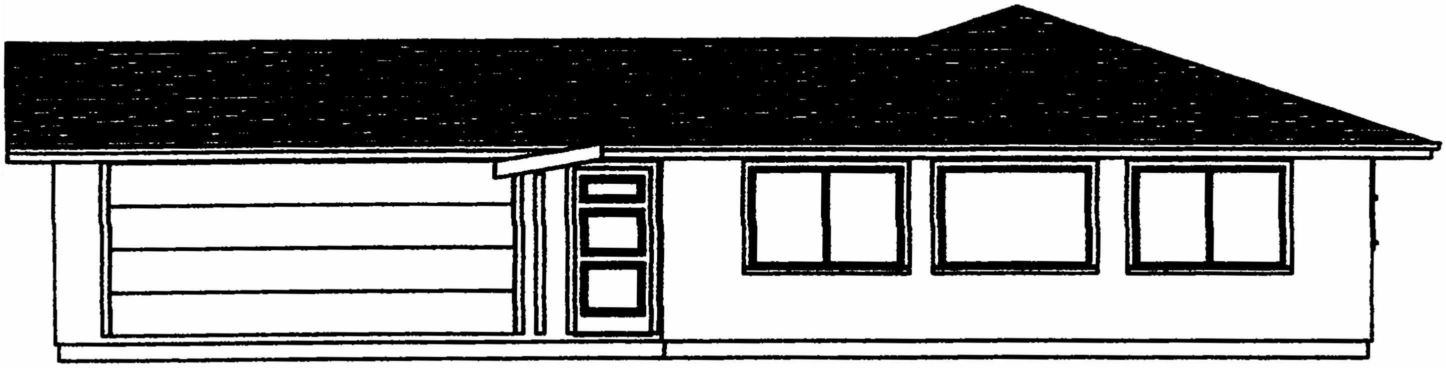
Signature ________________



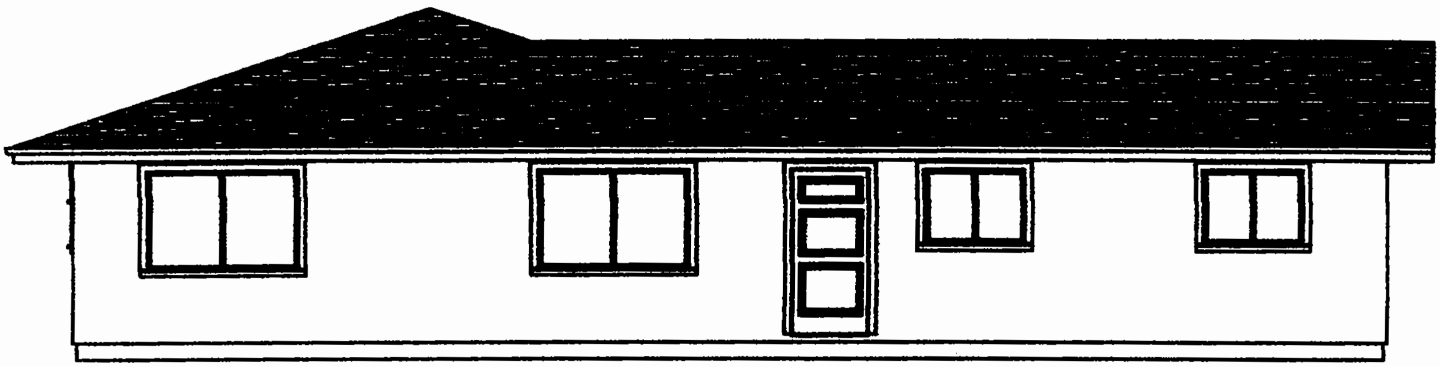
2 HR RATEING - ALL WALLS (FIRE)
1 HR RATEING - ROOF (FIRE)

EXTERIOR:

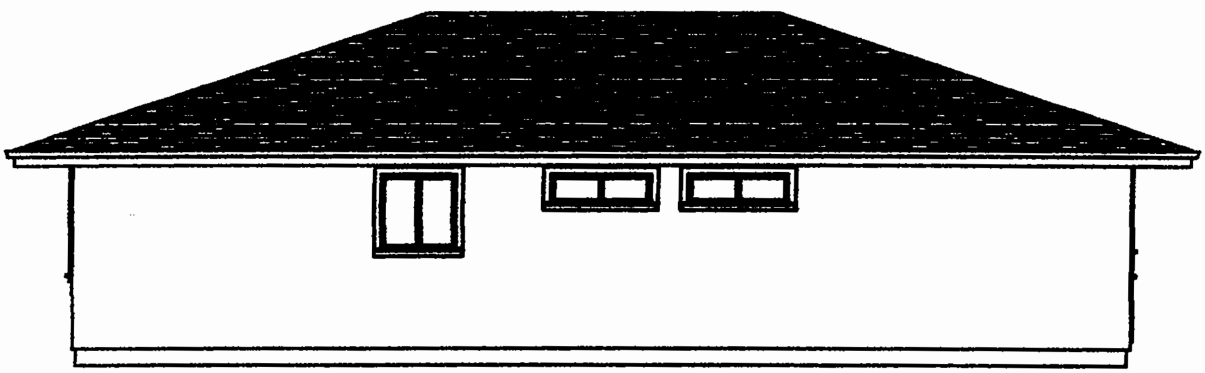
201G



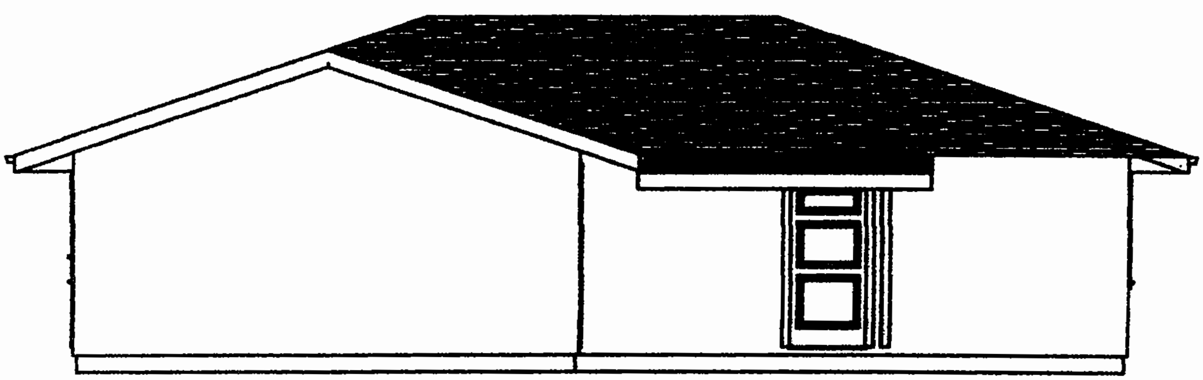
FRONT



REAR

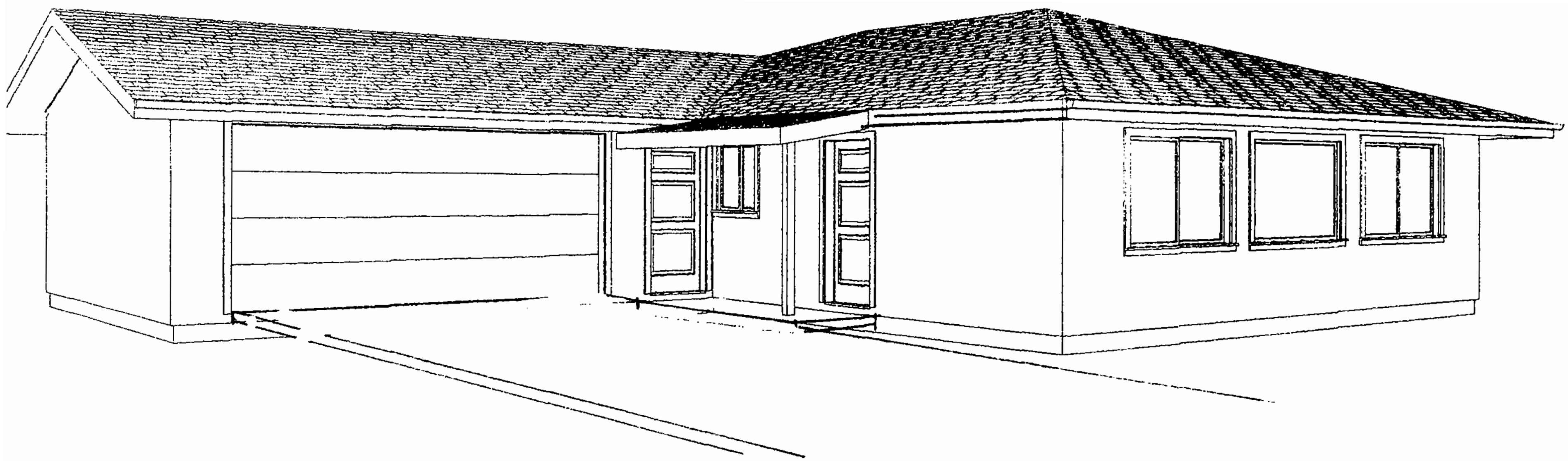


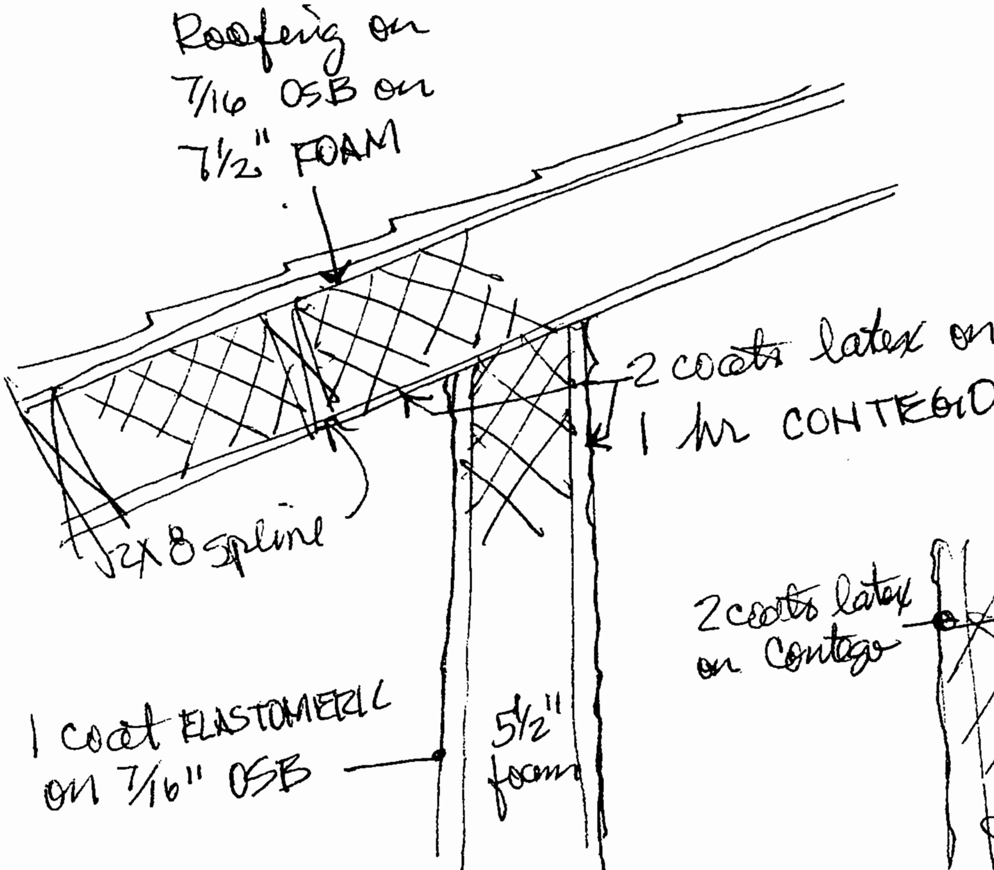
RIGHT



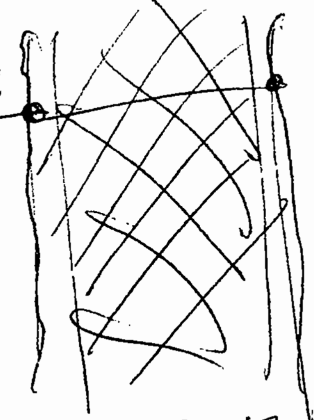
LEFT

9016

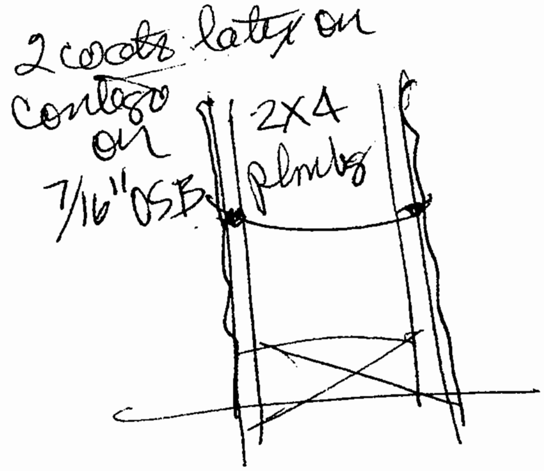




EXTERIOR WALL



INTERIOR



Appendix B

Proposed Exemptions for Affordable Housing Subdivision

HALE MUA AFFORDABLE HOUSING SUBDIVISION
PROPOSED SECTION 201G-118, HRS EXEMPTIONS
FROM THE MAUI COUNTY CODE (MCC)

A. EXEMPTION FROM TITLE 2, MCC, ADMINISTRATION AND PERSONNEL

1. An exemption from Chapter 2.80B, MCC, General Plan and Community Plans, shall be granted to permit the project without obtaining a Community Plan amendment.

B. EXEMPTION FROM TITLE 12, MCC, STREETS, SIDEWALKS, AND PUBLIC PLACES

1. An exemption from Chapter 12.08, MCC, Driveways, shall be granted to exempt the project from driveway permit and inspection fees.

C. EXEMPTIONS FROM TITLE 14, MCC, PUBLIC SERVICES

1. An exemption from Chapter 14.25A, MCC, Service Connections, relating to wastewater connections, shall be granted to exempt the affordable units from wastewater system connection fees.

2. An exemption from Chapter 14.35, MCC, Wastewater Assessment Fees for the Facility Expansion for the Wailuku/Kahului Wastewater Treatment System shall be granted to exempt the project from wastewater assessments.

3. An exemption from future traffic impact fees which may be adopted shall be granted for the project.

D. EXEMPTIONS FROM TITLE 16, MCC, BUILDINGS AND CONSTRUCTION

1. Exemption from MCC Chapters 16.04A Fire Code, 16.18A, Electrical Code, 16.20A, Plumbing Code, and 16.26A, Building Code, shall be granted to exempt the project from fire, electrical, plumbing, building permit fees, and demolition permit fees, as well as inspection fees.

2. An exemption from Section 16.26.3304, MCC, Improvements to Public Streets, relating to frontage improvements, shall be granted so that only that portion of Kahekili Highway between the subdivision access roads will be provided with sidewalks and curb and gutter improvements.

E. EXEMPTIONS FROM TITLE 18, MCC, SUBDIVISIONS

1. Exemption from MCC Section 18.04.030, Administration, and Section 18.16.020, Compliance, shall be granted to exempt the project from obtaining a Change in Zoning and Community Plan amendment to enable subdivision approval.

2. An exemption from Section 18.16.320, MCC, Parks and Playgrounds, shall be granted to allow the 6.92 acres of parks within the project to satisfy the park dedication and assessment requirements.

3. An exemption from Section 18.20.70, MCC, Sidewalks, relating to frontage improvements, shall be granted so that only that portion of Kahekili Highway between the subdivision access roads will be provided with a sidewalk.

4. An exemption from Section 18.20.080, MCC, Curbs and Gutters, relating to frontage improvements, shall be granted so that only that portion of Kahekili Highway between the subdivision access roads will be provided with curb and gutter improvements.

F. EXEMPTIONS FROM TITLE 19, MCC, ZONING

1. An exemption from Chapter 19.30A, MCC, Agricultural District, shall be granted to permit the development and use of the parcel for single-family residential purposes, including supporting infrastructure requirements. Further, this exemption shall allow the subdivision of the property in the plat configuration shown in the attached Attachment "A". The following zoning standards shall apply to the proposed lots:

• Minimum Lot Size:	5,000 Square Feet
• Height:	No building shall exceed two (2) stories or thirty (30) feet in height
• Front Yard Setback:	Minimum of 15 feet
• Garage Setback:	Minimum of 15 feet
• Side and Rear Yard Setback:	
Market-priced, one-story homes:	Minimum of 6 feet
Market-priced, two-story homes:	Minimum of 10 feet
Affordable homes:	Zero-lot line will be permitted so as to allow two, private, attached carports on abutting lots to adjoin. Other setbacks shall be a minimum of 6 feet. Should any affordable homeowners construct a future second-story addition, the side and rear yard setbacks for the

second-story addition shall be 10 feet.

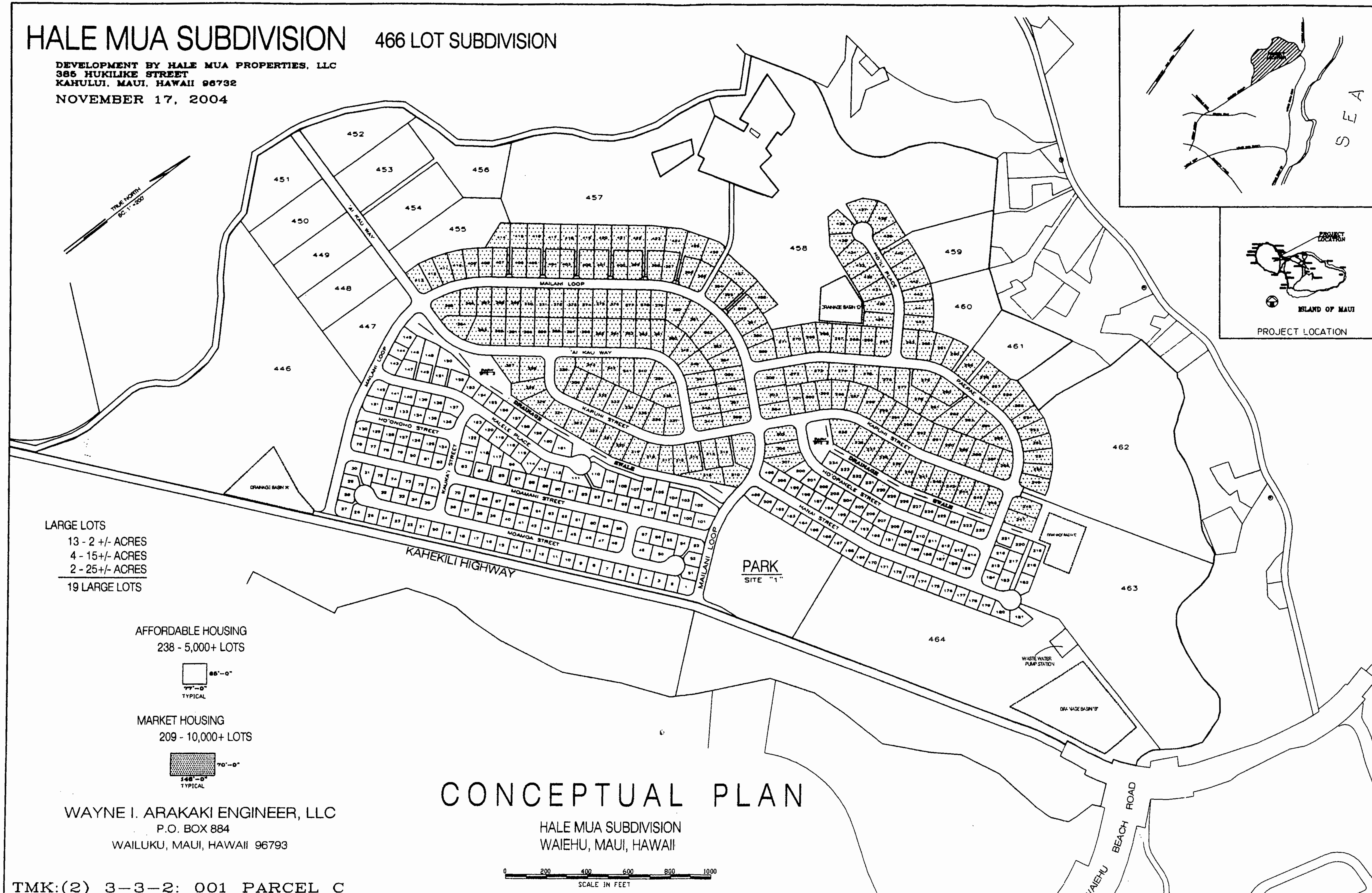
2. An exemption from Chapter 19.45, MCC, Project District Processing Regulations, shall be granted to permit the realignment of Imi Kala Street without the filing and processing of Project District Phase II and Phase III applications.

G. ***EXEMPTION FROM TITLE 20, MCC, ENVIRONMENTAL PROTECTION***

1. An exemption from Section 20.08.090, MCC, Grubbing and Grading Permit Fees shall be granted to exempt the project from grading, grubbing and excavation permit fees, as well as inspection fees.

kim/waiehu/201gexemp

ATTACHMENT "A"



Appendix C

Archaeological Inventory Survey of Subdivision Site

SCS Project 425-1

ARCHAEOLOGICAL INVENTORY SURVEY OF 240.087 ACRES LOCATED IN WAI`EHU, WAI`EHU AND WAILUKU AHUPUA`A, WAILUKU DISTRICT, MAUI ISLAND, HAWAI`I [TMK:(2) 3-3-02: portion of 001]

Prepared by:
Jon Wilson, B.A.
and
Michael F. Dega, Ph.D.

March 2004

Prepared for:
Sterling Kim
187 Haulani Street
Pukalani, HI 96768

SCIENTIFIC CONSULTANT SERVICES Inc.

711 Kapiolani Blvd. Suite 975 Honolulu, Hawai`i 96813

ABSTRACT

Archaeological Inventory Survey was conducted on 240.087 acres of land that composed one large land tract in Wailuku District, Wai`ehu and Wailuku Ahupua`a, Maui Island, Hawai`i (TMK:(2) 3-3-02: portion of 001). The Inventory Survey included historic background research and settlement pattern analysis prior to fieldwork, a complete pedestrian survey of the project area, subsurface testing, and reporting.

Thirteen historic sites were documented during this Inventory Survey, one of which was recorded previously. State Site Number 50-50-07-1508 represents Spreckels Ditch. This sugar industry irrigation ditch was built by Claus Spreckels in 1882 and nominated to the Hawaii Register of Historic Places in 1974. SCS field archaeologists assigned 13 temporary site numbers to these sites, which were later condensed to 7 total sites when assigned State Site Numbers.

State Site Number 50-50-04-5522 is a conglomerate of historic sugar agriculture features including ditches, berms, a boulder mound, and dirt access roads. State Site Number 50-50-04-5523 consists of three isolated lithic finds, each consistent with the characteristics of traditional tool craft. State Site Number 50-50-04-5524 is an early historic marine shell isolated find, with a unique provenience within the property that strongly implies cultural association. State Site Number 50-50-04-5525 is a historic terrace and mound, likely associated with plantation-era land clearing. State Site Number 50-50-04-5526 is a concrete foundation remnant of a historic pig-raising facility. Finally, State Site Number 50-50-04-5527 is a five-feature terrace complex from an early historic period. Four test units and six stratigraphic trenches were excavated within the project area. Site –5527 testing produced a charcoal sample associated with the site's architecture which later produced a radiocarbon date confirming Site –5527's early historic age.

Although these sites were considered significant because of their ability to yield information about history or prehistory, that information has been documented. Thus they are no longer deemed significant and no further archaeological studies are recommended for these sites. However, the eastern border of the property is closest to the context in which several sites containing human remains have been documented. For this reason, archaeological monitoring is recommended for any earth-moving project on the property whose borders will share the Kahekili Highway perimeter.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Scientific Consultant Services (SCS), Inc. conducted an Archaeological Inventory Survey on 240.087 acres of land positioned on the border of Wailuku and Wai`ehu Ahupua`a, Wailuku District, Maui Island, Hawai`i [TMK:(2) 3-3-02: portion of 001] (Figures 1 and 2). The large survey area lies between coastal flats to the east and more mountainous terrain to the west along the northern reaches of the Maui isthmus between Wailuku and Waihee (Figure 3). A wetter windward environment than the open, dry areas of Wailuku and Waikapu to the south, the project area has been valued for its agricultural potential for centuries. Traditional agriculture was replaced by historic period sugar cane cultivation, which lasted over 100 years. In turn, sugar replaced by a macadamia nut plantation in the last two decades. Over 90 percent of the project area has been intensely modified through this history of cultivation; road construction, earth leveling, erosion control techniques, and irrigation systems are all types of modifications found on the land tract that may date back to the late-nineteenth century (Figure 4).

Fieldwork, primarily consisting of systematic pedestrian survey, recordation, and representative subsurface testing, was conducted intermittently between December 8, 2003 and January 11, 2004 by SCS personnel Randy Ogg, B.A., John Risedorf, Guerin Tome, B.A., and Michael Dega, Ph.D. The Principal Investigator for this project was Michael Dega, Ph.D.

Archaeological Inventory Survey of the project area was conducted to determine the presence/absence of archaeological deposits in surface and subsurface contexts through complete systematic survey and representative subsurface testing. The ultimate goals of the project were to determine if significant archaeological sites occurred on the parcel and to provide recommendations to the State Historic Preservation Division (SHPD) concerning site mitigation in lieu of future land use on the subject property.

It was deemed likely that evidence of prehistoric agriculture remained on the property. Although prehistoric and historic human remains were previously found on adjacent lands, SCS believed the likelihood of uncovering humans remains was low, given the previous earth moving in the area and a non-sandy soil layer presence—a distinct shift in soils from burial areas a short distance *makai*. Also prior to fieldwork, it was believed that evidence of early historic use of the land was likely to be encountered, as multiple Land Claim Awards (LCAs) occur within in the Wai`ehu Ahupua`a area of the property. Several of these LCAs included house

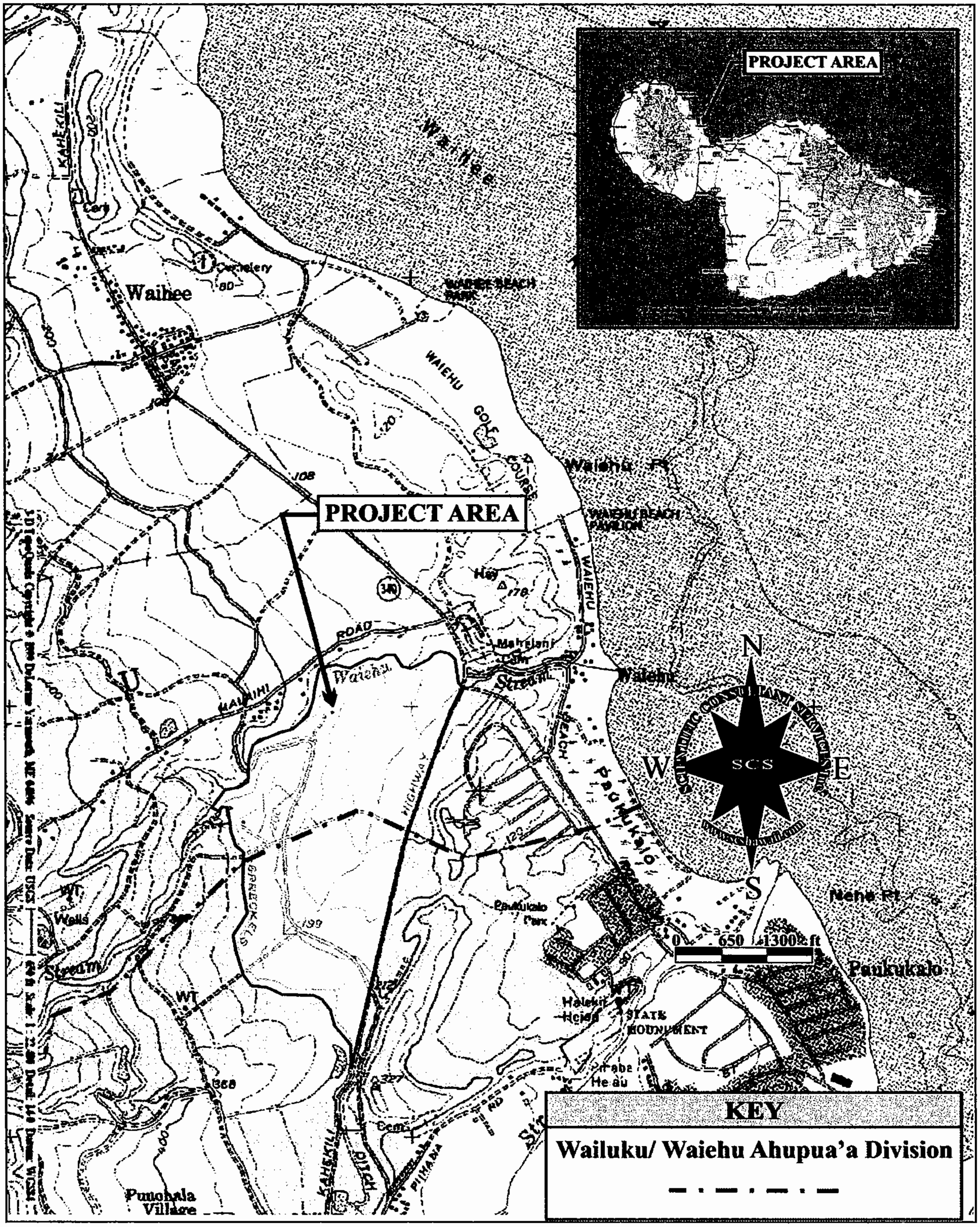


Figure 1: USGS Quadrangle Map Showing Project Area.

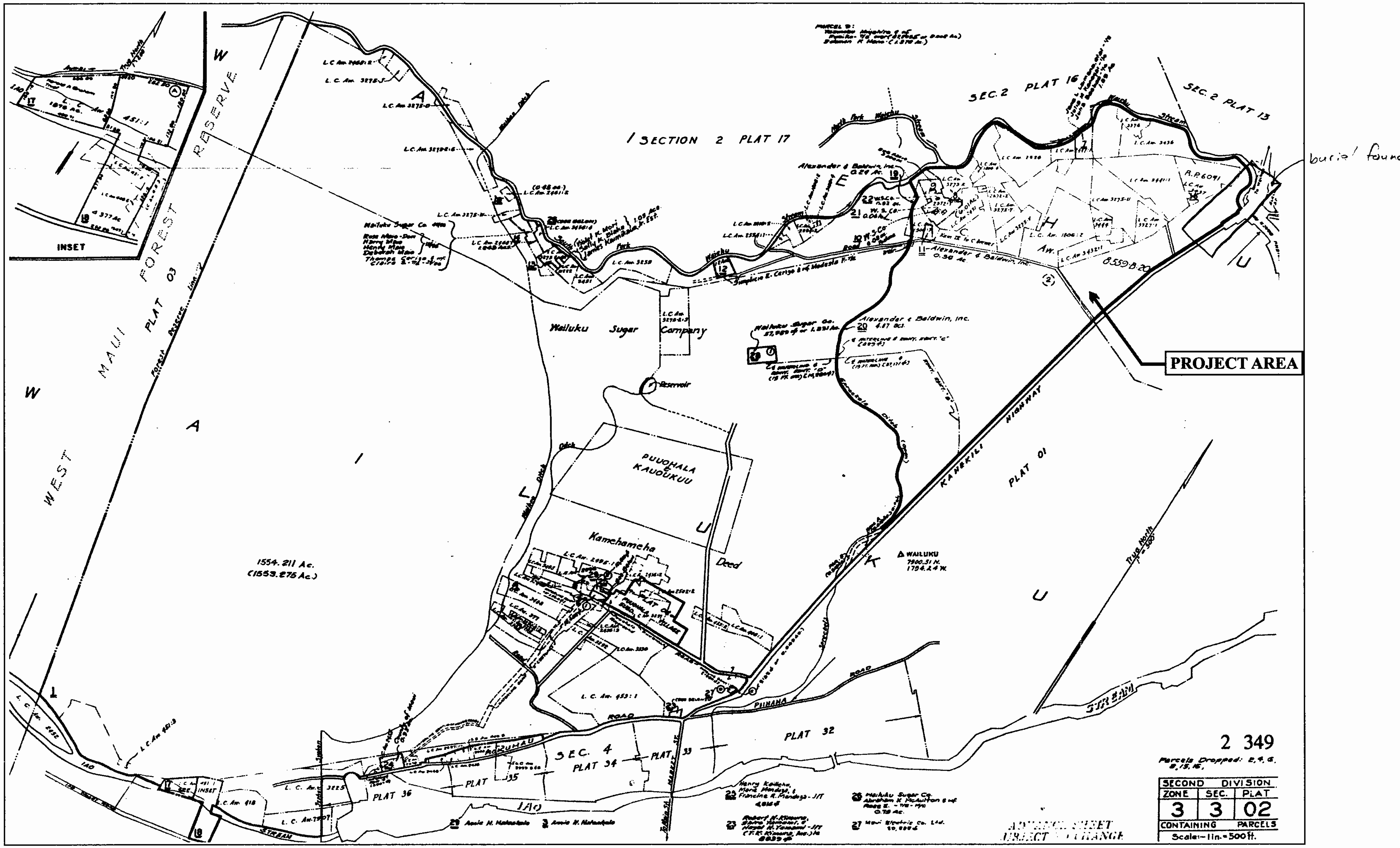


Figure 2: Tax Map Key [TMK] Showing Project Area.

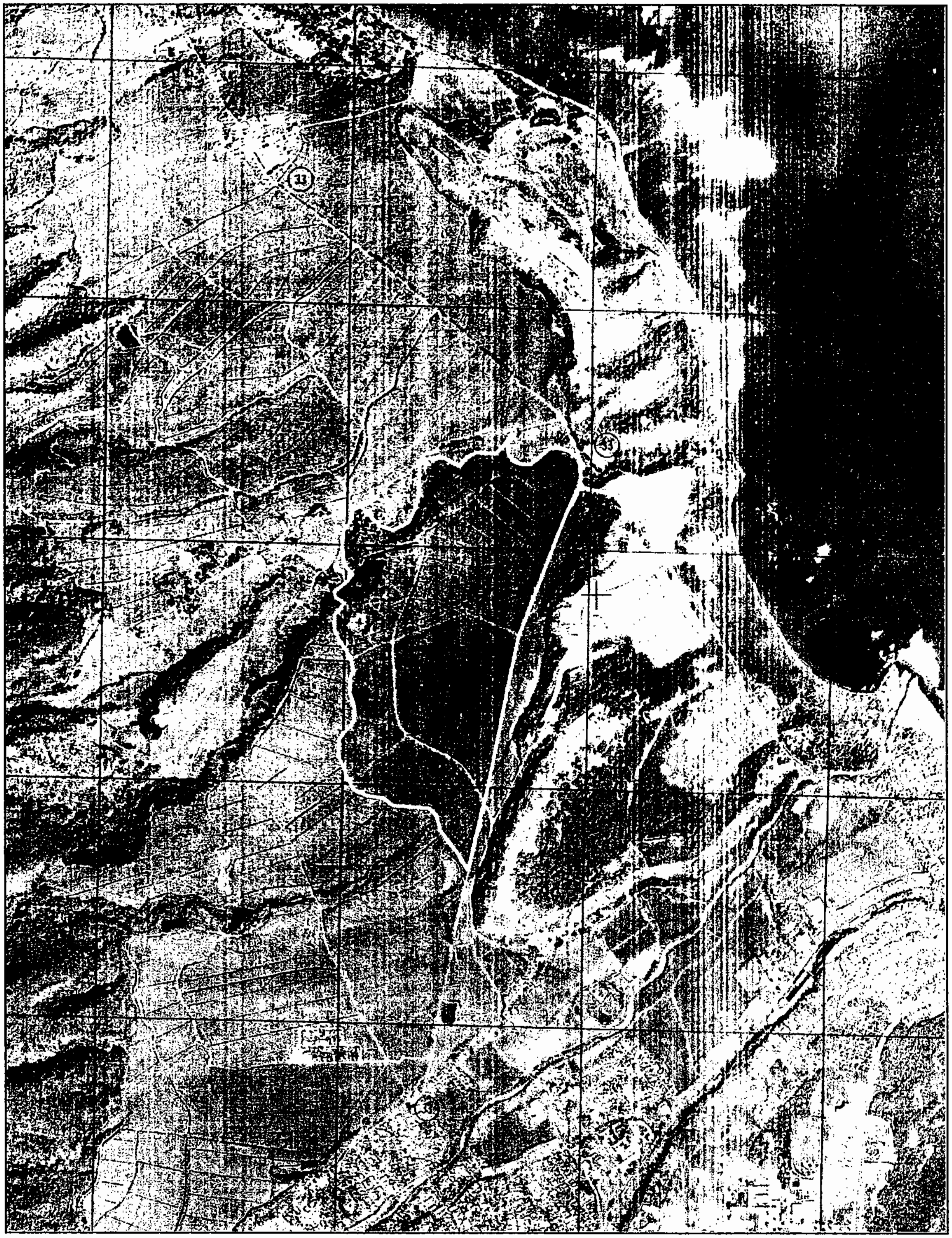


Figure 3: USGS Aerial Photography Map Showing Project Area Topography.

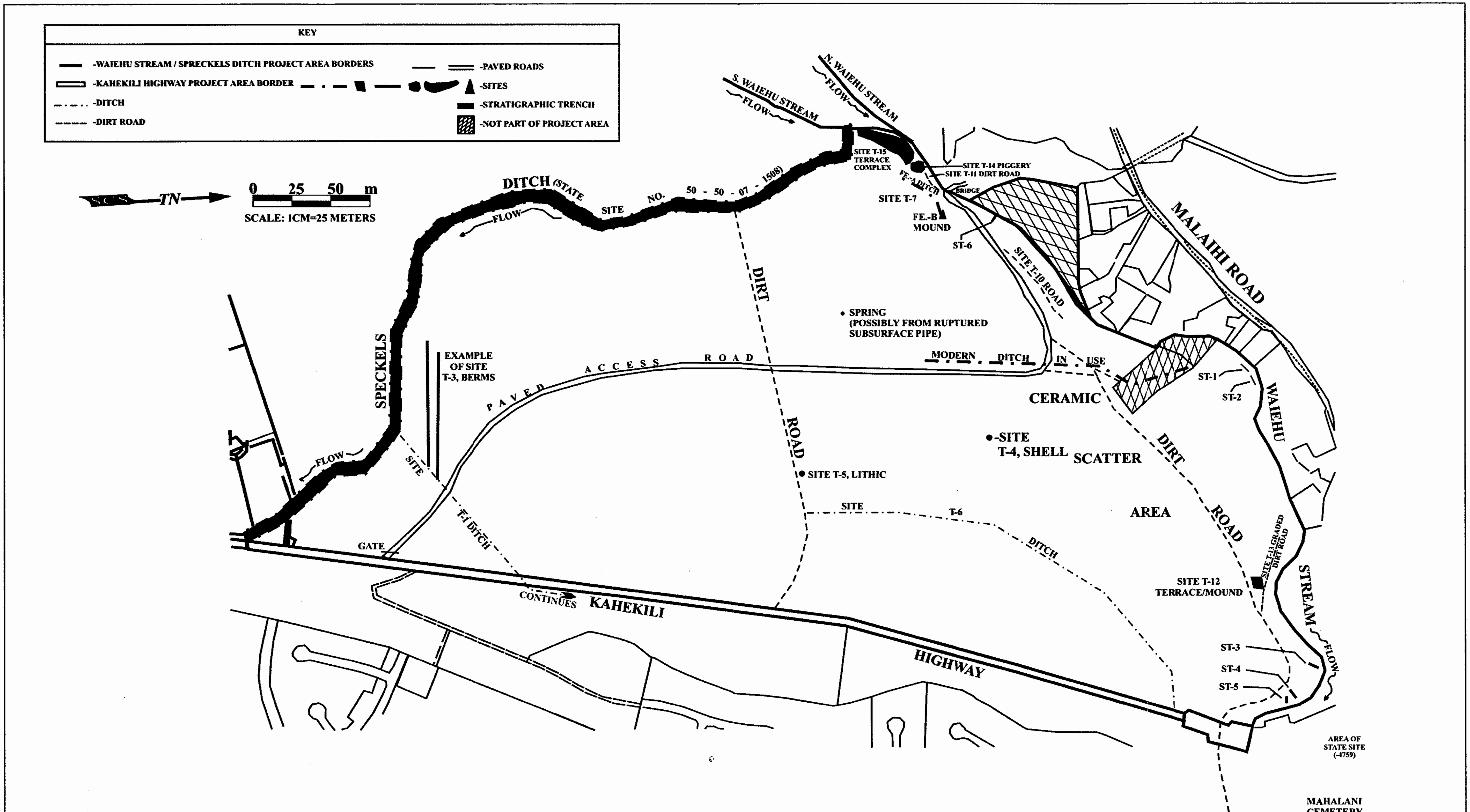


Figure 4: Project Area Map Showing Site Locations.

sites. Finally, very high expectations were held for adding more to Hawai`i's plantation-era record. Spreckels Ditch (50-50-07-1508), a sugar cane irrigation ditch, was known to form the southern border of the project area (see Figure 4).

ENVIRONMENTAL SETTING

LOCATION

Wailuku District is situated on the eastern side of the *Mauna Kahalawai* (West Maui Mountains) and occupies the isthmus through the center of Maui to coastal reaches in Kahului and Mā`alaea. The project area lies within the northern half of the Wailuku District, and consists of a large land parcel totaling a recorded area of 240.087 acres. Approximately 60 percent of the project area is in Wai`ehu Ahupua`a—the southern 40 percent lies within the boundary of Wailuku Ahupua`a (see Figure 1). The project area is one kilometer north of Wailuku Town and 750 meters *makai* of the West Maui Mountains. Its eastern perimeter, a section of the Kahekili Highway, averages 500 meters *mauka* of the coastline, situated south of Wai`ehu Point and north of Nehe Point.

The property is roughly three-sided, with the Wai`ehu Stream defining the northern boundary and the curving Spreckels Ditch as the perimeter to the west and south, where it intersects Kahekili Highway (the eastern boundary). The coastal Wai`ehu Golf Course sits 700 meters northeast of the project area's northeastern corner. It should be noted that two cemeteries—the Wāi`ehu Chinese Cemetery and Mahalani "Hawaiian" (also known as "Ka Home Ma Ha Mau") Cemetery (Fredericksen and Fredericksen 2000)—are adjacent to the northeastern corner of the project area (Figure 5). However, these locations are *makai* of Kahekili Highway and thus do not share an immediate border with the project area, although the highway forms the only separating barrier.

PROJECT AREA LANDFORM

Geologically, the project area is located on the northern portion of the Kahului Isthmus, the wide and low-lying saddle area between Haleakala and the West Maui Mountains. While the coastal areas in this part of West Maui (250 to 500 m east of the project area) are dominated by sandy beaches and dunes, the project area has a slightly higher elevation. Situated between the coastal sands and the steep slopes to the west, the gently northeast-sloping project area does not change in elevation more than approximately 45 meters. At its highest, the midpoint of the western perimeter, the elevation is 85 meters above mean sea level (amsl); the lowest point, at the northeast corner, is 40 meters amsl (Figure 6).

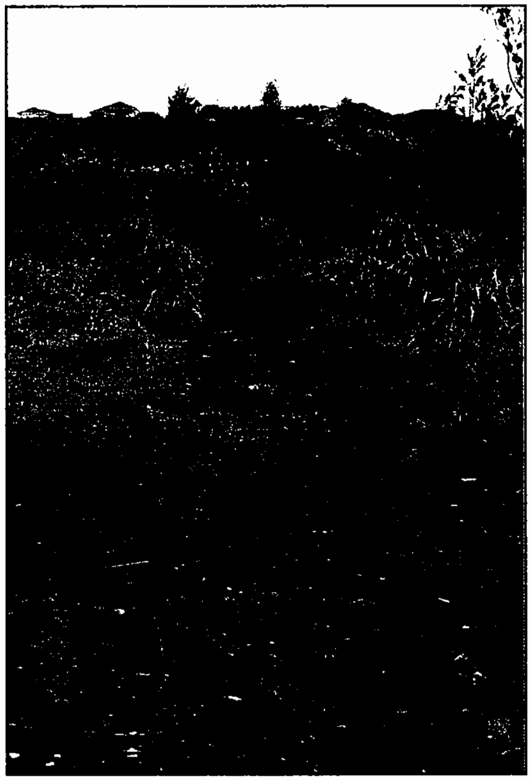


Figure 5: Dirt Road at Northeast Corner of Project Area, with Mahalani Cemetery Beyond Perimeter. View to Northeast.

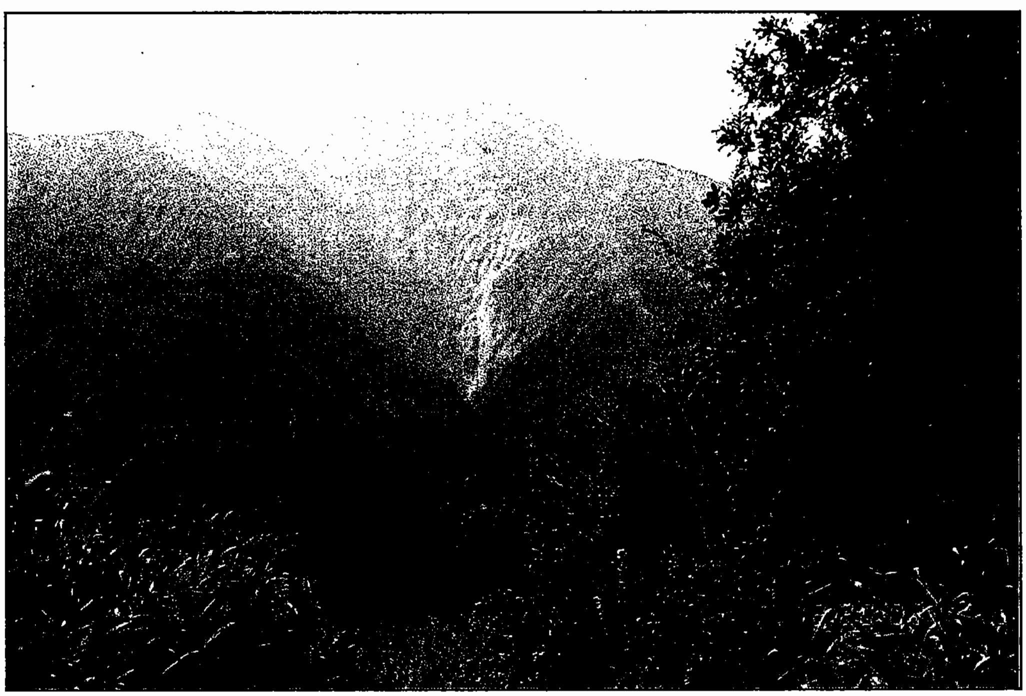


Figure 6: Photo from Center of Project Area to West Maui Mountains. View to West.

The parcel has been altered in several ways through its history of commercial cultivation. Planted protective windrows, pushed topsoil deposits, and irrigation constructions have noticeably altered the landscape. The project area, along with adjacent parcels, was utilized for sugar cane production for over 100 years, starting in the late 1800s (Fredericksen and Fredericksen 2002). In the 1980s, macadamia nut trees replaced the sugar cane, and the land surface still bears evidence from the earth moving of heavy machinery. Awai *et al.* (1967:15) describe the "nonstony" ground surface as "well-suited" for machine tilling, having a "slope of predominantly 8 percent" with near optimal conditions for sugar cane productivity. SCS field archaeologists documented furrowed areas where sugar cane once grew, and remaining stretches of piled earth served as berms that slowed erosion. More recent crops are protected with alignments of introduced trees, sometimes growing on top of the berms, forming windbreaks (Figure 7).

Figure 7: **Pine Windrow Used as Erosion Control. View to Southeast.**

The roughly 5 percent of the project area's surface that is not covered by macadamia nut orchards is often overgrown with species of grasses, which are especially dense along the wetter northern perimeter formed by Wai`ehu Stream and its associated floodplain. The North Wai`ehu Stream and the South Wai`ehu Stream join in their eastward flow at the northwest corner of the project area. Rainfall here is slightly heavier than in areas a short distance to the south and east, and the wetter conditions are compounded by *mauka* downpours at the streams' higher elevation origins. The result is the occasional swelling of Wai`ehu Stream, which has created a flat floodplain extending as much as 15 meters southward into the northern perimeter of the project area.

In addition to the water supplied by Wai`ehu Stream, the Spreckels Ditch (which continues to flow) has irrigated the drier southern area of the parcel since its construction in 1882 (Figure 8). In 1974, Spreckels Ditch was designated as State Site 50-50-07-1508 and nominated to the Hawaii Register of Historic Places. Site -1508 is part of the 1878 to 1974 "large, complex irrigation system of ditches, tunnels, weirs, and aqueducts" (Wilcox 1996: 123). Forming the western and southern perimeters of the project area, this ditch once irrigated the parcel with waters from as far north as the Waihe`e River.

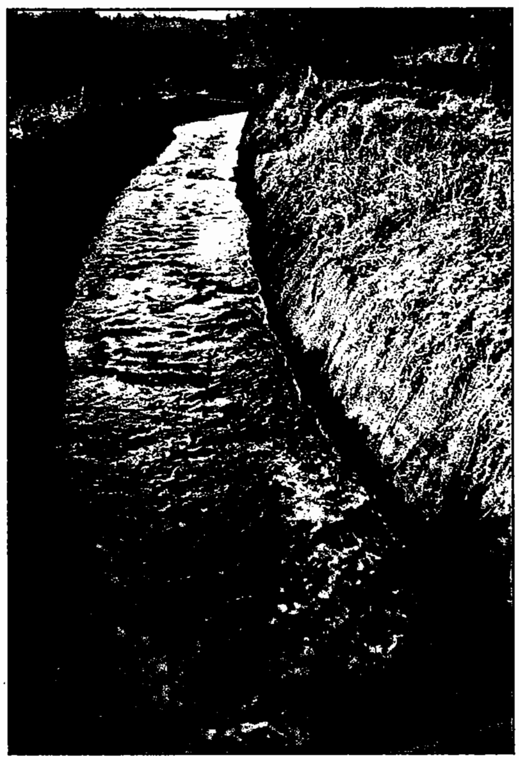


Figure 8: Portion of Spreckels Ditch (State Site -1508). View to South.

VEGETATION

Vegetation in the project area is dominated by the presence of macadamia nut trees (*Macadamia integrifolia*). The now-abandoned macadamia orchards cover 95 percent of the project area, having replaced decades of sugar cane cultivation (Figure 9). The series of irrigation ditches and cane roads found on the property indicate that the vast majority of the 240 acres once

Figure 9: Example of Macadamia Nut Tree Rows within Project Area. Northeast Quadrant, View to Southeast.

served the sugar industry. Feral sugar cane (*Saccharum officinarum*) grows on the south bank of Wai`ehu Stream. Cook pines (*Araucaria columnaris*), common ironwoods (*Casuarina equisetifolia*), and *koa haole* trees (*Leucaena leucocephala*) align in windrows that—along with piled soil berms—were designed to prevent erosion and divide the parcel into over 20 orchards. Other species found within the project area include the Java plum (*Syzygium cumini*), monkey pod (*Samanea saman*), Christmas berry (*Schinus terebinthifolius*), albizia (*Albizia* sp.), sisal (*Agave sisalana*), casuarina (*Casuarina* sp.), eucalyptus (*Eucalyptus* sp.), papaya (*Carica papaya*), and banana (*Musa* sp.) (Herbst e*t al.* 1990). At the time of this survey, recent winter rains caused various common grasses, among them Bermuda grass (*Cynodon dactylon*), to grow extremely thick and as high as three meters in some areas outside of the orchards.

CLIMATE

Rainfall in this windward environment is considerably heavier than in areas of Wailuku District to the south. The project area occurs north of what is considered the leeward-windward boundary and seasonal variation in rainfall amount follows normal orographic patterns for windward areas of Maui. Northeasterly trade winds consistently bring more intense precipitation to the east side of the West Maui Mountains, and the northern reaches of Wailuku Ahupua`a are no exception. Lands immediately south of Wai`ehu Stream receive an average annual rainfall of 101 to 177 centimeters (Price 1983:63)—slightly lessening to the south and within the coastal regions to the east—with much of this precipitation occurring during the winter months

(November–April). At higher points within Wailuku and Wai`ehu Ahupua`a, the amount of rainfall can vastly increase, with some elevations receiving as much as 10.2 meters of rain per year. *Mauka*, from `Īao Stream Valley area toward Waihe`e Valley, rainfall is much more intense, with combined rainfall and geographic patterns also conducive to traditional types of crops once cultivated within the project area (*i.e.*, *lo`i*, or taro pond-fields). Average annual temperatures here range from a maximum of 85 degrees Fahrenheit in late summer to a minimum of 60 degrees Fahrenheit in mid-winter (Price 1983).

SOILS

According to Foote *et al.* (1972:46–47, 133), soils in the project area are predominantly classified as Wailuku silty clay (WvC), which occurs in roughly 60 percent of the project area, primarily the *mauka* region and northern quadrant. This soil is a derivative of the Wailuku series that consists of well-drained soils on Maui's alluvial fans. Wailuku soils are developed from weathered igneous rock and are used for sugar cane, pasture, and home sites. Wailuku silty clay is often a dark reddish-brown, having a subangular blocky structure. This soil is geographically associated with the `Īao series of soils, two types of which cover the remainder of the project area.

`Īao soils are derivatives of the series that consist of well-drained soils on valley fill and alluvial fans. These soils all have developed from igneous rock and are located on nearly level to moderately sloping terrain. Soil types within the `Īao series are similar, yet differentiated by the texture of the surface layer and inclusions of a higher content of cobblestones. `Īao cobbly silty clay (IbB)—located in the southeast quadrant of the project area—has a greater content of cobble than the `Īao silty clay (IaA) found within the northeast quadrant. The presence of these soil types was confirmed through geotechnical studies and archaeological testing during the current project. Importantly, no sandy sediment was identified in the project area. Sandy sediment (sand dunes) and mixed coastal-terrigenous sediments occur to the east of this parcel.

TRADITIONAL AND HISTORIC SETTING

PRE-CONTACT TO EARLY HISTORIC ERA

During traditional times, the entire area from Wailuku Valley north to Waihe`e Valley was part of an old land division named *Na Wai `Ehā* ('The Four Waters'), referring to streams contained within several great valleys draining the slopes of the West Maui Range. Wai`ehu Stream, together with Wailuku, Waikapū, and Waihe`e formed *Na Wai `Ehā*, known for the occupancy of chiefly individuals (Kame`eleihiwa 1992; Pukui and Elbert 1992; and Creed 1993). This was said to be the most expansive area of continuous *kalo* (taro) pond-field agriculture in the Hawaiian Islands. Cheever (1851:124) writes: "the whole valley of Wailuku, cultivated terrace after terrace, gleaming with running waters and standing pools, is a spectacle of uncommon beauty to one that has a position a little above it." The landscape between Wai`ehu and Waihe`e, in particular, was extensively modified by terraces and irrigation ditches, from the near-coastal sand dunes to the high upper valleys (Handy and Handy 1972). The present project area is situated on the border of what was likely the southern limit of this extensive *lo`i* system. Later in time, innumerable terraces, irrigation ditches, and associated features were destroyed as these lands were developed for commercial sugar cane cultivation.

Wailuku District, including Wailuku and Wai`ehu Ahupua`a, is frequently mentioned in historical texts and oral tradition as being politically, ceremonially, and geographically important during traditional times (Cordy 1981, 1996; Kirch 1985). Wailuku was considered a "chiefly center" (Sterling 1998:90) with many of the chiefs and much of the area's population residing near or within portions of `Īao Valley and lower Wailuku. The importance of the eastern regions of the district, however, is reflected by the relatively large number of *heiau* that were reportedly present in pre-Contact times. Walker (1931) located and plotted five *heiau* in Wai`ehu, in addition to the thirteen in Wailuku Ahupua`a. Among the Wai`ehu *heiau* are Halelau Heiau (Walker Site 37), Malumaluakua Heiau (Walker Site 39), Kukuikomo Heiau (Walker Site 40), and Puukoa Heiau (Walker Site 41).

No discussion of Wailuku District is complete without mentioning the important *heiau* complex north of `Īao Stream near its seaward terminus. During the mid to late 18th century, the Halekii-Pihana *heiau* complex was supposedly designed by a Hawaiian named Kiha (Sterling 1998:89). These monuments, designated as State Site Number 50-50-04-522, are described as very important *heiau* within Hawaiian history. Yent (1983:7) notes the life cycle of the *ali`i* was represented here. It was the place where Kamehameha I's wife was born, Kahekili lived, and Kekaulike died. Thrum (1917:46) reported that Kamehameha I evoked his war god at Pihana Heiau after his warriors defeated Kalanikupuli's forces during the Battle of `Īao in 1790. The two *heiau* are primarily associated with Kahekili, who is connected with the Halekii-Pihana complex between *c.* A.D. 1765 and 1790, and Kamehameha, during his conquering of Maui in 1792 (Yent 1983:18).

Oral tradition accounts surrounding these *heiau* provide examples of how religion tied into political power in the traditional Wailuku setting. Indeed, the period immediately preceding contact with the Europeans was one of considerable upheaval and conflict. *Wailuku*, meaning 'water of destruction,' succinctly describes the area in the late 1700s. Political power emanating from Moloka`i was an active element in *Na Wai `Ehā* during the mid-eighteenth century. An uprising led by Kahakana of Kaopoko over food acquisitions originated near Wai`ehu. The resulting battle at Kalae`ili`ili (A.D. 1765) led to the expulsion of Keeaumoku and the Moloka`i *ali`i* and the beginning of Kahekili's reign (Kamakau 1992). Kahekili successfully defended his capital in Wailuku throughout the 1770s, until his defeat at the hands of Kamehameha's forces.

Shortly thereafter, Wailuku would again see drastic change after Captain James Cook's 1778 arrival in Kahului Bay. The reign of Kamehameha I was already intertwined with the increasing presence of Europeans within the Hawaiian Islands. By 1821, American missionaries had established a foothold in Lahaina and first arrived in Wailuku a year later. The religion of the Hawaiian people began to wane under the influence of Christianity. Fredericksen and Fredericksen (2002:4) point to a girls' seminary (Central Female Boarding School), established in Wailuku in 1836, as one of the initial steps in the conversion of Hawaiian language and customs in Maui.

Another influence that brought change to Maui was foreign commercialism. Two Chinese brothers, Ahung and Atai, of Honolulu's Hungtai Company arrived in Wailuku to explore the possibility of setting up one of its earliest sugar mills in 1828. Atai soon created a plant that processed sugar cane cultivated by Hawaiians, named the Hungtai Sugar Works (Dorrance and Morgan 2000:15–16). Ahung later joined Kamehameha III's sugar producing enterprise, although by 1844 both operations had ceased. The Wailuku Sugar Company was the next to follow, in 1862, and would expand sugar production over the next 126 years of its existence—4,450 acres by 1939, still more than three decades before its maximum production levels—encompassing much of the lower elevations of Wailuku and Wai`ehu Ahupua`a. As it expanded its territory, the Wailuku Sugar Company cultivated the entire southern half of project area concerning this inventory survey (Dorrance and Morgan 2000:66).

THE GREAT MĀHELE

In 1848, commissioners of the Great Māhele instigated an extreme modification to traditional land tenure on all islands that resulted in a division of lands and a system of private ownership. The Māhele was based upon the principles of Western law. While a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society into that of a market economy (Kuykendall Vol. I 1938:145, footnote 47, *et passim*; Daws 1968:111; Kame`eleihiwa 1992:169–170, 176). The dramatic shift from a redistributive economy to a market economy resulted in drastic changes to land tenure, among other things. As a result, foreigners demanded private ownership of land to ensure their investments (Kuykendall Vol. I, 1938:145, *et passim*; Kame`eleihiwa 1992:178; Kelly 1998:4).

Once lands were made available and private ownership was instituted, native Hawaiians, including the *maka`āinana* (commoners), were able to claim land plots upon which they had been cultivating and living. Oftentimes, foreigners were simply just given lands by the *ali`i*. However, commoners would often only make claims if they had first been made aware of the foreign procedures (*kuleana* lands, or land commission awards). These claims could not include any previously cultivated or currently fallow land, *okipu*, stream fisheries, or many other natural resources necessary for traditional survival (Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). Awarded parcels were labeled as Land Commission Awards (LCAs). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property. Commoners claiming house lots in Honolulu, Hilo, and Lāhainā were required to pay commutation to the government before obtaining a Royal Patent for their awards (Chinen 1961:16).

During the Māhele, Wailuku District was declared Crown Land and numerous Land Commission Awards, approximately 180, were awarded within Wailuku Ahupua`a alone (Creed 1993). A handful of foreigners (*i.e*., Anthony Catalena, James Louzada, E. Bailey) gained control of large parcels of lands that would later be used for mass cultivation of sugar. Significantly, the majority of LCAs were awarded to Hawaiians, a gauge that can be used to measure pre-Contact settlement, since there was little overall change in traditional land use among Hawaiians prior to 1853 (Creed 1993:38).

During the Māhele, a total of 19 land claims were made within the northern portion the current project area, the 60 percent of the subject property that lies within Wai`ehu Ahupua`a (Waihona `Aina 2003). No LCAs were awarded with the lower 40 percent of the project area, the Wailuku Ahupua`a portion. This fact may be attributed to the pre-1848 Hawaiian population within the northern portion of the parcel, a result of agricultural conditions along the border of the two *ahupua`a* favoring Wai`ehu. LCA documents indicate that the lands there, naturally (and likely artificially) irrigated by the Wai`ehu floodplain, were prime areas of traditional cultivation.

A sample of eight LCAs (of the 19 claimed for the property) receiving Royal Patents reveals that the land was used for extensive *lo`i* cultivation, *kula* lands (dry land agriculture), *poalima* (small unit of one's land to be farmed for the chief), *hala* groves (pandanus), *wauke* (mulberry trees used for *tapa* construction), *lokoia* (fishponds), house sites, and a traditional wall (Figure 10; Table 1). These findings keep with the overall LCA pattern of the Wai`ehu-Wailuku area where taro cultivation is in association with permanent residences. Such a pattern is historically documented from 1848, but likely extends deeper into the past. However, much of

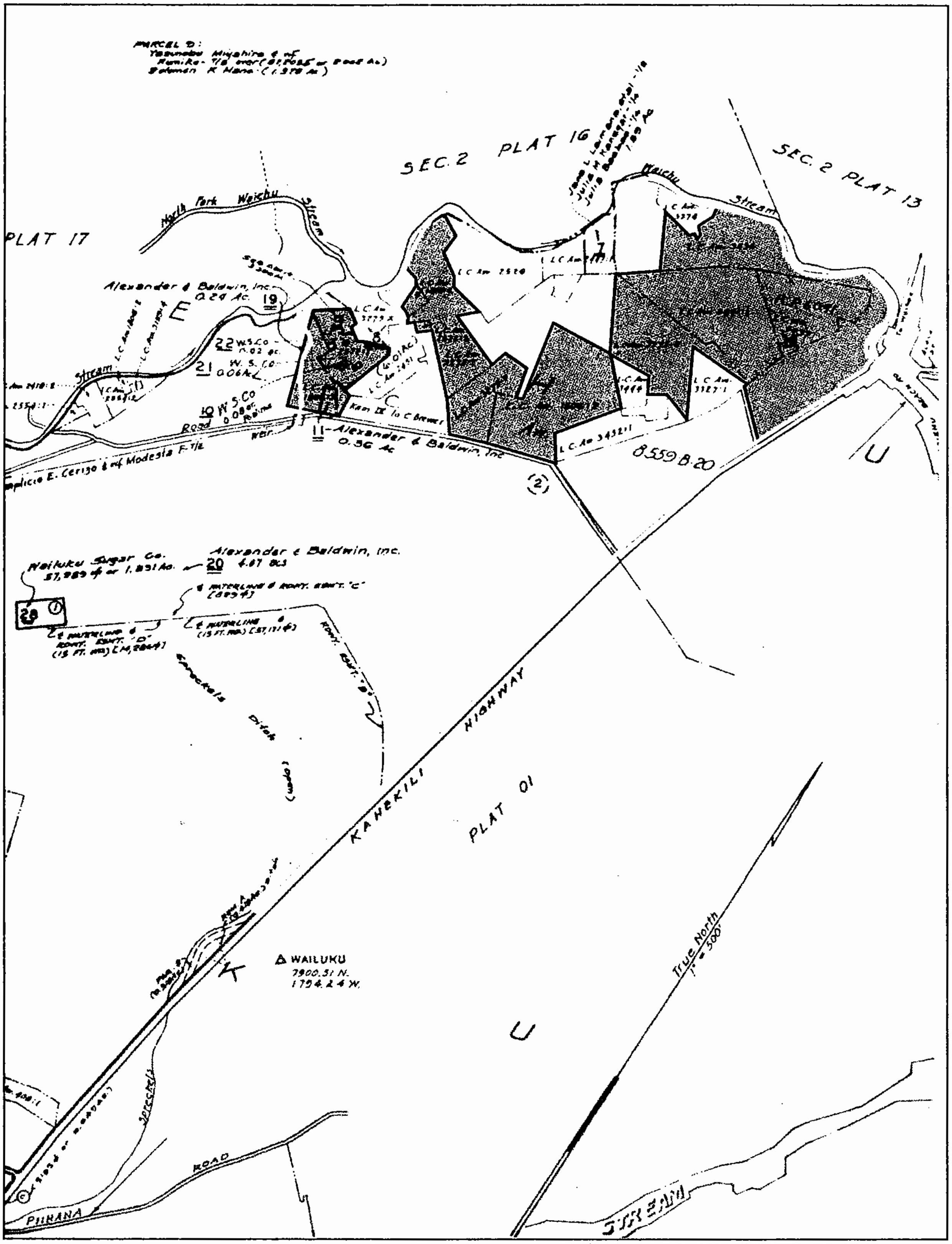


Figure 10: TMK of Project Area with Researched LCAs Highlighted in Orange.

the evidence related to such prehistoric settlement of the Wai`ehu area has been effaced by late historic and modern cultivation.

Table 1: A Sample of Eight LCAs within Project Area and their Contents.

LCA No.	Claimant	Royal Patents Awarded	LCA Contents
03441	Kapoula	1	52 *lo`i* 1 *kula* 1 house lot *lokoia* stream
02572	Maheana	1	42 *lo`i* 1 *hala* grove stream
03437	Kaliuula	2	21 *lo`i* 1 *kula* 2 *hala* groves 1 wall stream
01806	Makalawelawe	1	19 *lo`i* 2 *kula* 2 house lots *poalima* dunes stream
03275V	Keaole	1	7 *lo`i* 1 *kula* 1 *wauke* stream *pali*
03275U	Kaiolani	1	4 *lo`i* 1 *kula* 1 house lot stream
03436	Kapahi	1	2 *lo`i* 2 *kula* 2 house lots stream
03275T	Kahookano	1	2 *lo`i* 1 *kula* *poalima* stream *pali*

THE LATE HISTORIC PERIOD AND GROWTH OF THE SUGAR INDUSTRY

As sugar cultivation became a major market in the economic picture of Maui, northeastern Wailuku District water was needed to irrigate the sugar cane fields in lower

Wailuku. Wailuku Sugar Company took over Waihee plantation in 1895, which had already cultivated the lands within the Wailuku Ahupua`a of the present project area for nearly 30 years. Included in this southern portion of the parcel was the Spreckels Ditch (State Site No. 50-50-07-1508), built by Claus Spreckels for his Hawaii an Commercial & Sugar Company in 1882 (Wilcox 1996:122–124). Wailuku Sugar Company then protested that Spreckels, who needed the ditch's south-flowing Waihee River water to irrigate his fields to the south, did not have a proper right-of-way across what was now its land. However, by the time the issue came to a head, Spreckels had lost control of Hawaiian Commercial. New owners H. Baldwin and S. Alexander agreed to split ditch ownership and maintenance in the area with Wailuku Sugar.

Wailuku Sugar Company ended production in 1988, having averaged over 30,000 tons of sugar produced annually at its pinnacle in the 1970s (Dorrance and Morgan 2000:66). Owner C. Brewer & Company, Ltd. shut down sugar cultivation on the project area, which was then used almost entirely for macadamia nut orchards under the jurisdiction of Wailuku Agribusiness. In January of 2002, Wailuku Agribusiness announced that it was placing the land for sale, thus ending the 137-year presence of commercial agriculture in this region of Wailuku District (Fredericksen and Fredericksen 2002:7).

PREVIOUS ARCHAEOLOGY

In terms of general projects in the Wailuku-Wai`ehu environs, the earliest archaeological endeavors were undertaken by Thrum (1917), Stokes (1918), Emory (1921), and Walker (1931). None of their archaeological finds directly pertain to the current project area; however, their data allows for a deeper understanding of the traditional use of the Wailuku-Wai`ehu area. In addition to recording five Wai`ehu *heiau*, Walker documented Pihani and Haleki`i Heiau within Wailuku Ahupua`a (500 m southeast of the current project area), which lie on the north side of `Īao Valley near the mouth of `Īao Stream (1931:131–144). In more recent decades, the archaeological significance of these important *heiau* has been determined through testing (Yent 1983), restoration, and preservation.

As previously noted, the current project area lies one kilometer north of the lower `Īao Valley portion of Wailuku Ahupua`a, an area of central political and religious importance in pre-Contact Hawai`i. Due to the relatively large traditional settlement in this area of Wailuku District, previous archaeology within Wailuku Town has recorded numerous burials and prehistoric habitation sites. (For a more comprehensive overview of Wailuku Ahupua`a archaeology, see Dega 2003.) However, the current study stands to gain more insight into the project area's historical and traditional land use via an examination of previous archaeology in the northeastern reaches of Wailuku District (Table 2; Figure 11). Previous archaeological research in Wai`ehu and Waihee Ahupua`a is more relevant to the current study than research in areas to the south due to a shared topography, climate, land use, and settlement pattern.

Table 2: Selected Archaeological Research Near Project Area.

Year	Author	Project / Location within Wai`ehu or Wailuku Ahupua`a	Nature of Work	Findings (Site #)
2004	Monahan, C.	Wai`ehu Golf Course (Maintenance Building Project) TMK: 3-2-13: 06	Inventory Survey	Test units and backhoe trenches found nothing of archaeological significance on 1.5 acres
2003	Dega, M.F.	Kehalani Mauka Subdivision, in Wailuku near Waikapu. TMK: 3-5-001:001	Inventory Survey	8 historic sites documented on 349 acres, two of which were previously recorded (50-50-04-5473, -5474, -5197, -5489, -5490, -5491, -5492, -5493), including a reservoir, ditches, historic-modern roadways, historic artifact scatter, plantation-era clearing mounds
2003	Dega, M.F.	Residential construction at 921 Kualoa Place, Wai`ehu. TMK: 3-3-10:06	Monitoring	Negative results: no cultural material or burials within sandy substrate
2003	Donham, T.K.	Residential construction at 1376 Kakae Place, Wai`ehu. TMK: 3-2-20:64	Archaeological Assessment	Negative results: no evidence of cultural material; monitoring not recommended
2002	Fredericksen, E. and D.	Puuohala Mauka Residential Subdivision, Wailuku Ahupua`a TMK: 3-3-2:001 (identical to subject project area)	Inventory Survey	4 sites, two previously unrecorded: a plantation-era boulder/retaining wall/platform (-5195), and coral/shell surface midden scatter (-5196); also the known historic Waihee Ditch (-5197) and Spreckels Ditch (-1508)
2002	Federicksen, E. and D	Wai`ehu Kou Residential Development, Drainage and Diversion Easement	Data Recovery	309 features associated with (-4731); 19 disturbed burials; A.D. 1200–1650
2002	Fredericksen, E. and D.	Paukukalo waterline replacement	Monitoring	4 pre-Contact habitation sites with burials (-5001, -5005, -5023, and -5027), historic burial (-5102), disturbed human remains (-5103)
2000	Fredericksen, D. and E.	Wai`ehu Kou 2 Residential Sew Line Corridor TMK: 3-2-3	Inventory Survey	Habitation site with 3 burials (-4759)
1999	Winieski and Hammatt	Paukukalo Water Replacement project	Monitoring	Burials near Kanai Street
1999	Fredericksen, E. and D.	Wai`ehu Kou 2 Residential Development and Diversion Easement	Inventory Survey	Extensive habitation (-4731) near Wai`ehu Dune; 2 burials; A.D. 1195 to late 1700s
1998	Fredericksen, E. and D.	North Waihe`e Water Source Project, Phases I and II, along Kahekili Highway through both Waihe`e and	Monitoring	6 historic sites: 2 rock walls (-4473 and -4512), former along Kahekili Highway; Old Waihee Sugar Mill (-4409); *kuleana* water flume (-4371);

		Wai`ehu Ahupua`a		the Old Poi Factory (-4372) 1 pre-Contact habitation (-4374) with associated burials, which extends 300 m along K. Highway at toe of Waihee Dune: dated *c.* A.D. 1500 to late 1700s
1997	Fredericksen, *et al.*	TMK: 3-8-07:123, at Lower Main and Wai`ehu Road, Nisei Veterans Memorial Center	Data Recovery	Historic (3112) Kahului Railroad: large pre-contact habitation (3120) with continuous occupation from c. 1200 A.D. to 1700; numerous burials preserved *in situ*.
1997	Fredericksen, E.	North Waihee Water Source Project, Phases I and II, along Kahekili Highway through both Waihee and Wai`ehu Ahupua`a. (Area *mauka* of highway to water tank.)	Monitoring	No cultural deposits: Area under sugarcane cultivation for more than a century
1996	Burgett, B. and R.L. Spear	Lower Main St., Oceanhouse, Inc., TMK: 3-4-39:77	Inventory Survey	Habitation site remnant (-4004); human burials dated A.D. 1420 to 1640
1996	Donham, T.	Wai`ehu Golf Course	Inventory Survey	Mapped human remains found in 27 locations on the dune, 16 of which appeared to represent primary burials
1996	Jones, B., J. Pantaleo, and A. Sinoto	North Waihee Wells Waterline Project	Inventory Survey	5 Sites: rock terrace (-3196); rock terrace along Waihee Stream (-3199); 3 surface scatters of artifacts, midden, and *`ili `ili* stones (-3197); 533 m long wall (-3198); Waihee Bridge foundation (-4097)
1995	Burgett, B. and R.L. Spear	Lower Main St., Home Maid Bakery, TMK: 3-8-37:48	Inventory Survey	Habitation (-3924 and -3925) with human burials. Dated *c.* 1430 A.D. to 1671
1995	Spear, R.L.	Lower Main St., TMK: 3-8-37:48	Inventory Survey	Habitation (-4066) with human burials
1992	Donham, T.	Wai`ehu Golf Course	Data Recovery	2 flexed burials were removed from eroding sand dune (-1189)
1992	Donham, T.	Wai`ehu Kou 1 Residential Development	Data Recovery	Burial (-2917) found in storm drain line excavation and reinterred 3.3 mbs
1992	Folk, W. and H. Hammatt	Wai`ehu Beach lots TMK: 3-2-13:05	Inventory Survey	Surface survey and 9 backhoe trenches produce no cultural material other than 2 buried charcoal lenses (-3115) ranging from A.D. 1300s–1600s
1992	Folk, W. and H. Hammatt	Yagi property in Waihee	Inventory Survey	Several burials and a possible pre-Contact *`auwae*
1989	Donham, T.	Waihee Golf Club	Inventory Survey	270-acre project area found 88 sites with 195 components, including structures, surface midden, lithic scatters, agricultural and residential complexes, ceremonial features, 4 cemeteries, and 4 isolated human graves. Dates from A.D. 960–1330 to modern times.
1988	Clark, D. and J.F. Baliki	Waihee Midden Site	Inventory Survey	Coastal dune site: 4 fire hearths, 4 fire floors, an *imu*, a rock alignment, and artifact clusters. One date of A.D.

				1010–1150 from 2.0 mbs
1987	Trembly, D.	Wai`ehu Planned Development	Monitoring	Remains of 6 individuals displaced by construction along Wai`ehu Beach Road
1983–1984	Yent, M.	Halekii-Pihana State Monument: Phase I, Wai`ehu	Survey, Test Coring	Halekii (-4592): *ili-ili* stones, shell, charcoal. No evidence of cultural deposit earlier than construction date. Pihana (-4592): *ili-ili* stones, shell, human and pig bone, human burial left *in situ*
1983	Bordner, R.	Wai`ehu housing Development, Environmental Impact Study Corp.	Survey, Excavation	Historic military features only.
1982	Han, T.	Wai`ehu Heights Subdivision	Inventory Survey	4 additional sites—2 burials, a lithic/midden scatter, and a possible quarry; as well as located a walled *ka`a* fishpond—are added to previous fieldwork which revealed (2 sites) a burial and a walled terrace
1978	Cordy, R.	Waihee Stream Hydroelectric power project	Survey	Numerous sites. Formulated model for predicting general location for 6 functional sites types: temporary and permanent habitation sites, dryland and wetland agriculture, burials, and *heiau*
1978	Kelly, M., Y. Sinoto, and R. Cordy	Wai`ehu Heights Subdivision	Survey, Data Recovery	Over 20 historic coffin burials exposed during bulldozer activity in dune area
1973	Hommon, R. and R. Connolly	State Register of Historic Places	Survey	Limited fieldwork on 4 sites: Wai`ehu Dune burials (-1185); burial cave (-1186); Wai`ehu Golf Course burials (-1188); Wai`ehu midden site (-1189)
1966	Kirch, P.	Wai`ehu Golf Course	Survey	Southern section of an exposed extensive midden site (-1189) along beach, as well as northern section (-1796)
1931	Walker, W.	*Archaeology of Maui*	Island-wide investigation	Among other records, documents 5 *heiau* in Wai`ehu and 13 *heiau* in Wailuku
1918	Stokes, J.F.G.	"... Heiau of Maui."	Island-wide investigation	Among other records, documents *heiau* in Wailuku District
1917	Thrum, T.G.	"Maui's Heiau ..."	Island-wide investigation	Description of Wailuku's Pihana Heiau, among other records

(Table 2: Adapted from Fredericksen and Fredericksen 2000:12–13, 2002:12–13).

While no previous archaeological work has been conducted within the project area itself, at least two past investigations have shared borders with this property. Of most relevance to the current study is Fredericksen and Fredericksen's (2002) Puuohala Mauka Residential Subdivision report, an Inventory Survey conducted on a 470-acre parcel sharing the current project area's southern Spreckels Ditch perimeter. Having the same TMK number, the history of this parcel's commercial cultivation is identical to that of the current project area. The 470 acres

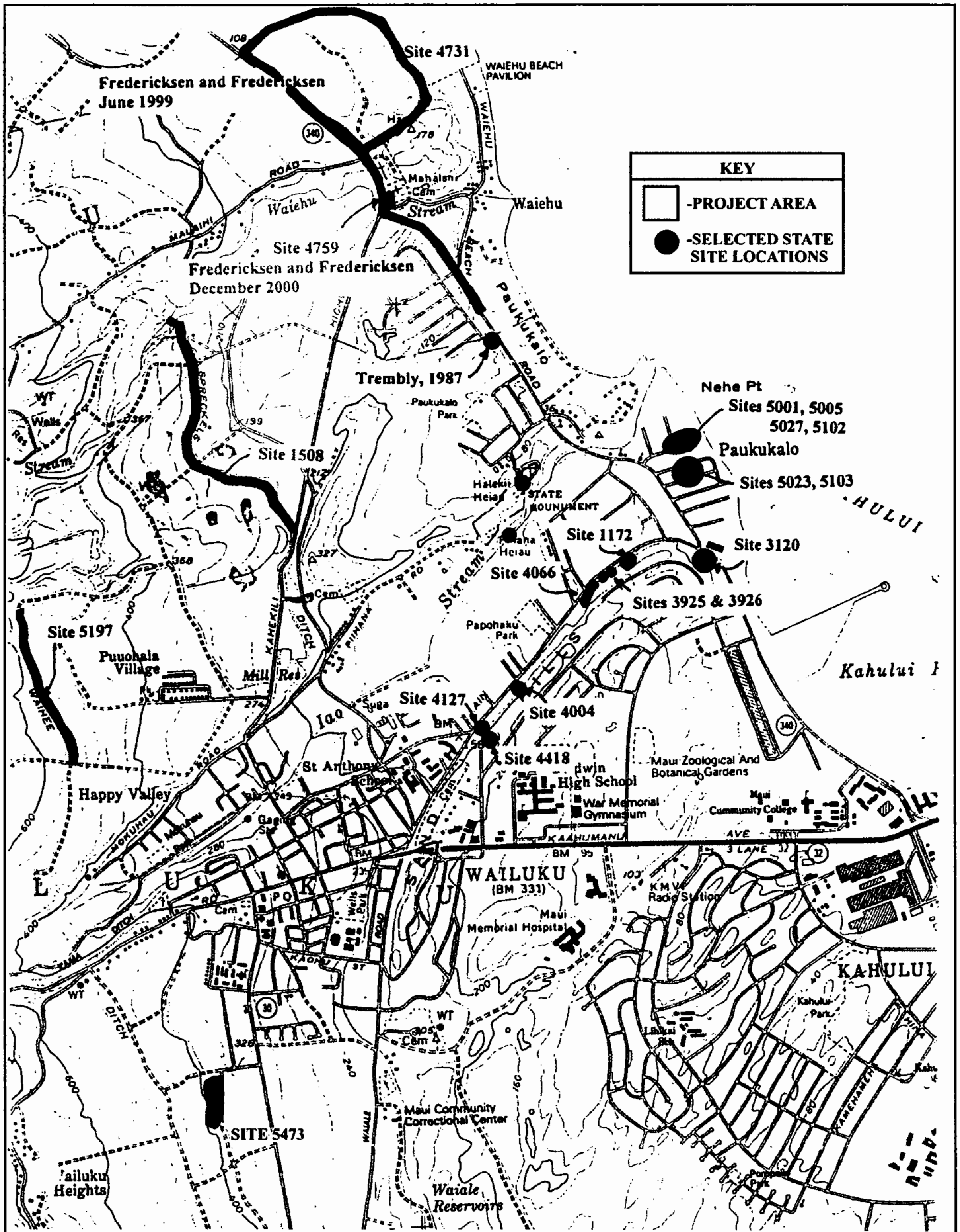


Figure 11: Selected State Site Locations Near Project Area. Adapted from Fredericksen and Fredericksen 2002:Map 5.

had also been under Wailuku Sugar Company's plantation and subsequently planted with macadamia trees decades later. Thus, unsurprisingly, Fredericksen and Fredericksen documented two previously numbered State Site ditches from the sugar days—Waihee (-5197) and Spreckels (-1508). The two other sites recorded are a possible plantation-era boulder retaining wall/platform (-5195) and a "very low-density" surface scatter (-5196) of coral and shell (2002:31–32).

Another of the Fredericksens' studies shares the northeast Kahekili Highway border with the current project area. The *Archaeological Inventory Survey For the Wai`ehu Kou Sewer Line Corridor* involved a segment of excavation less than 25 meters *makai* of the current project area (2000:5, 38), in which a "low-density, probable pre-contact habitation site" (4759) was associated with three probable pre-Contact burials. The Fredericksens' two studies provide an example of the *mauka-makai* shift in archaeological site types within the southern Wai`ehu/ northern Wailuku Ahupua`a. Parcels having sandy deposits *makai* of Kahekili Highway are more likely to contain historic or traditional burials, as well as cultural material associated with pre-Contact Hawai`i. Parcels *mauka* of Kahekili Highway are likely to have a history of intense land alteration by commercial cultivation that likely destroyed much evidence of traditional use. That which remains in these areas is often a remnant of temporary habitation or wetland and dryland agriculture. A sampling of previous archaeology within the area lends to this observation.

In 1966, the Bishop Museum conducted a reconnaissance survey in coastal Wai`ehu. Patrick Kirch recorded a site (-1189) that extended from the Wai`ehu Golf Course north to Kalepa Gulch and beyond. The site contained midden that was exposed along the beach. Hommon and Connolly recorded this as the Wai`ehu Midden Site in 1973, along with the Wai`ehu Dune burials (-1185), a burial cave (-1186), and Wai`ehu Golf Course burials (-1188). The extensive Wai`ehu midden site was later divided and renumbered as Site -1189 (southern portion) and Site -1796 (northern portion) [Donham 1989:8].

Between 1978 and 1983, the Bishop Museum conducted three surveys in Wai`ehu. The first was a field inspection of burials and cave sites that had been found during the construction of the Wai`ehu Heights Subdivision. Over twenty historic burials were identified, but the cave sites did not yield cultural deposits. Nothing of significance was found in the reconnaissance survey of additional construction areas within the subdivision (Kelly, Sinoto, and Cordy 1978:5).

Cordy's 1978 survey of a proposed hydroelectric power plant involved a project area on both sides of the Waihee Stream beginning at about 120 meters amsl and continuing up into the valley to about 305 meters amsl. He located 13 sites consisting of over 71 features. These included 4 terraced platforms, 2 enclosures, an alignment, a pavement, and numerous terraces and canals (Cordy 1978:55). Cordy proposed a model predicting the general location probabilities of 6 site types—permanent and temporary habitation, dryland and wetland agriculture, burials, and *heiau*. He concluded that permanent habitation was found primarily along the coast and lower valley slopes, with *heiau* and burials associated; temporary habitation was most often located in upper valley slopes and stream flats, along with wetland agricultural sites, which would be present in swamps as well as on stream flats; and dry-land agricultural sites along non-valley slopes or on alluvial fans at the base of mountain slopes (Cordy 1978:58). No such comprehensive study has been done in Wai`ehu Stream Valley. But because of the close proximity and the fact that Waihee and Wai`ehu Streams were both parts of the larger *Na Wa Eha*, Cordy's model would seem to apply to the location of the project area.

In 1979, Han conducted a reconnaissance survey of another increment of the Wai`ehu Heights Subdivision and found two sites—a burial and a walled terrace. In 1989, she returned to excavate these sites, and located 4 additional sites: 2 burials, a lithic/midden scatter, and a possible quarry (Han 1989, 1979). Construction on Wai`ehu Dune has also exposed numbers of burials. In 1986, Trembly identified 6 individuals from collected scattered skeletal material, displaced by the construction of the Wai`ehu Planned Development along Wai`ehu Beach Road (Trembly 1987).

The most extensive archaeology in this part of Wailuku District has involved the Waihe`e Golf Club Project. An archaeological inventory survey was conducted in 1989 by Paul H. Rosendahl, Inc. (PHRI) on this 270-acre project area. Topography included coastal flats and sand dunes, swampy lowlands and fringe areas, high inland dunes, and a broad alluvial fan. Eighty-eight sites with a minimum of 195 component features were identified, of which 37 are habitation sites. Human burials are represented by 4 cemeteries, 4 isolated graves, and 8 sites that had a ceremonial function. Dated cultural material ranges from A.D. 960 to 1330 (Donham 1989).

Closer to the current project area, Wai`ehu Golf Course beach erosion revealed two flexed burials in 1992 (Donham). In 1996, more human remains were inventoried and mapped on the Wai`ehu Sand Dune (Site -1185). The remains were recorded on the surface in 27 different locations, 16 of which appear to represent primary, *in situ* burials (Donham 1996).

Further support for Cordy's 1978 model of site type location is Aki Sinoto Consulting's *Waihee Wells Transmission Waterline Project* inventory survey. This survey extended along an 8-kilometer corridor that included lands less than 300 meters *mauka* of the current project area. Five sites were recorded: three historic properties and two terraces likely associated with a traditional *lo`i* complex (Jones *et al.* 1996). Likewise, the North Waihee Water Source Project Phase III impacted no cultural deposits during its 400 meter-long Wai`ehu trenching segment that was west of Kahekili Highway. The three gulches crossed by the pipeline were all found to have been disturbed previously by post-Contact agriculture (Fredericksen 1997). Due to the decreased probability of burial discoveries and traditional sites on the western side of Kahekili highway, sections of the water line were re-routed to the *mauka* side of the highway (Fredericksen and Fredericksen 2000:10).

SETTLEMENT PATTERN

Archaeological settlement data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward sides of the main islands, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). Archaeological dates for initial occupation of the Hawaiian Islands far pre-date accepted ranges gathered from palynological data. A more conservative estimate for initial occupation of the islands is the A.D. 9th century (Athens 1997), if one is to lay more credibility with the pollen record than the archaeological record. In the Waihe`e and Wai`ehu areas of Wailuku, Kirch (1985:87) notes that "a number of coastal dune midden sites have been reported, and at least one of these contained pearl-shell fishhooks similar to those from the Bellows Site, eroding from the wave-cut midden." (The Bellows site, located on the windward coast of O`ahu, has yielded the controversial data of occupation dates from A.D. 300 to 600 [Pearson *et al.* 1971], one of the earliest dated sites in the Hawaiian Islands. For the most part, these dates have now been diagnosed as problematic and are no longer considered valid.)

More recent research within Wailuku Ahupua`a indicates that the area was likely settled between *c.* A.D. 1100 (Kirch 1985:142) and A.D. 1200 (Fredericksen and Fredericksen 1996), whereas *ahupua`a* to the northeast have produced slightly earlier date ranges (see Table 2). The earliest dates recovered thus far that are in the immediate vicinity of the project area are from the Waihe`e Golf Course project—A.D. 960 (Donham 1989)—and from a sample collected by Clark at Site -1796, A.D. 1010 to 1150 (Clark and Balicki 1988:11).

The earliest populations purportedly used local resources and seldom ventured into upland valleys. Cordy (in Creed 1993) suggests, however, that upper valley areas on windward coasts were likely populated before the A.D. 1100s. Coastal settlement was still dominant, but populations began exploiting and living in more upland *kula* zones. Greater population expansion to inland areas did not occur until the *c.* A.D. 12th century but continued through the 16th century. Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands. Upland areas of Maui such as the Waiohuli-Kula area contained large garden enclosures, ceremonial structures, and permanent habitation sites by *c.* A.D. 1600.

To the southwest of the current project area lies `Īao Valley, one of the most important locations in the area for prehistoric activity. Connolly (1974:5) states that the pre-Contact valley [`Īao] had a large population base with "most people residing in a settlement near `Īao Needle," roughly one kilometer south of the project area. Supposedly, the subsistence base of this population consisted of fish and taro, with Kahului Harbor close by and *lo`i* systems lining `Īao Valley's stream banks. Prehistoric ditches or *`auwai* were utilized in taro cultivation (Connolly 1974:5).

Nearer the coast in lands like the current project area (*c.* 40–85 meters amsl), taro was cultivated along stream courses (such as the northern portion of the project area), dryland taro was grown on *kula* lands, and populations settled there as well. In the southern portion of the current parcel, however, no LCA records exist. This distinct settlement division of the parcel between north and south is a reflection of the location of the most favorable agricultural lands within the Wai`ehu floodplain. It would be four decades after the Great Māhele that the Spreckels Ditch would irrigate the southern portion of the project area, optimizing sugar cultivation.

PROJECT AREA EXPECTATIONS

Based on evidence from other archaeological projects conducted in the area, knowledge of area settlement patterns, and key facts about the project area's environment, the expectations for finding certain archaeological sites was high (*i.e.*, more recent sites, like those relating to historic agriculture) whereas expectations for finding other types of sites were somewhat lower (*i.e.*, older sites that might have been encroached upon by earth moving from historic agriculture). Among those types of sites that had a high probability of occurring on the project area were remnants of the sugar cane era. Traditional Hawaiian agriculture was also practiced on the property in the early historic period, and likely for generations prior to the Great Māhele as well. However, the expectations for finding sites representative of these earlier time periods decrease proportionally to the increase in years of intense historic-era agricultural land alteration. Finally, the limited expectations of inadvertently encountering burials on the property was a result of soil stratigraphy and information gathered from previous archaeology.

Prior to fieldwork, high expectations for locating historic sites were supported by archives from the sugar era. Indeed, the historic Spreckels Ditch was already known to form a boundary of the project area, and the property was likely to contain more subtle remnants of its more than one hundred years of sugar cultivation. Archaeological work on adjacent parcels (see Table 2) recorded numerous plantation-era sites, such as drainage systems and clearing mounds.

Although land clearing for both sugar cane and macadamia orchards had changed much of the surface landscape, it was believed possible, through subsurface testing, to locate evidence of remaining LCA agriculture. Selected archival research indicated that 149 *lo`i*, 9 *kula*, 2 *poalima*, 3 *hala* groves, a l*okoia*, and a *wauke* (see Table 1) were contained in what amounted to less than half of the LCAs present in the Wai`ehu Stream floodplain. Also included in this area were two house sites and a traditional wall. The chances of locating evidence of traditional Hawaiian agriculture depended largely on how much of the evidence survived over a century of intense land alteration. Even in areas where the upper 0.75 m to 1.0 m layer has undergone continuous cultivation, it is quite possible that there may still be pre-Contact cultural materials beneath the historic and modern agricultural disturbance. As Handy and Handy note, ". . . in the early days the terraces were nearly contiguous in a belt between the sand dunes and the present [Spreckels] ditch" (1972).

Because burials associated with historic and prehistoric periods were documented within very short distances of the project area's Kahekili Highway border, the possibility of uncovering inadvertent human remains was considered possible. The probability of encountering burial locations decreased as *mauka* distance from the highway increased. Burial expectations lowered further when soil analysis of property's eastern border proved the terrain to be quite different than the *makai* side of the highway where the Mahalani Cemetery is positioned. Soils on the project area here are a dark brown silty loam whereas the sandy matrices to the east are likelier to contain human remains.

METHODOLOGY

FIELD METHODS

Fieldwork consisted of systematic pedestrian survey of the entire 240-acre parcel, followed by subsurface testing in the form of mechanically-excavated stratigraphic trenches and hand-dug test units across portions of the parcel thought to be the least affected by late-historic and modern cultivation. The pedestrian survey was conducted to assess the presence/absence of surface features and artifacts as well as to gauge soil deposits amenable to testing. Although in some cases vegetation was thick, a 100-percent survey was conducted by two to three crewmembers spaced five meters apart, walking parallel along north-south transects. When any structures, artifacts, or intriguing topographical changes were identified, they were recorded in detail and flagged. Surface artifact assemblages, surface features, or anomalies were assigned temporary site numbers. Thirteen temporary sites were recorded. The location of each site in reference to other sites and the project area was recorded on a project area site map (see Figure 4).

After the survey was complete, the crew returned to each flagged location to more fully investigate the area and assess excavation potential. Hand-tested excavation occurred at two sites, T-12 and T-15. These sites were also mapped in detail in support of the excavation. Additionally, six mechanically-excavated stratigraphic trenches were dug in areas thought most likely to be have been LCA locations. Sites for stratigraphic trenches were also chosen at the few locations that seemed the least impacted by recent earth moving—namely, within a few meters south of Wai`ehu Stream. These trenches were excavated in order to get a larger sample size of the stratigraphy in the area as well as to test for subsurface features. The details of all excavations were recorded by a crew of field archaeologists.

LABORATORY METHODS

While the stratigraphic trenches yielded little in the way of cultural materials, many artifacts were found within the test units at sites T-12 and T-15. A single radiocarbon sample was submitted for analysis to Beta Analytic from T-15, Feature B, TU-4, Layer II. A sizeable historic artifact component was recovered from the surface of the parcel and within excavations at the sites. These artifacts were catalogued, analyzed, and interpreted in the laboratory. Laboratory work also consisted of drafting the stratigraphic profiles, mapping illustrations, and section drawings. All field notes, maps, photographs, and artifacts pertaining to this project are being curated at the SCS laboratory in Honolulu.

RESULTS

PEDESTRIAN SURVEY RESULTS

A 100-percent pedestrian survey of the project was performed by several SCS field archaeologists who identified thirteen sites (Table 3) on the property in addition to collecting 22 surface finds (see Appendix A), mostly from a historic period. Of these sites, one was a previously recorded historic state site (Spreckels Ditch), nine others were new sites from the historic period, one was a terrace complex from the late prehistoric to late historic times, and two were isolated finds, likely from the early historic period. The sites mostly related to historic-era agricultural production—including drainage and irrigation ditches, erosion control berms, and access roads. Hand-tested excavation was performed on two sites, T-12 (a terrace/mound) and T-15 (a terrace complex) in order to gain more information about the sites.

Table 3: Temporary Sites Recorded within Project Area.

Temp. Site No.	Features	Form	Function	Dimensions	Age	Testing
T-1	—	Ditch	Cane field drainage	250.0 m by 10.5 m	Historic	None
T-3	Dozens	Agricultural berms	Cane field erosion control	100.0 m by 8.0 m	Historic	None
T-4	—	Lithic	Isolated Find	N/A	Early historic	None
T-5	—	Marine Shell	Isolated Find	N/A	Historic	None
T-6	—	Ditch/swale	Cane field drainage	700.0 m by 11.0 m	Historic	None
T-7	2	Ditch; boulder mound	Cane field Irrigation	60.0 m by 2.3 m	Historic	None
T-9: State Site No. 50-50-07-1508	—	Spreckels Ditch	Cane plantation irrigation	1,050.0 m by 7.0 m (within project area)	Historic, built in 1882	None
T-10	—	Dirt road	Cane field Motorized vehicle access	125.0 m by 4.0 m	Historic	None
T-11	—	Dirt road	Cane field/ piggery access	35.0 m	Historic	None
T-12	2	Terrace and mound	Agriculture/ cane field clearing	30.0 m by 15.0 m	Historic	TU-1
T-13	—	Graded dirt road	Cane field access	60.0 m by 4.0 m	Historic	None
T-14	—	Concrete foundation	Piggery	19.5 m by 13.4 m	Historic	None
T-15	5	Terrace complex	Agriculture	80.0 m by 25.0 m	Early historic	TU-2, 3, and 4

TEMPORARY SITE 1 (T-1)

T-1 consisted of a historic-era drainage ditch located on the southern end of the project area (Figure 12). This dry ditch measures 250.0 m long (within project area) by 10.5 m wide. It is oriented in a southwest-northeast (upslope-downslope) direction. The ditch has an earthen berm surrounding it, thus making it measure 1.1 m on its exterior (*i.e.*, from ground surface to the top of the berm) and 2.8 m on its interior (*i.e.*, from bottom of ditch to top of earthen berm). The bottom of the ditch is covered with water worn pebbles and at 1.8 m wide is considerably narrower than the surface width. The feature was found unaltered and in good condition.

This gently curving ditch crosses underneath an elevated Spreckels Ditch (T-9 or -1508) flume, and underneath a paved access road. The ditch is routed through a culvert beneath the road that is plugged with soil and debris. T-1 intersects with several T-3 berms presumably to allow heavy rainwater to flow off the cultivated land and enter ditch. T-1 appears to have been part of a larger irrigation complex.

TEMPORARY SITE 3 (T-3)

T-3 consisted of dozens of features, a collection of historic earthen berms scattered throughout the macadamia nut plantation. On average, the features measured about 100.0 m long by 8.0 m wide. For the most part, they were oriented across slope (east-west); however, there were several in lower portion of the property (near the highway) that ran upslope-downslope, likely positioned for optimum drainage. These appeared to predate the macadamia nut orchards, as these trees and the windrow pine and eucalyptus species were planted on top of the berms. T-3 intersected and cut into the T-1 ditch at the southern end of this parcel, likely to allow drainage from upslope T-3 areas (see Figure 4).

TEMPORARY SITE 4 (T-4)

T-4 consisted of three lithics found isolated from any specific feature or excavation. T-4 artifacts were located on the surface in the macadamia nut plantation downslope from the paved access road. These lithics were basalt debitage—specifically an interior flake, a flake with polish, and a piece of volcanic glass debitage. They are consistent with the formation of traditional tools, but this does not preclude them from being made in the historic or modern era. Because the debitage is otherwise nondiagnostic, its period of use is merely implied to be early historic or traditional.

TEMPORARY SITE 5 (T-5)

T-5 was a single *Conus* sp. shell isolated find weighing 29.6 grams. It was found on the surface of the north side of a graded road, downslope of the paved access road (Figure 13) and

Figure 12: Site T-1, a Ditch. View to North.

Figure 13: Site T-5, the Marine Shell Isolated Find Marked with Red Flagging Tape (at center). View to Northwest.

appeared to be friable and worn. It was not associated with any particular feature and was given a site number in order to classify its location. Its association with any particular time period is unknown; however, its degraded appearance suggests it is old, perhaps from the historic period.

TEMPORARY SITE 6 (T-6)

T-6 is a historic drainage ditch/swale located in the central portion of the property and intersecting Wai`ehu Stream near the highway. The ditch was 70.0 m long by 11.0 m wide and was about 1.1 m high (Figure 14). It was oriented in a southwest-northeast direction. The wide ditch appeared to be cut by a bulldozer instead of excavated by a backhoe. It provided a path for storm runoff in the northern portion of the macadamia nut plantation. T-6 followed a natural, subtle drainage basin to Wai`ehu Stream. This ditch was noted on the USGS map as an 'intermittent drainage.' The feature was considered to be in good condition although obscured by tall, thick grasses in some areas.

Figure 14: Site T-6, a Ditch/Swale. View to North.

TEMPORARY SITE 7 (T-7)

T-7 consisted of two features, a ditch (Feature A) and boulder mound (Feature B) at the north end of the ditch (Figure 15). The site was located on a steep slope at the northwest end of the property, upslope of Wai`ehu Stream. T-7 was from the historic era and likely used as an irrigation ditch for the sugar plantation.

Feature A

Feature A, the ditch, measured 60.0 m long by 2.3 m wide by 0.4 m deep and was oriented in a north-south direction. It appeared to have been truncated by erosion on its southern side (Figure 16). A bottle from the 1940s was observed in association with the ditch (see Figure 15).

Feature B

Feature B, a boulder mound consisting of various sized boulders and measuring 3.0 m long by 1.6 m wide by 1.1 m high, was located on the ditch's northern end (Figures 17 and 18). The mound was probably created during clearing for the sugar or macadamia plantation—evidenced by a probable earthen dozer berm 4.0 m upslope. While the ditch might have extended beyond this mound, it was unidentifiable due to massive earthmoving. The ditch was considered to be in poor condition as its northern and southern ends were obliterated.

STATE SITE 50-50-07-1508 (SPRECKELS DITCH)

The Spreckels Ditch, designated Site T-9 during pedestrian survey, comprises a very long irrigation ditch that forms the western boundary of the southern half of the project area, from the *mauka* side of the property to the highway. The ditch measures approximately 1,050.0 m long by 7.0 m wide within the project area, and is oriented in a northwest-southeast position. The depth of the ditch is as high as 1.5 m and this site is still in use. In some places it is still surrounded by earthen berms (see Figure 8), in others it is concrete-walled (Figure 19). It has also been channeled into a pipe to accommodate an earthen road that crosses over the top of it. Spreckels Ditch crosses over Site T-1 on a short aqueduct (Figure 20). This ditch was used to irrigate much of the former agricultural land on the southern half of the project area.

TEMPORARY SITE 10 (T-10)

T-10 was a historic vehicular road located in the northwestern end of the property between a paved road and Wai`ehu Stream. This dirt road measured over 125.0 m long by 4.0 m wide. The road was oriented in a southwest-northeast position. The origin of this road diverged from an existing paved road, but soon trailed off in open grass between the macadamia nut trees and some *koa haole* trees near the stream. The trees were planted to accommodate the road; no t

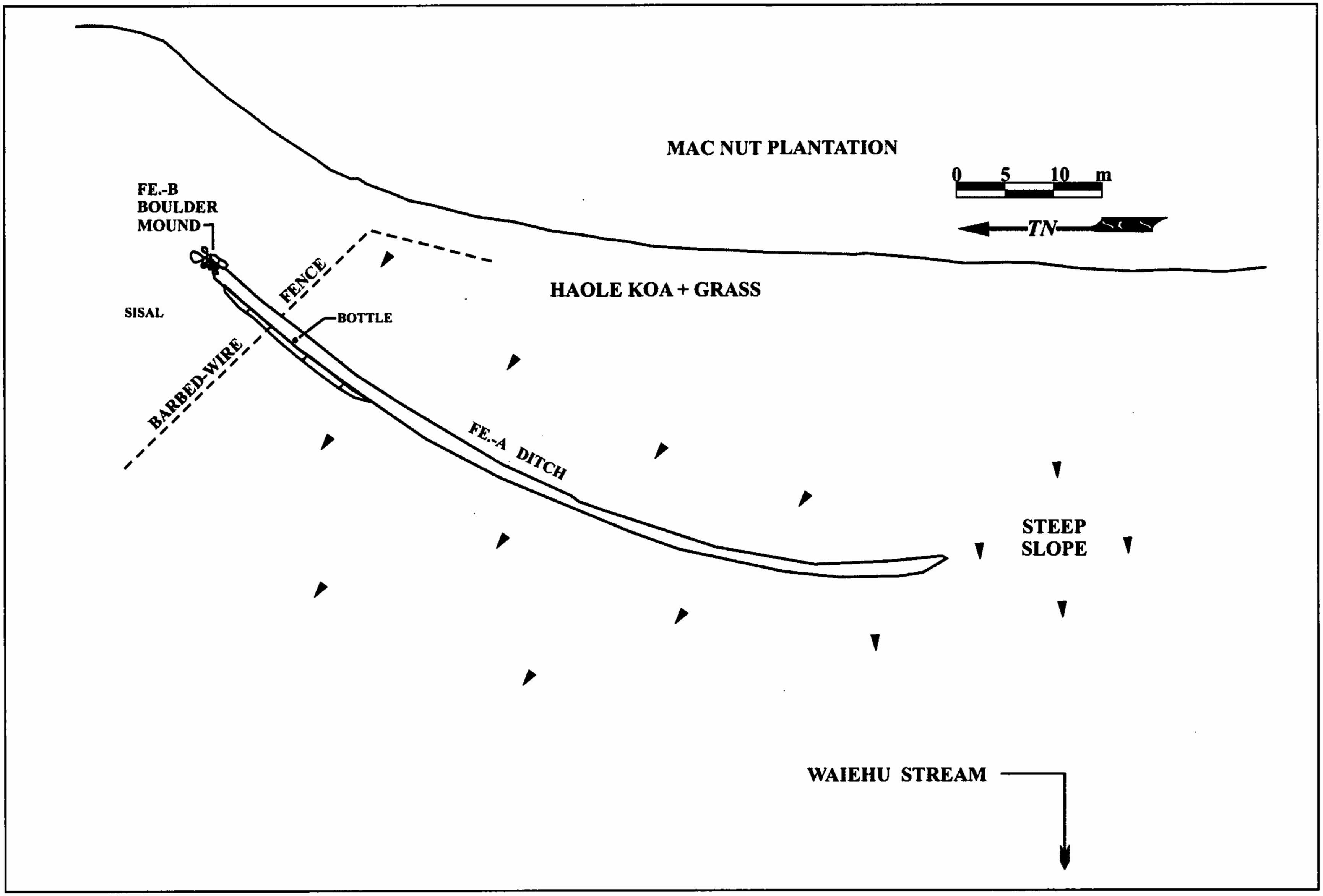


Figure 15: Site T-7 Map.

Figure 16: Site T-7, Feature A, a Ditch. View to Southwest.

Figure 17: Site T-7, Feature B, Boulder Mound. View to Northeast.

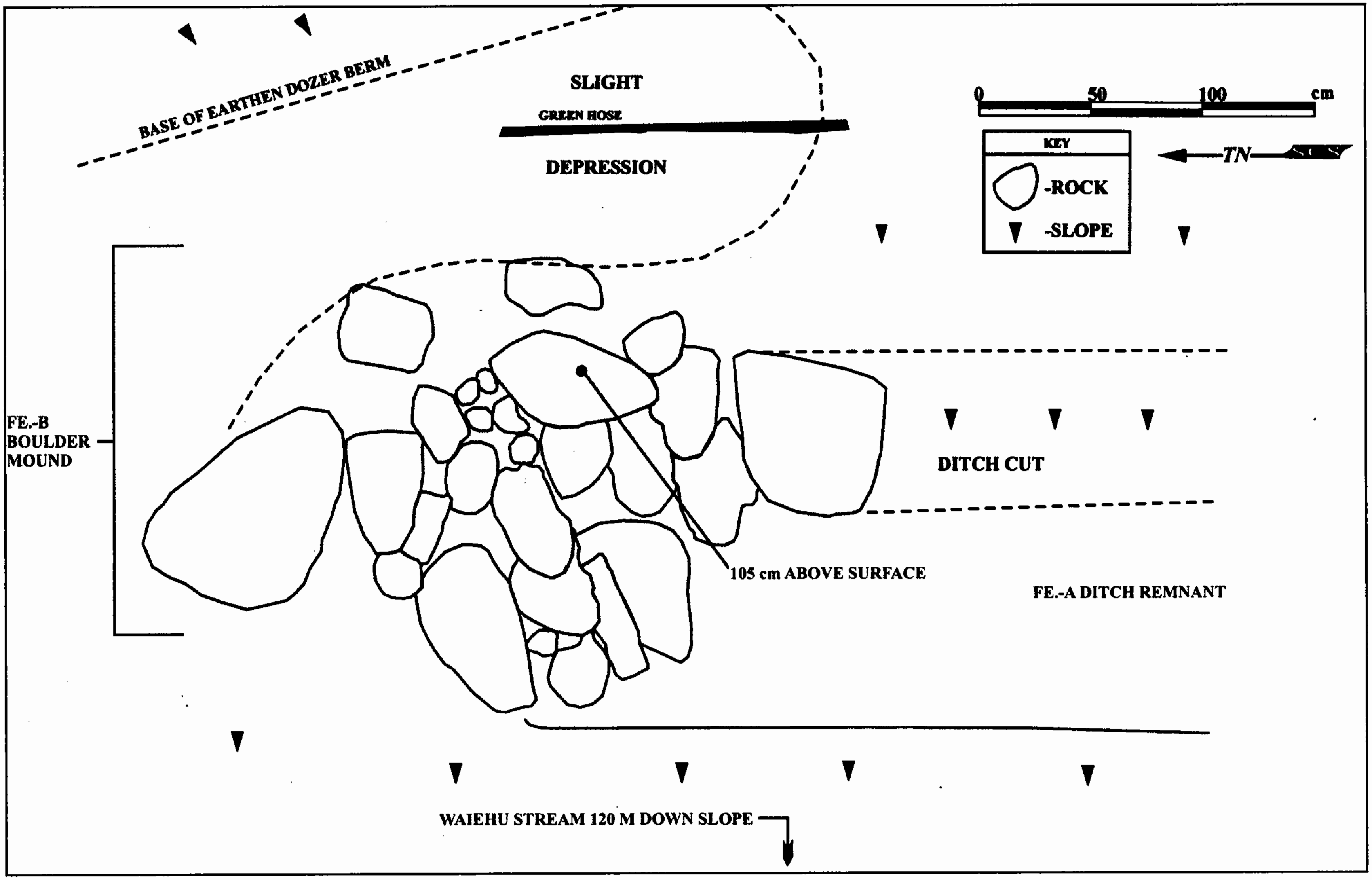


Figure 18: Site T-7, Feature B Map.

Figure 19: Portion of Spreckels Ditch (State Site -1508). View to North.

Figure 20: Spreckels Ditch Crosses Over Site T-1 Ditch via this Aqueduct. View to North.

trees or shrubs grew in its path. However, the density of the grass made the road impossible to document further than 125.0 m (see Figure 4).

TEMPORARY SITE 11 (T-11)

T-11 was a historic road, which was located in the northwestern corner of the property beside Wai`ehu Stream, immediately south of the bridge. This short road served as an access road to the piggery and former sugar cane fields. It measured 35.0 m long and was oriented in a north-south position. This road diverged from a paved road and continued into tall grass, beyond which point it was untraceable. The road (at least the portions able to be documented) was marked on both its south and north ends by iron and wooden posts. T-11 may have connected to T-10 at one point, although both roads disappear in the high foliage on the Wai`ehu Stream flood plain.

TEMPORARY SITE 12 (T-12)

Site T-12 contained two features, a terrace (Feature A) and a mound (Feature B), that were related to early historic/historic-era agriculture and clearing. T-12 was located on the south side of Wai`ehu Stream on a steep, north-facing slope. T-12 was adjacent to the upslope portion of T-13, a dirt road. The site measured 30.0 m long by 15.0 m wide and was oriented east-west. These features could be related to a field-clearing effort in the early sugar cane period or early historic LCA homestead agriculture.

Feature A

Feature A was the broad rock terrace, which was located on a steep slope and constructed of sub-rounded boulders and cobbles with some pebbles (Figure 21). Feature A measured 10.3 m long by 6.0 m wide and was oriented southwest by northeast. The terrace resembled a mound except at the top of the feature, which coincided with the brow of a hill (Figure 22). This area was leveled off. Ceramic, metal from machines, concrete pillars and fragments, plastic tubing, and aluminum were found on the surface of the feature. Feature A was considered to be in fair condition.

T-12, Feature A, Test Unit 1 (TU-1)

One test unit, TU-1, was placed in Feature A to investigate the use of the feature more thoroughly. The unit measured 50 cm by 50 cm and was situated over a portion of the feature's architecture and its level soil area (Figure 23). The unit yielded two layers as follows.

Layer I was 10 cm deep and was a loose, black (5YR 2.5/1) moist silty clay that contained small basalt rocks ranging in size from 5 cm to 25 cm (Figure 24). Roots from a

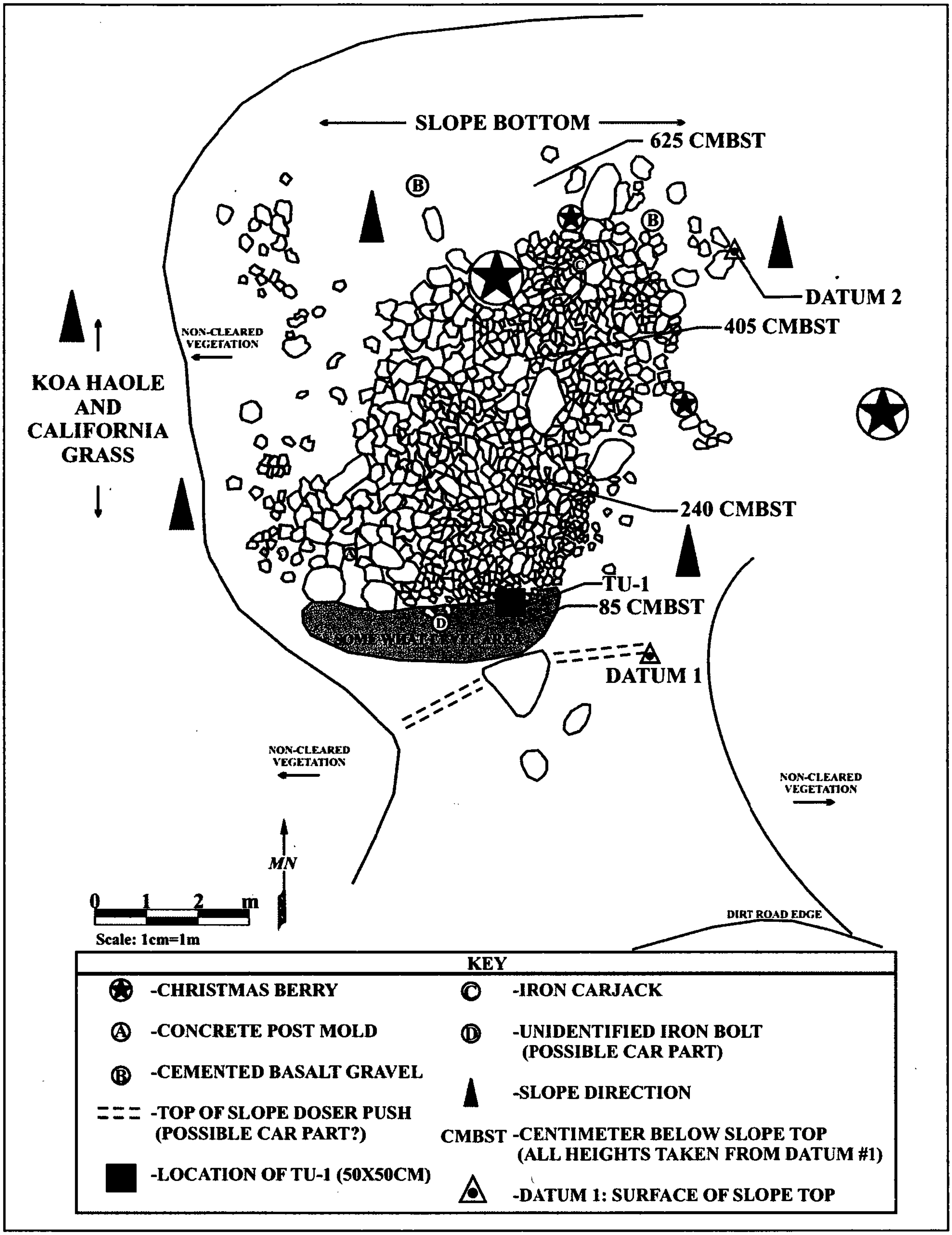


Figure 21: Site T-12, Feature A Map.

Figure 22: Site T-12, Feature A, Broad Rock Terrace. View to East.

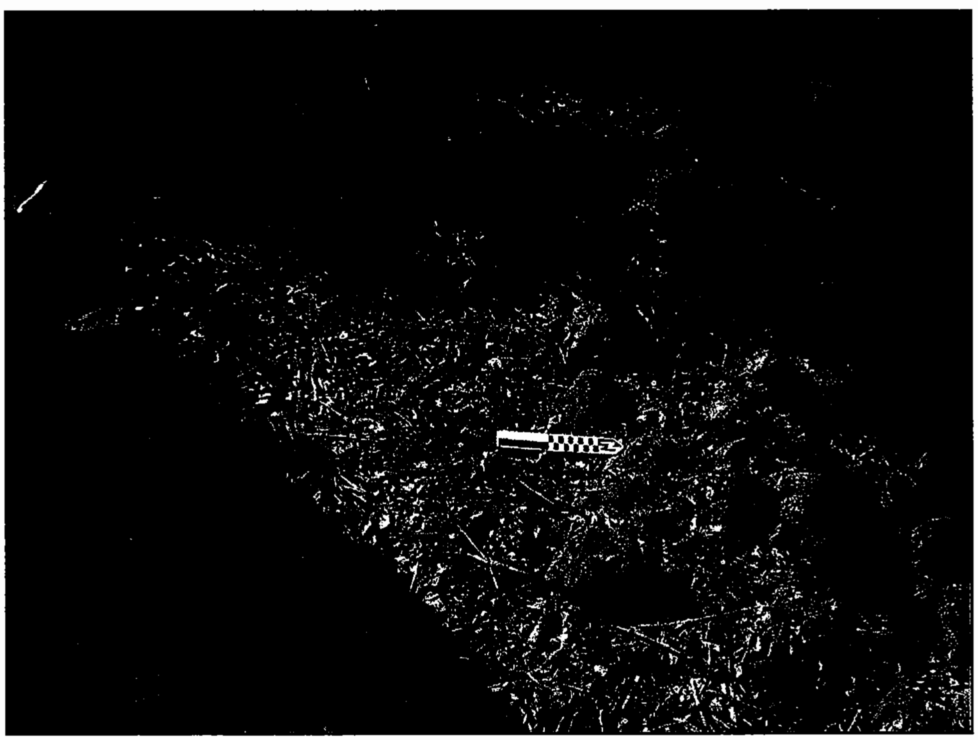


Figure 23: Site T-12, Feature A, TU-1, Pre-excavation. View to West.

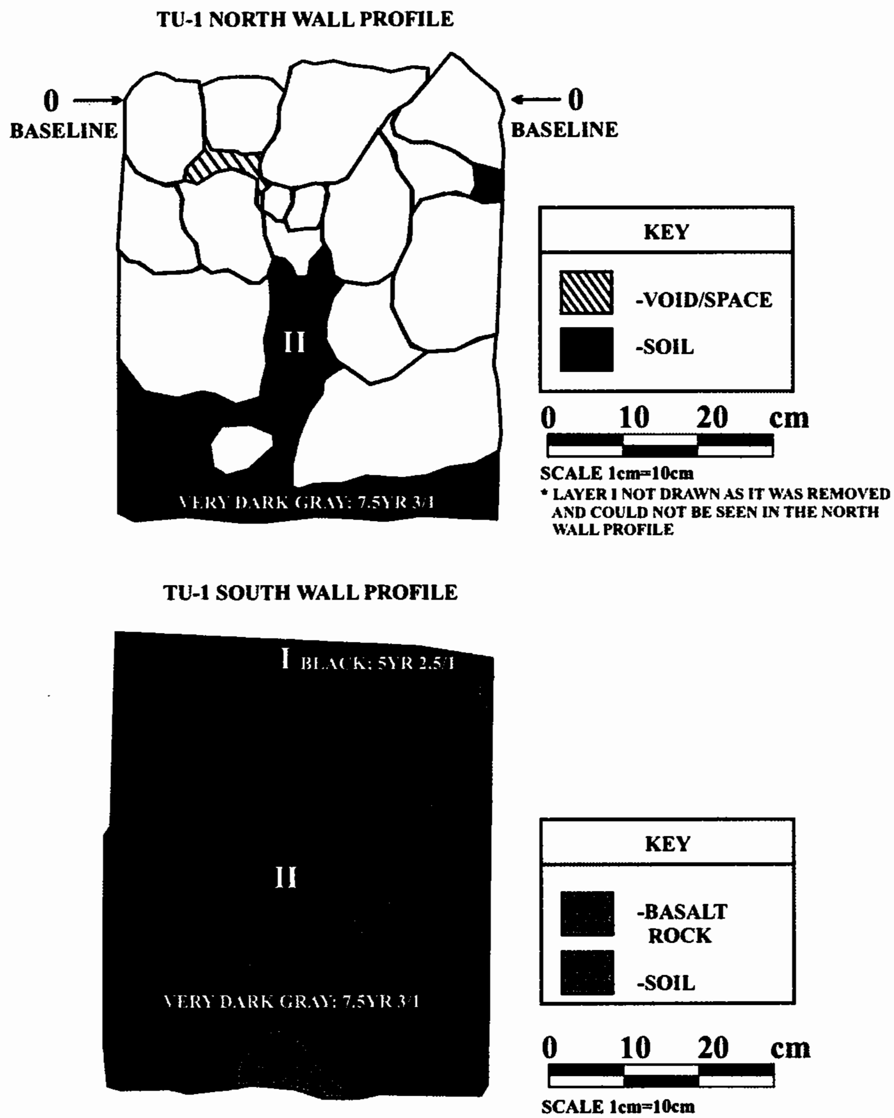


Figure 24: Site T-12, Feature A, TU-1, Post-excavation. North and South Wall Profiles.

previously cut *koa haole* tree were present throughout the layer. One ceramic sherd was found *in situ* and collected. The sherd may have dated to the mid-20th century or earlier.

Layer II was approximately 37 cm deep, although most of the soil came from the level soil area and not from underneath the architecture. Layer II was a moist, semi-compact very dark gray (7.5YR 3/1) silty clay with *koa haole* roots and sub-rounded to subangular basalt cobbles ranging from 4 cm to 20 cm. The northern portion of the unit terminated on bedrock before the southern portion (Figure 25). Broken glass, perhaps from a lantern or window, was found as was one ceramic sherd.

Feature B

Feature B was a rock mound, consisting of subangular basalt boulders and cobbles with some water worn rocks included (Figure 26). The feature measured 7.0 m long by 6.0 m wide (Figure 27). Because of its location on a slope, it had collapsed. The rock mound was probably a clearing mound. Historic and modern artifacts were found in association with the feature, including mid-20th century beer bottles, an aluminum beverage can, and some nondiagnostic iron and ceramics. Because of the tumble, this feature was considered to be in poor condition.

TEMPORARY SITE 13 (T-13)

T-13 consisted of a historic-era plantation road located in the northern end of the property. The road measured 60.0 m long by 4.0 m wide and was oriented in an east-west direction. The road was cut with a bulldozer into a north-facing slope above Wai`ehu Stream, downslope from T-12. The west end of the road reached the stream's floodplain and disappeared in tall grass. The east end of the road crossed the existing plantation road and then descended through macadamia nut trees before it, too, was lost in tall grass. No trees grew in the road, even where it became indistinguishable, suggesting it was used for historic-era plantations (see Figure 4).

TEMPORARY SITE 14 (T-14)

T-14 consisted of a concrete and cinder block foundation for an abandoned piggery. It was located in the floodplain on the east side of Wai`ehu Stream, about 30.0 m from the observed end of the T-11 road segment. The site measured 19.5 m by 13.4 m. The site was a level concrete foundation supported by cinder blocks on the stream (northwest) side. Local informants claimed that it was a pig-raising structure that had been abandoned ten years prior. Observed artifacts include a hog trough, metal debris, and pipes. The feature was considered to be in good condition (see Figure 4).

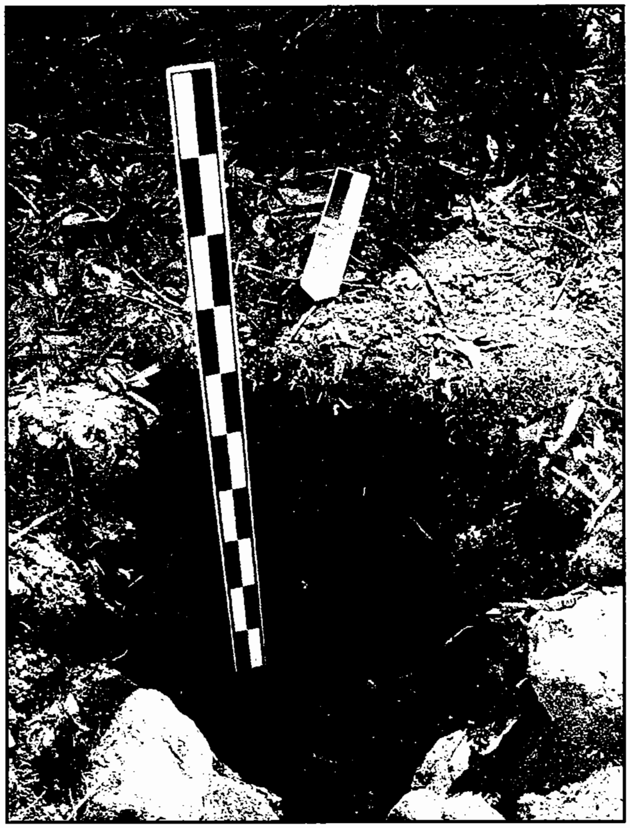


Figure 25: Site T-12, Feature A, TU-1, Post-excavation. South Wall Photograph.

Figure 26: Site T-12, Feature B, Rock Mound. View to East.

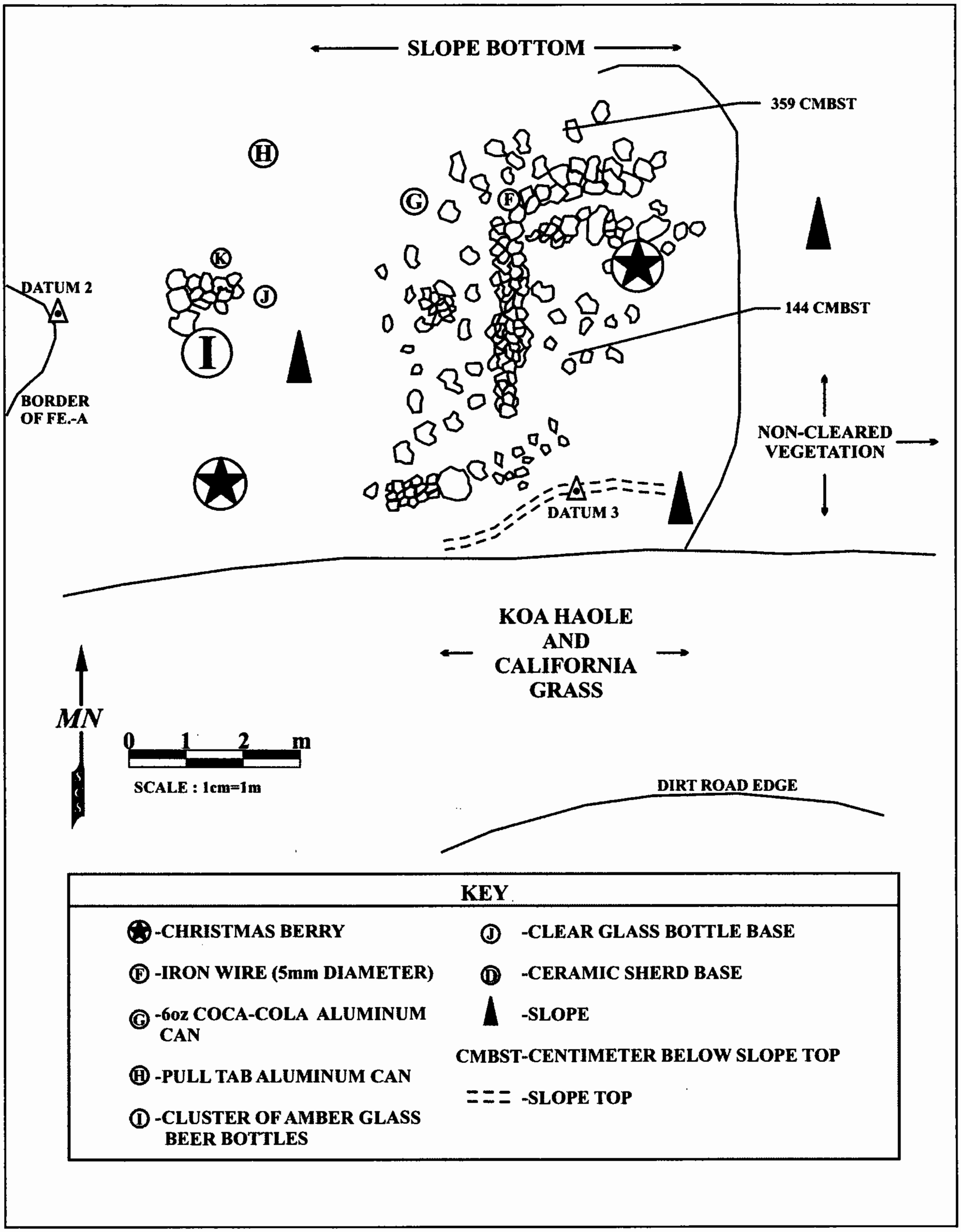


Figure 27: Site T-12, Feature B Map.

TEMPORARY SITE 15 (T-15)

T-15 contained five features (Feature A–E)—all terraces—with one terrace containing a sub-feature alignment (Figures 28 and 29). Three test units revealed T-15 was a likely an early historic agriculture site that was also used for an interim period during the late historic era. The terrace walls were constructed of stacked cobbles and small boulders up to 13 courses high. Located on the southeast bank of Wai`ehu Stream's south fork, the site was about 30.0 m upstream of the confluence with north fork. T-15 measured 80.0 m along its long axis, oriented southwest to northeast; it was 25.0 m wide. Its position on a moderately steep bank overlooks the Wai`ehu floodplain below and it is downslope of an immense modern trash pile that overflows onto the site.

Feature A

Feature A was an angled terrace wall on the level floodplain at the northwest point of Site T-15, 6.0 m southeast of Wai`ehu Stream (see Figure 28). The wall was constructed of small, rounded, uniformly-sized basalt boulders up to 6 courses (0.8 m) high and 0.4 m thick (Figure 30). Two segments of the terrace wall—a tumbled north-facing segment and a west-facing segment in excellent condition—adjoined at a 45 degree angle, the point of the angle facing the stream. Two much larger boulders formed the main construction of this point. The feature's maximum length, from northeast point to southwest perimeter was 7.0 m and its width 5.5 m. A discarded 3.0 m long metal pipe was found on the surface 30 cm downslope of Feature A's west wall.

Subsurface Feature A1 (SF-A1)

SF-A1 consisted of a short alignment of 5 small boulders situated on the level surface of Feature A terrace. SF-A1 ran roughly northeast to southwest across the interior of the feature, perpendicular to the north-facing wall (Figure 31). The center of the alignment was 2.0 m south of the northern corner of Feature A. The alignment was 2.0 m long, 0.3 m wide, and 0.1 m at its highest point.

T-15, Feature A, Test Unit 2 (TU-2)

One test unit, TU-2, was placed in Feature A to investigate the function and architecture of the feature more thoroughly, as well as the subsurface extent of SF-A1. The unit measured 1.0 m by 1.0 m and was situated over a portion of the feature's west wall as well as the sub-feature's western perimeter (Figure 32). The unit yielded two layers as follows.

Layer I was 41 cm deep and was a very friable, dark brown (10YR 3/2) very fine silty clay that contained several small water worn pebbles rarely larger than 3 cm. TU-2 no longer showed SF-A1 extending downward along the north wall (Figure 33) after the excavation

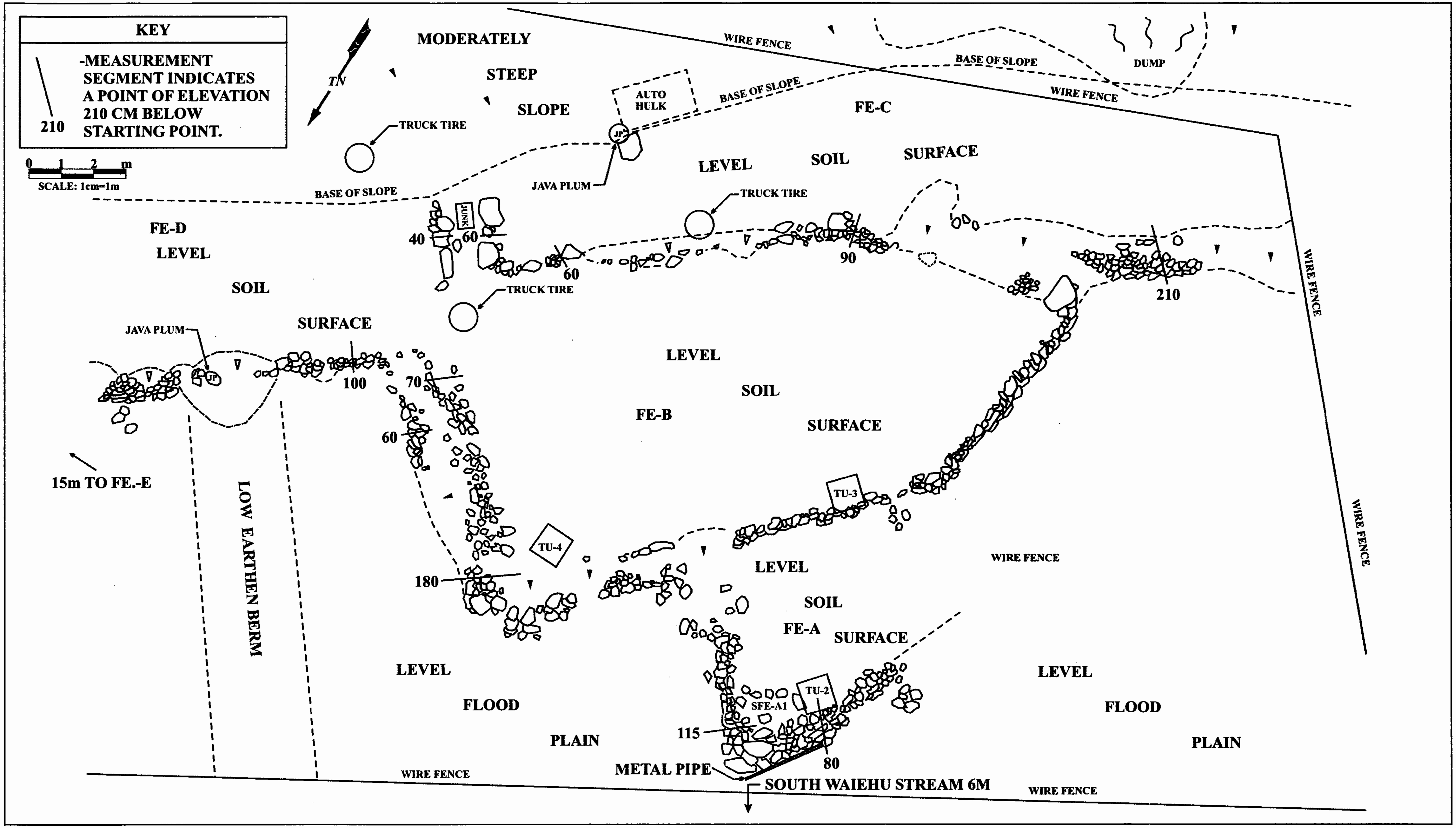


Figure 28: Site T-15 Map, Feature A through D.

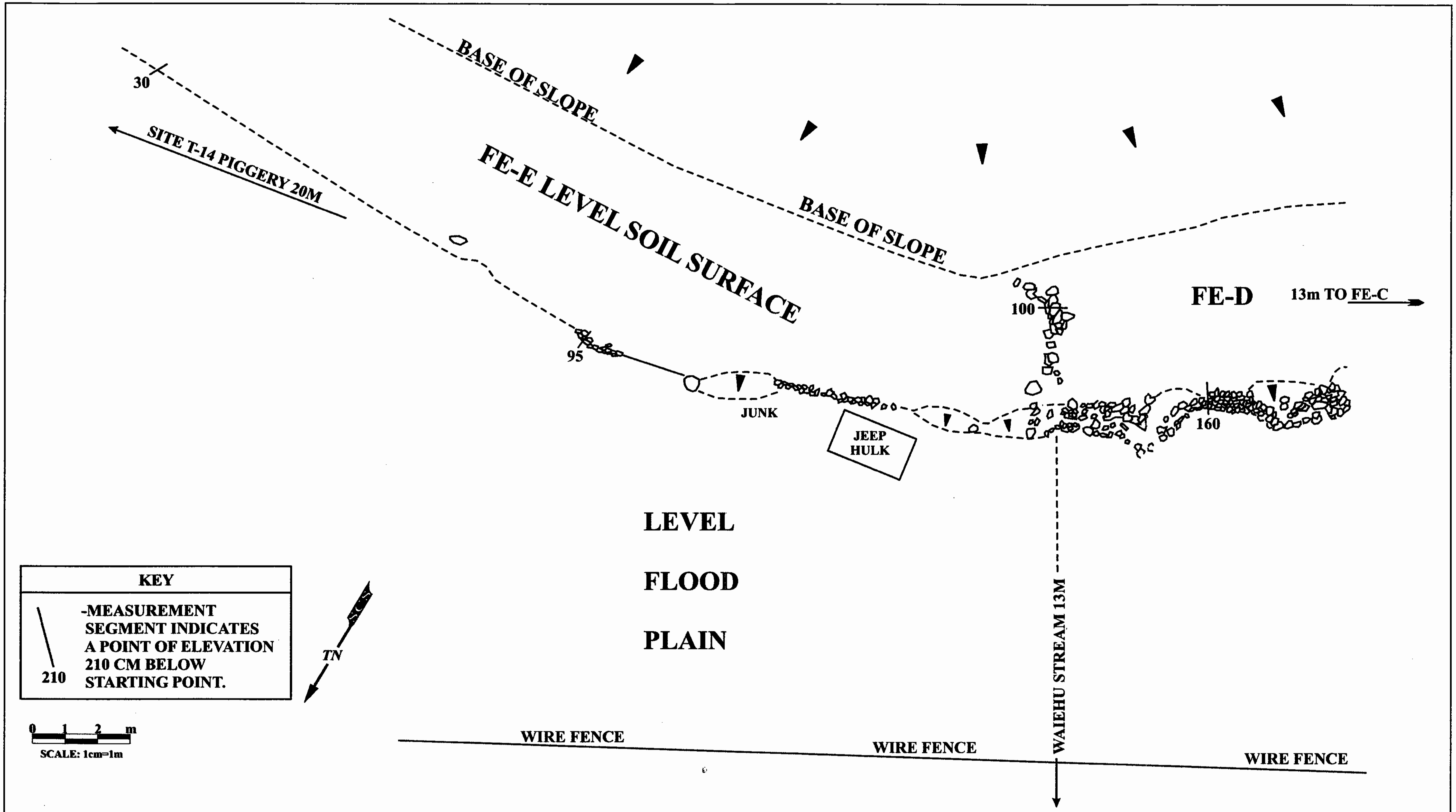


Figure 29: Site T-15 Map, Features D and E.

Figure 30: Site T-15, Feature A, Terrace. View to Northeast.

Figure 31: Site T-15, Feature A, SF-A1. View to North.

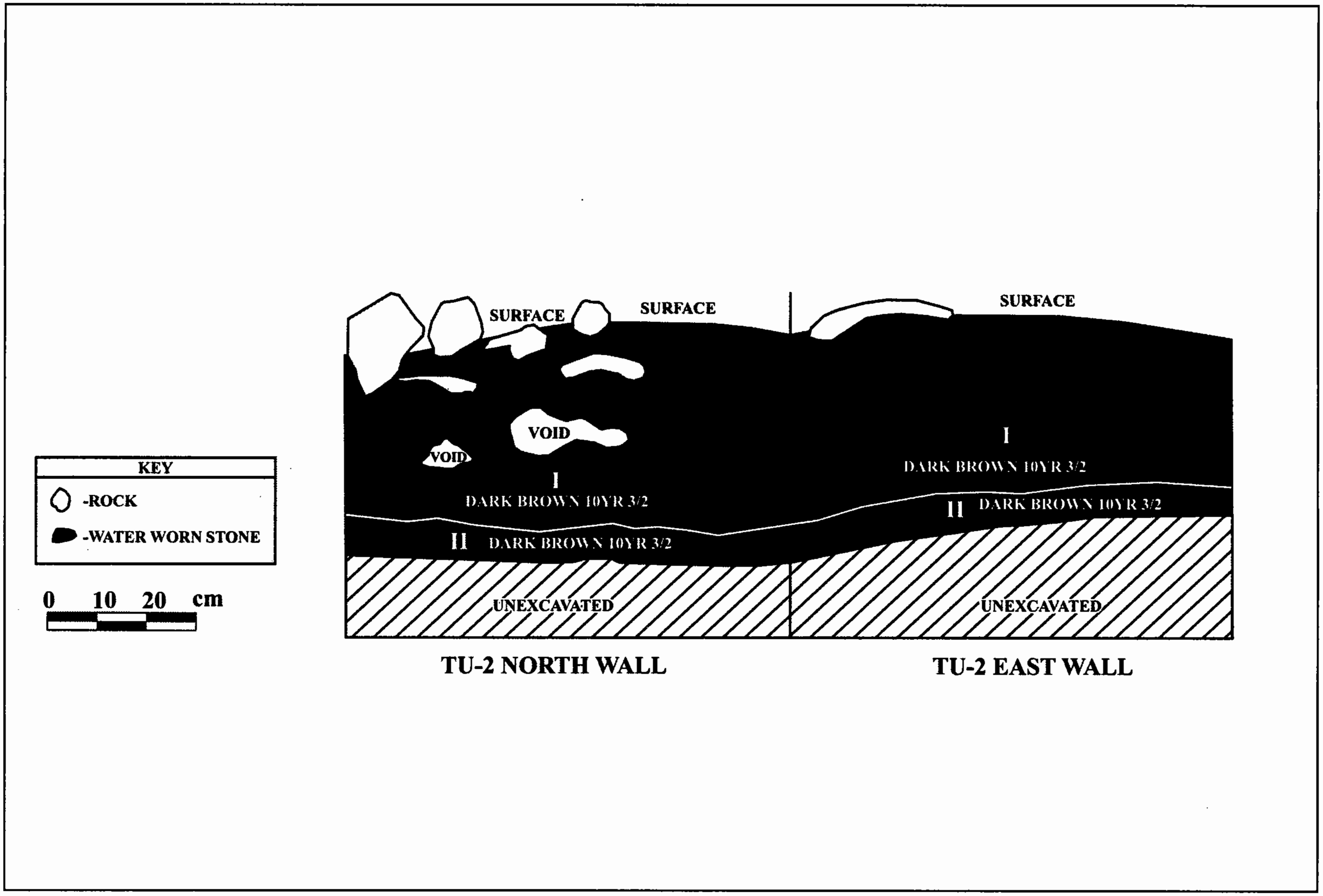


Figure 32: Site T-15, Feature A, TU-2, Post-excavation. North and East Wall Profiles.

Figure 33: Site T-15, Feature A, Tu-2, Post-excavation. View to Northeast.

exceeded 30 cmbs. Abundant microroots were present on all four walls throughout Layer I. Sparse charcoal samples were collected throughout Layer I, yet were not associated with any particular subsurface feature.

Layer II started at 42 cmbs was approximately 13 cm deep, terminating at 55 cmbs when excavation became impossible due to the increased boulder content. It is this boulder content alone that serves to differentiate Layer II from Layer I, as the soil remains consistent in every respect. Also consistent is the sparse amount of charcoal that TU-2 produced, evenly distributed throughout the unit. The approximately 30 percent water worn pebble inclusions also continued until the base of excavation, having been determined as naturally occurring. Aside from revealing a slightly wider interior width for the west wall of Feature A, TU-2 did not uncover a continuation of SF-A1.

Feature B

Feature B was a three-sided terrace located east of Feature A and approximately 0.3 m upslope of adjacent T-15, Feature D wall segments (see Figure 28). Feature B was formed by stacked walls made of sub-rounded boulders supporting a level soil surface. The walls were mostly three courses high; however, the northeastern end of the northeastern wall appeared to be two-tiered. Feature B measured 21.5 m long by 10.5 m wide. The wall was about 0.3 m thick. It was oriented on a southwest by northeast axis. A sparse amount of modern trash was found in association with the feature. Although much of it had tumbled, the southern end remained in excellent condition (Figure 34).

T-15, Feature B, Test Unit 3 (TU-3)

TU-3 was placed in Feature B's northwestern wall in order to examine feature construction and to search for cultural materials. TU-3 was a 1.0 m by 1.0 m unit that partially extended into the Feature B construction (Figure 35). Only one stratigraphic layer was found in this unit, beneath a thin layer of decomposing and previously cut vegetation.

Layer I was approximately 46 cm thick and a very dark brown (10YR 2/2) silty clay with *koa haole* roots present (Figure 36). At 24 cmbs, small water worn basalt pebbles were exposed. Larger subangular and sub-rounded basalt cobbles appeared at approximately 35 cmbs. These rocks—particularly the water worn pebbles—probably came from the nearby stream when it overflowed. They did not appear to be part of feature construction. A trace amount of charcoal was periodically observed in the unit, although it was not collected. This was the only cultural material noted within the unit.

The excavation of TU-3 was abandoned after no cultural material was found and after the feature's construction was clearly observed. The wall was no more than one course high and it was built directly into the Layer I soil. If more courses existed at this wall, they have been washed away, perhaps by stream erosion. The portion of the terrace wall observed is the first course of rocks stacked to form the wall (Figure 37).

T-15, Feature B, Test Unit 4 (TU-4)

TU-4 was placed in Feature B to further observe what types of activities might have taken place at this feature. TU-4, a 1.0 m by 1.0 m unit, was located near the northern corner of Feature B on a slight slope (see Figure 28). TU-4 was positioned on top of the terrace at the border of the Wai`ehu Stream floodplain (Figure 38). This test unit contained two stratigraphic layers (Figure 39). The surface of TU-4 was composed of living and decomposing vegetation.

Layer I (from 15 to 40 cm thick) was a dark brown (10YR 3/2) silty clay with many roots and some subangular cobbles and pebbles. At 20 cmbs, one historic ceramic sherd was found. Deeper in Layer I, at its base of 40 cmbs, 5 pieces of coral weighing at total 10.7 grams were found in the center of the unit.

Layer II (20 to 30 cm thick) was observed as shallow as 15 cmbs near TU-4's north wall, and was non-existent in areas on and near the east wall. The soil color and texture of Layer II

Figure 34: Site T-15, Feature B, Terrace. South End of West Terrace Wall Segment. View to Northeast.

Figure 35: Site T-15, Feature B, Tu-3, Pre-excavation. Northwest Terrace Wall Segment. View to South.

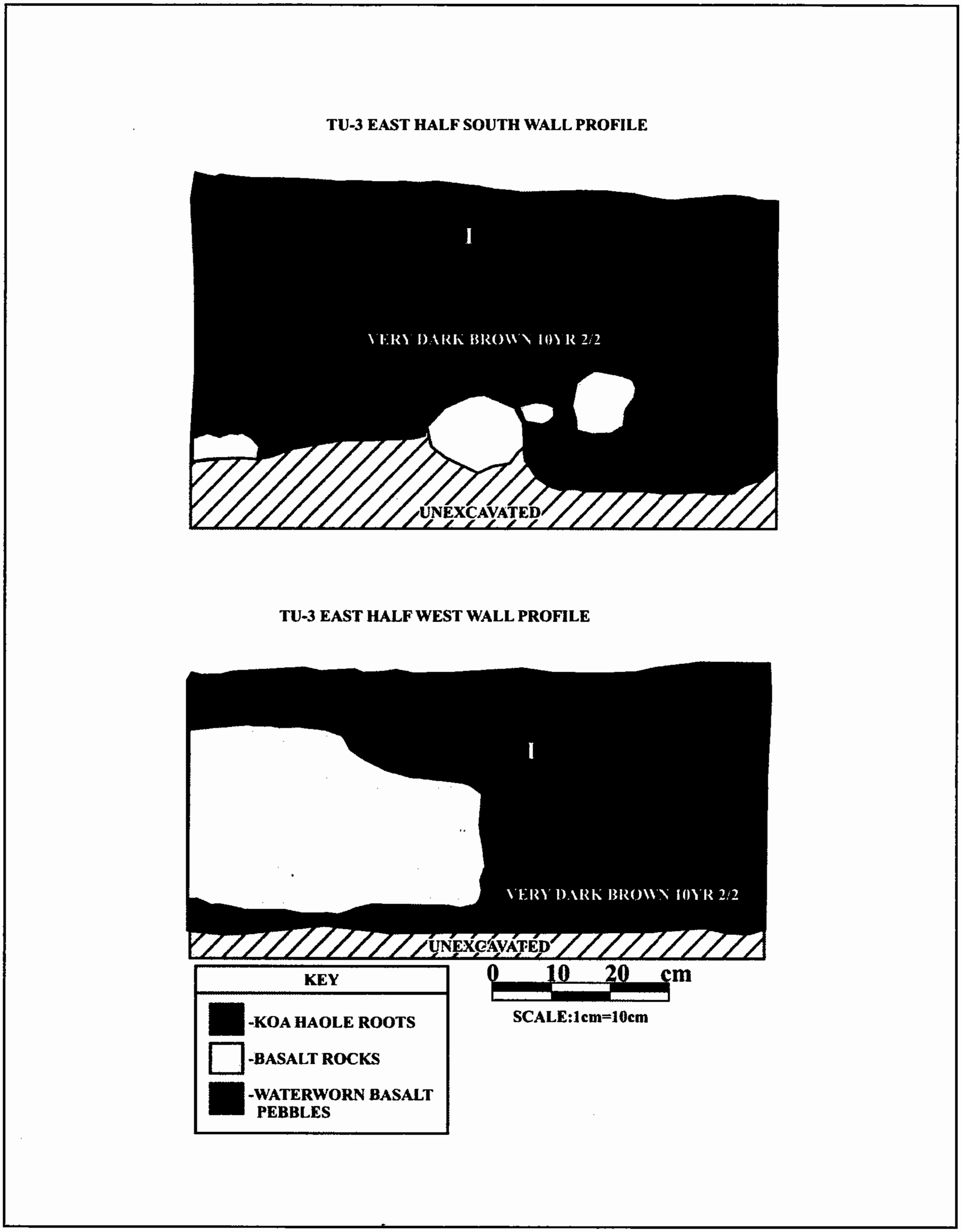


Figure 36: Site T-15, Feature B, TU-3, Post-excavation. Eastern Half of South and West Wall Profiles.

Figure 37: Site T-15, Feature B, TU-3, Post-excavation. View to Southwest.

Figure 38: Site T-15, Feature B, TU-4, Pre-excavation. View to South.

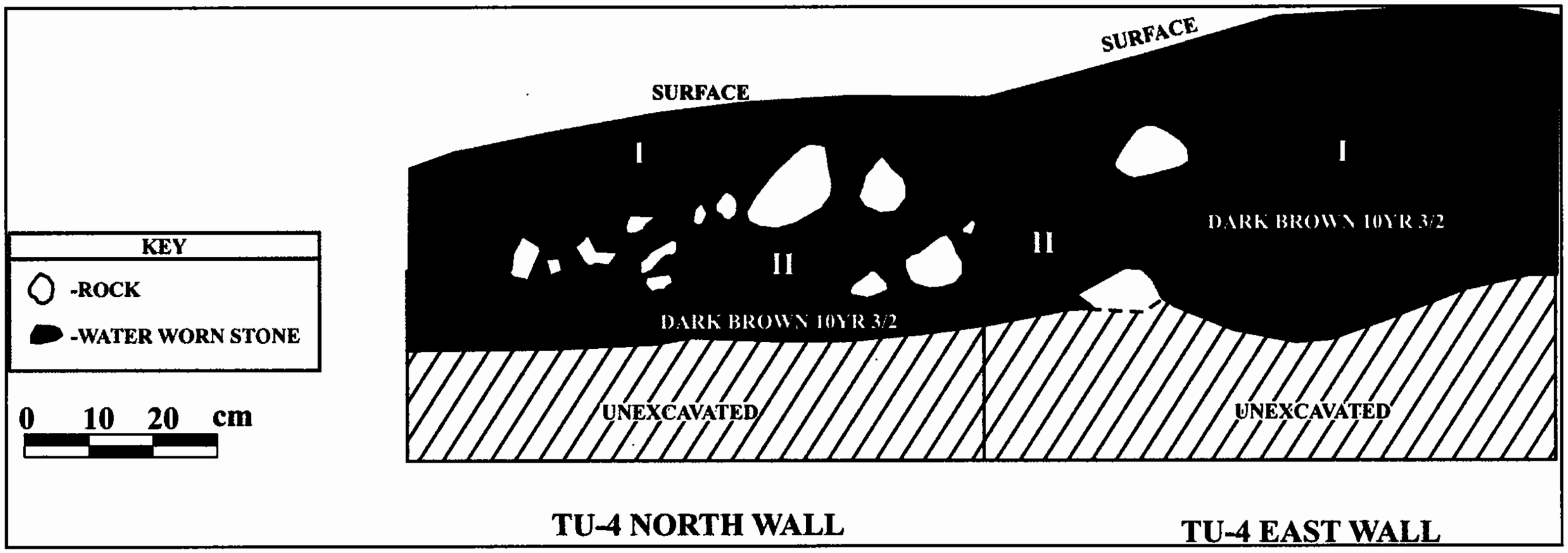


Figure 39: Site T-15, Feature B, TU-4, Post-excavation. North and East Wall Profiles.

was identical to Layer I, however, this deeper layer contained a concentration of small boulders, cobbles, pebbles, and water-worn basalt cobble unlike that found in Layer I (Figure 40). It is probable that Layer II marked the original surface of the level terrace that Layer I's sloping sediment now covered. A charcoal sample weighing 5.7 grams was collected from between 35–41 cmbs. SCS submitted this sample for radiocarbon dating in an effort to gain a more accurate understanding of Feature B and Site T-15's age (see LABORATORY RESULTS for date).

Feature C

Feature C was a roughly rectangular terrace abutting Feature B at its northeastern end (see Figure 28). Feature C was formed by a wall stacked with uniform-sized boulders. The wall was faced and sloped slightly inward toward a level soil surface (Figure 41). The feature measured 25.0 m long by 5.0 m wide. The wall was about 0.4 m thick and was 0.9 m high on its exterior and 2.1 m high (10 courses) at its southwestern end. Feature C was oriented on a southwest by northeast axis. An immense trash pile on a southern slope was located near the feature; some of this trash had spilled onto it. The trash appeared modern. The feature was in good condition except for the tumbled wall that was adjacent to Feature B.

Feature D

Feature D was a rectangular terrace located between Features B and C to the west, and Feature E to the east (see Figures 28 and 29). This feature was formed by a 13-course high stone wall that supported a level soil surface (Figure 42). The eastern side of the terrace had been cut into the base of a steep slope. Feature D measured 21.0 m long by 6.5 m wide. The thickness of wall was 0.5 m and the exterior of the wall was 1.6 m high. It was oriented on a southwest by northeast axis. Some modern trash was found in association with the feature. On average, it was considered to be in fair condition although the terrace walls had tumbled in many places.

Feature E

Feature E was a long, rectangular terrace that was located on the floodplain 20 m west of Site T-14 (see Figure 29). It was bordered by Feature D on the west. It was formed by a stacked stone and earthen wall that supported a level soil surface. The feature measured 32.0 m long by 6.0 m wide. The thickness of the wall was 0.4 m and was about 0.9 m high. It was oriented on an east-west axis. Some modern trash was found in association with the feature. It was in poor condition as the wall had tumbled or eroded in most places.

STRATIGRAPHIC TRENCH RESULTS

Six trenches were excavated within the Wai`ehu Stream floodplain (see Figure 4), the northern border of the project area, in order to investigate subsurface features and soil

Figure 40: Site T-15, Feature B, TU-4, Post-excavation. View to North.

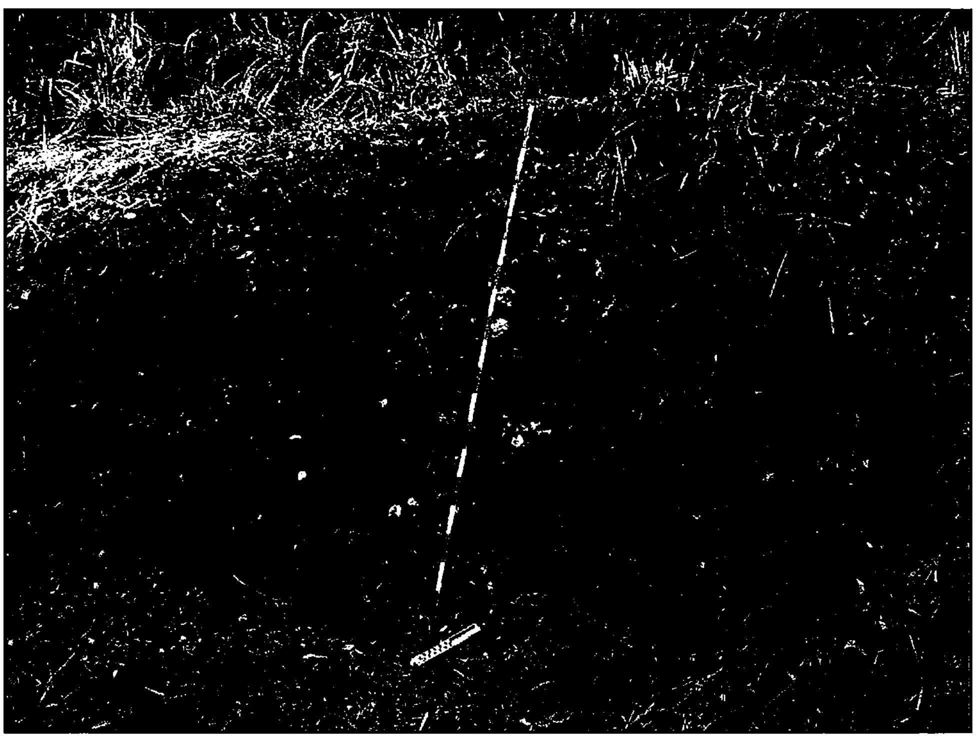


Figure 41: Site T-15, Feature C, Terrace. West Wall Face.

Figure 42: Site T-15, Feature D, Terrace. East Wall Face.

stratigraphy in an area of documented LCAs and abundant traditional *lo`i* agriculture. The trenches were excavated with a backhoe. All were 1.0 m wide and varied from 4.5 m to 7.6 m in length (Table 4). Little cultural material was found within these trenches, however, ST-1 contained a subsurface feature (SSF-1), a charcoal deposit. Most of the trenches contained only two layers of culturally sterile soil. The layers and inclusions were largely the results of flooding from the nearby stream.

Table 4: Stratigraphic Trenches Excavated within Project Area.

ST No.	Length	Maximum Depth	Orientation (degrees TN)	Distance from Wai`ehu Stream	Cultural material
ST-1	7.6 m	120 cm	040/220	8.0 m	Unburned *kukui* nuts (not collected; SSF-1, charcoal deposit
ST-2	4.7 m	110 cm	055/235	5.0 m	White PVC pipe at 25 cmbs
ST-3	5.6 m	130 cm	042/222	2.0 m	No cultural material
ST-4	7.0 m	135 cm	056/236	5.0 m	No cultural material
ST-5	5.6 m	105 cm	109/289	6.0 m	No cultural material

ST-6	4.5 m	150 cm	135/315	8.0 m	White PVC pipe at 30 cmbs

STRATIGRAPHIC TRENCH 1 (ST-1)

ST-1 was 7.6 m long by 1.0 m wide and was excavated to a depth of 120 cm (Figure 43). It was located in a level flood plain about 8.0 m southeast of Wai`ehu Stream, parallel to the stream. The area had been graded for sugar and macadamia trees. The trench revealed two stratigraphic layers (Figure 44). Layer I (75 cm maximum thickness) was a very dark grayish-brown (10YR 3/2) silty loam with microroots and very few water worn pebbles. Unburned *kukui* nuts, and bottle glass was observed in this layer as was a subsurface feature, SSF-1. SSF-1 was a charcoal deposit about 10 cm thick and located at the southeast corner of the trench at 40 to 55 cmbs (Figure 45). The deposit was 80 cm by 80 cm and scattered unlike an *in situ* fire pit. Pebbles within SSF-1 were not scorched. It is possible that SSF-1 had been pushed to its current location through past agricultural grading. A 111.8 g sample of SSF-1 was collected. Layer II (75 cm maximum thickness) was also very dark grayish brown (10YR 3/2) and a sandy loam. Few roots were found, but many water worn pebbles were located within this layer. Layer II was likely a stream deposit. No cultural materials were found within this layer.

Figure 43: ST-1, Post-excavation. View to Northeast.

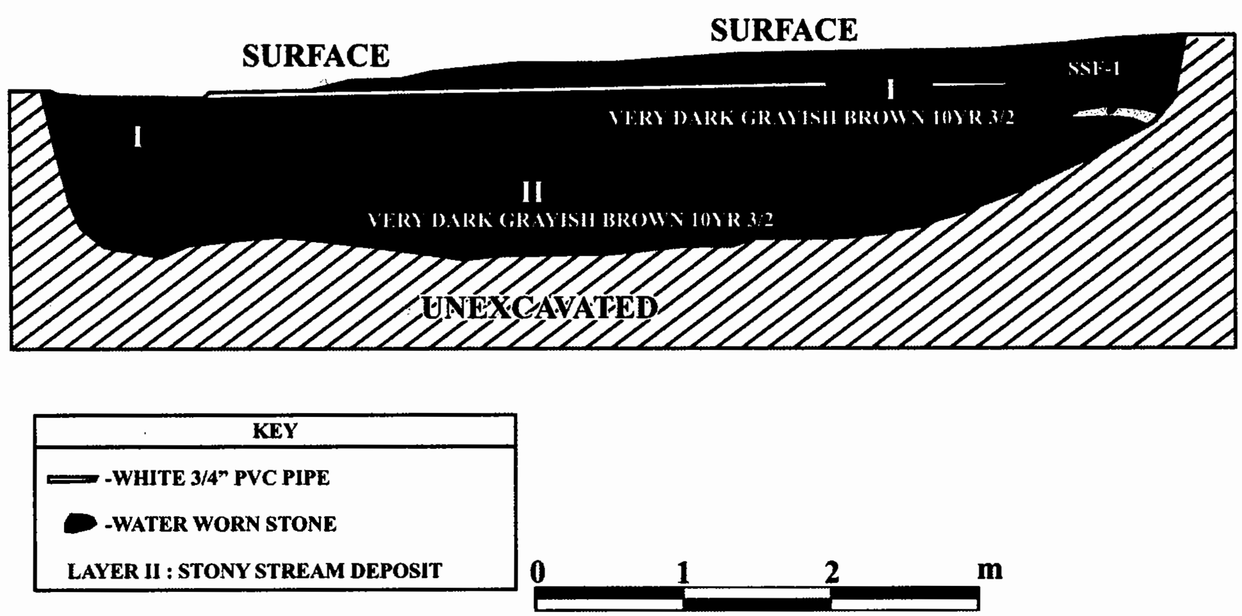


Figure 44: ST-1, Post-excavation. East Wall Profile.

Figure 45: ST-1, Post-excavation. SSF-1 within East and South Walls. View to East.

STRATIGRAPHIC TRENCH 2 (ST-2)

ST-2 measured 4.7 m long by 1.0 m wide and was excavated to a depth of 110 cm (Figure 46). This trench was located on a level floodplain about 5.0 m from and parallel to Wai`ehu Stream in a small opening between macadamia nut trees and the stream. This trench produced two layers (Figure 47). Layer I (50 cm) was a very dark grayish brown (10YR 3/2) silty loam with few roots and a number of sub-rounded cobbles and pebbles. A white PVC pipe was found in this layer. Layer II (65+ cm) was a dark brown (10YR 3/3) loam with few roots and many rounded cobbles and pebbles (Figure 48). No cultural material was found within this layer. This area of the floodplain appeared to have been modified by an excavation machine in the past, and the ST-2 stratigraphy supports this observation.

STRATIGRAPHIC TRENCH 3 (ST-3)

ST-3 was 5.6 m long by 1.0 m wide and was excavated to a depth of 130 cm. The northeastern end of ST-3 was located about 2.0 m from the stream bank and oriented nearly perpendicular to the stream on a gentle slope (Figure 49). ST-3 contained two layers (Figure 50). Layer I (45 cm) was a very dark grayish-brown (10YR 3/2) loam with many roots and no rock within its matrix. No cultural material was found in this layer. Layer II (75+ cm) was a brown (10YR 4/3) sandy loam with few roots and abundant water worn cobbles and pebbles (Figure 51). No cultural material was found within this layer and evidence of previous earth moving was observed.

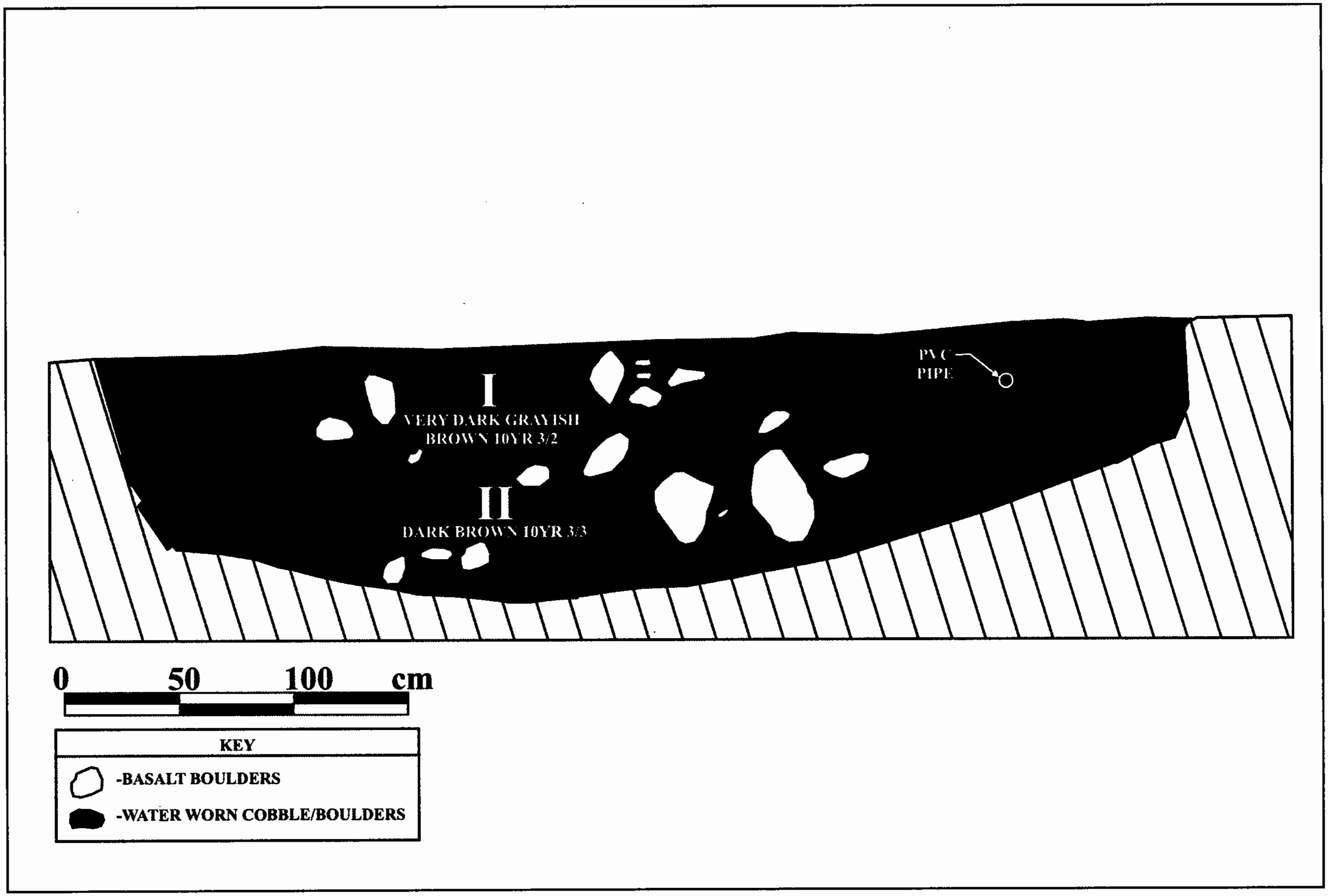


Figure 46: ST-2, Post-excavation. South Wall Profile.

Figure 47: ST-2, Post-excavation. View to Northeast.

Figure 48: ST-2, Post-excavation. East Wall Layers. View to East.

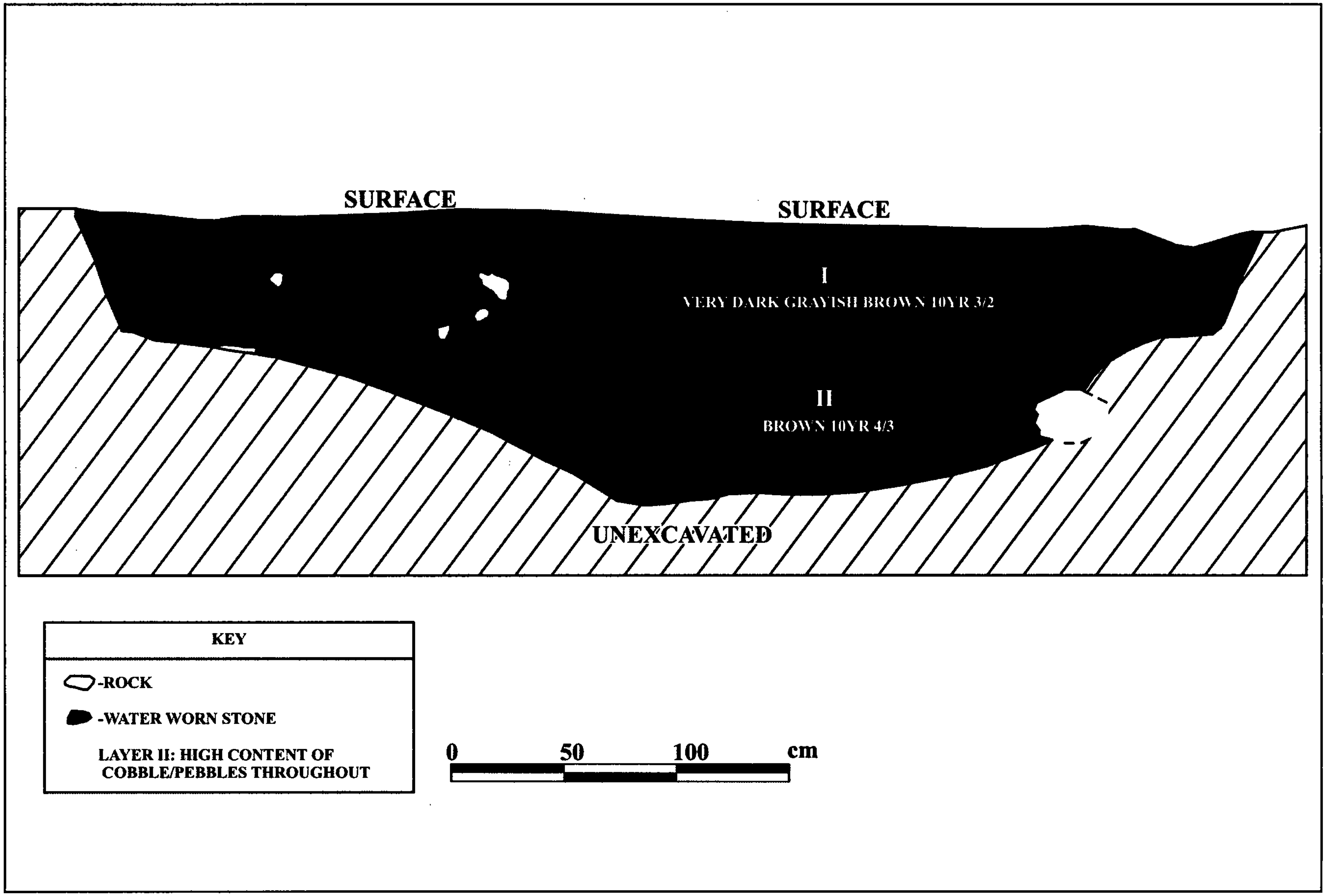


Figure 49: ST-3, Post-excavation. West Wall Profile.

Figure 50: ST-3, Post-excavation. Overview, Northeast toward Wai`ehu Stream Bank.

Figure 51: ST-3, Post-excavation. West Wall Layers.

STRATIGRAPHIC TRENCH 4 (ST-4)

ST-4 was 7.0 m long by 1.0 m wide and was excavated to a depth of 135 cm (Figure 52). ST-4 was located in the floodplain about 5.0 m from Wai`ehu Stream, positioned perpendicular to the stream. The northeastern end of the trench was placed in a berm made by a bulldozer that ran along the stream. Three stratigraphic layers were encountered in this trench (Figure 53). Layer I (30 cm) was a very dark gray (10YR 3/1) silty clay loam with many roots and a few rounded pebbles. No cultural material was observed in this layer. Layer II (90 cm) was a dark brown (10YR 3/3) silty clay with few roots and few rounded pebbles and cobbles. Cultural material was not found in this layer. Layer III (40 cm) was dark, yellowish-brown (10YR 4/4) loamy sand with few roots and an abundant amount of rounded pebbles, cobbles, and boulders. In fact, Layer III primarily consisted of sand and rocks (Figure 54). Layer III was likely stream wash debris or once a section of the stream bed itself. No cultural material was found in this layer.

STRATIGRAPHIC TRENCH 5 (ST-5)

ST-5 measured 5.6 m long by 1.0 m wide and was excavated to a depth of 105 cm (Figure 55). It was located on the Wai`ehu Stream floodplain—6.0 m from the stream itself—about 10.0 m downstream from ST-4 and not far from where the stream crosses beneath the highway. The east end of the trench was located in a 1.5 m high berm. Two stratigraphic layers were found within this trench (Figure 56). Layer I (30 cm) was a very dark gray (10YR 3/1) silty clay loam with many roots and a few water worn cobbles and pebbles. Cultural material was not found within Layer I. Layer II (75 cm) was a dark brown (10YR 3/3) silty clay with few roots and abundant water worn boulders, cobbles, and pebbles (Figure 57). No cultural material was found in Layer II.

STRATIGRAPHIC TRENCH 6 (ST-6)

ST-6 measured 4.5 m long by 1.0 m wide and was excavated to a depth of 150 cm (Figure 58). It was located 8.0 m east of the Wai`ehu stream bank to investigate for *lo`i* terraces buried by modern (machine) agriculture. Three stratigraphic layers were located within this trench (Figure 59). Layer I (95 cm) was a very dark grayish-brown (10YR 3/2) silty clay loam. It contained roots and a few subangular pebbles. Some modern trash was found near the surface of this layer and a cut PVC jutted from the north wall. Layer II (25 cm) was a very dark brown (10YR 2/2) silty loam, which contained roots and a few pebbles, cobbles, and boulders. Aside from a very small amount of charcoal flecking that was too minimal to analyze, no potential cultural material as found in this layer. Layer III (50 cm) was also very dark brown (10YR 2/2) silty loam. It had some roots but many water worn pebbles (Figure 60). No cultural material was observed. This final layer probably represented a flood event from the stream. No evidence of a

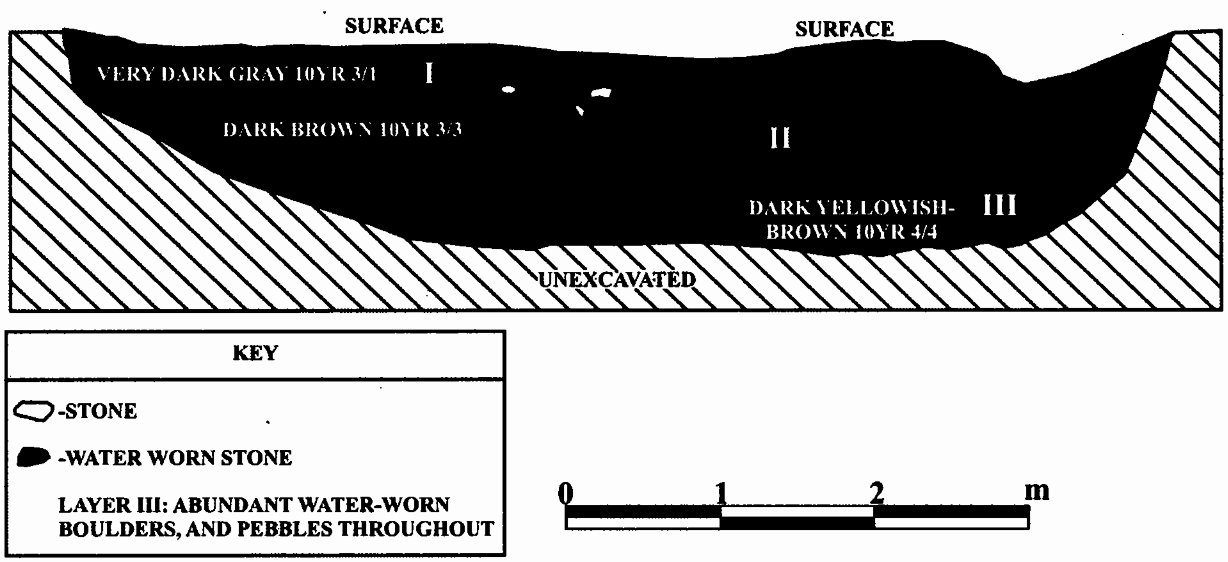


Figure 52: ST-4, Post-excavation. South Wall Profile.

Figure 53: ST-4, Post-excavation. View to Northeast.

Figure 54: ST-4, Post-excavation. North Wall Layers.

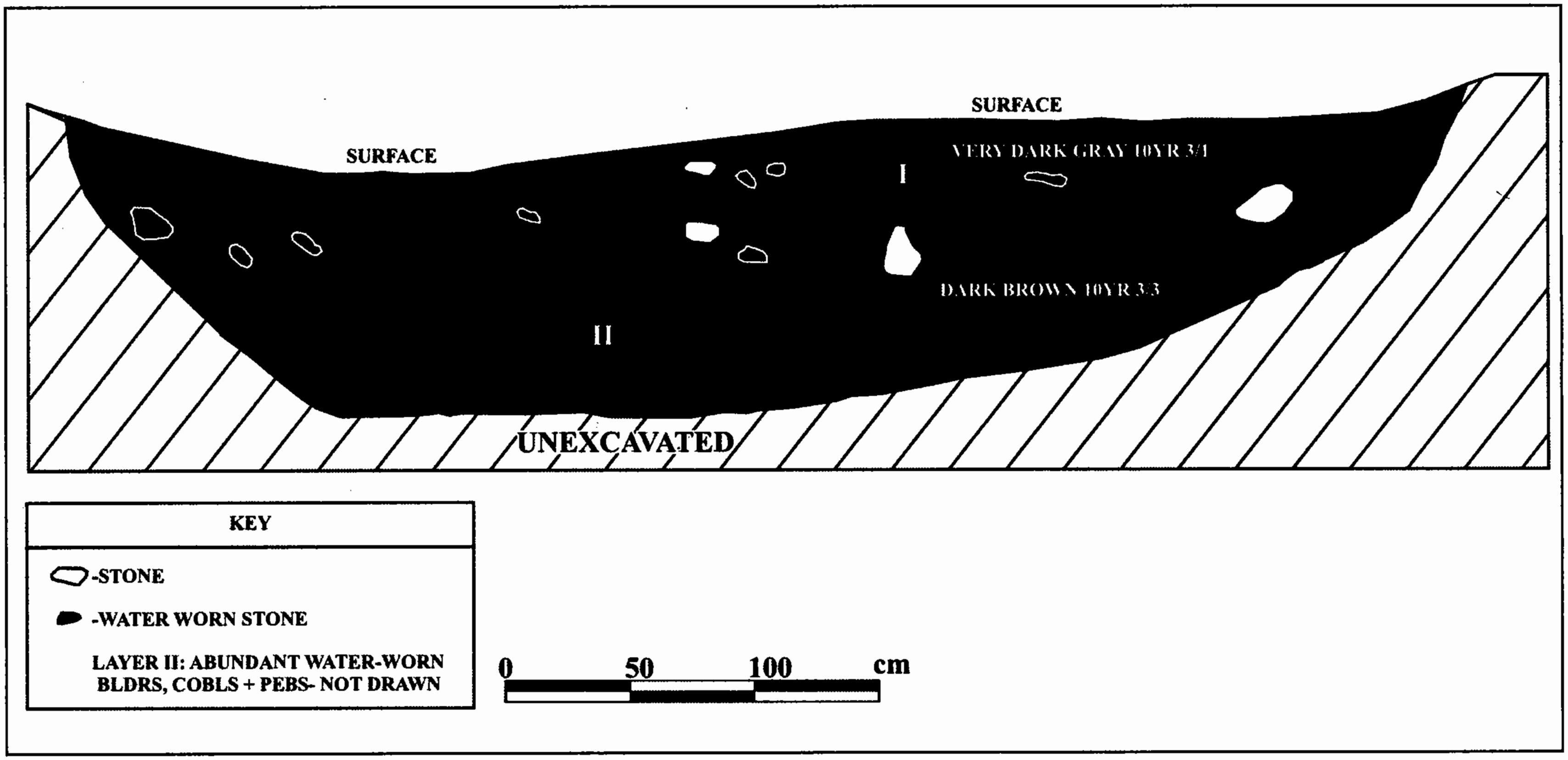


Figure 55: ST-5, Post-excavation. South Wall Profile.

Figure 56: ST-5, Post-excavation. View to Northeast.

Figure 57: ST-5, Post-excavation. South Wall Layers.

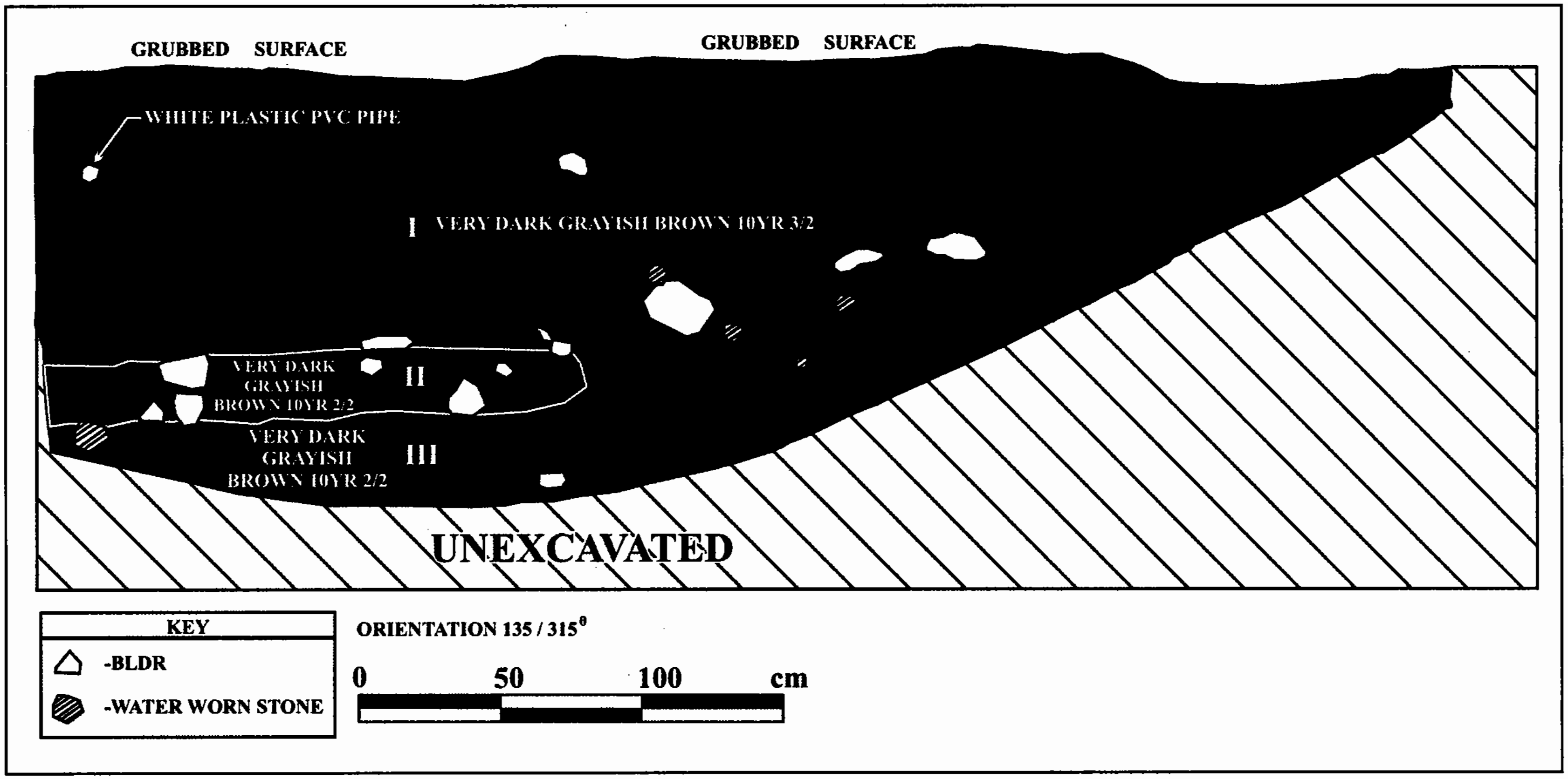


Figure 58: ST-6, Post-excavation. North Wall Profile.

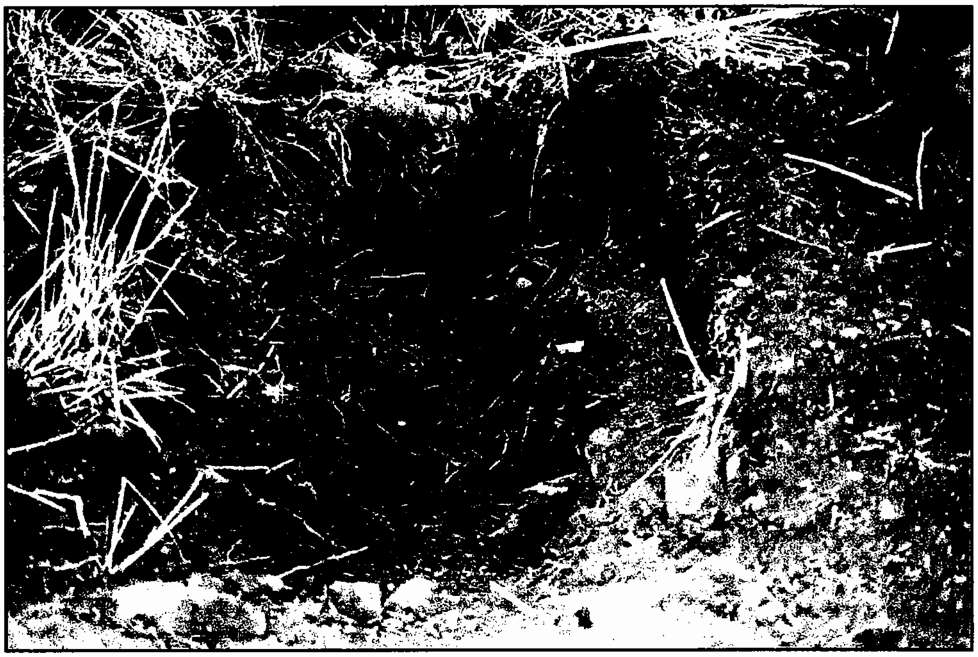


Figure 59: ST-6, Post-excavation. View to Northwest.

Figure 60: ST-6, Post-excavation. North Wall Layers.

lo`i system was observed in this trench. The bottom of the excavation also likely represented the top of the water table as about 10 cm of water pooled in the bottom of the layer after excavation.

LABORATORY RESULTS

Upon examining the cultural material found at the project area, the distributions of what types of materials were found and where they were located in relation to each other was noted. Artifacts, specifically historic artifacts, were the most prevalent type of cultural material found. Midden was restricted to only charcoal, marine shell, and coral. All of the midden, except for one marine shell (an isolated find known as T-5), was found within the context of a controlled environment like a stratigraphic trench or a site. Charcoal was found within ST-1, SSF-1 as well as in two test units in Site T-15 (TU-2 and TU-4). In fact, the amount of charcoal found at T-15 led to a portion of it being radiocarbon dated.

The charcoal found within T-15, Feature B, TU-4, Layer II was the sample found at the greatest depth on the project area. Also, it was located within the most substantial feature and had the greatest potential to yield an informative date. The radiocarbon sample yielded a conventional age of 180 +/- 30 BP. Calibrating with OxCal v3.5 converted this into A.D. date ranges at one and two Sigma. At one Sigma, the age range with the highest probability was A.D. 1730 to 1810 (67%) and at two sigma, the age range with the highest probability of accuracy was A.D. 1720 to 1820 (61%). These dates imply that this charcoal came from the early historic, or initial Contact period. The rest of the sites on the property were firmly within late historic times. The fact that this age came from T-15 suggests that the terrace complex may have been utilized chronologically earlier than the other sites.

The most pronounced types of cultural material found at this site were artifacts. All of the artifacts found were from the historical era, except for three, which were traditional. These three traditional artifacts were known collectively as Site T-4. They were all isolated finds, found on the surface of the project area in varying locations. Many of the historic artifacts were also found throughout the project area on the surface (15 items).

The rest of the historic artifacts were relocated in association with specific built structures, namely Sites T-12 and T-15. T-12 contained only historic artifacts (n=9). They varied from bottles to ceramic sherds (Figure 61) to non-diagnostic iron. They were found on the surface all the way through the test unit to the second layer. No midden was found, nor were any other materials suggesting traditional use.

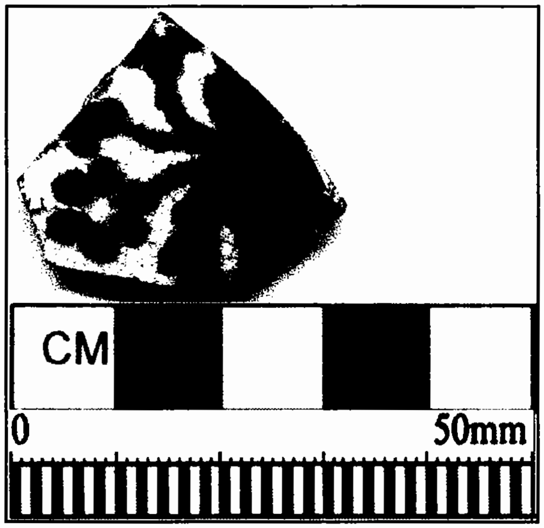


Figure 61: Example of a Ceramic Sherd Coming From Site T-12.

Site T-15 also contained a historic artifact, as well as the previously mentioned midden. Three test units were excavated at the site, in comparison to T-12's one unit. Of the three units excavated at this site (as well as on the surface), only one historic element was found. This small piece of ceramic sherd (Figure 62) was found in TU-4, Layer I. The older radiocarbon date came from the same unit in Layer II. Because the artifact came to the islands post-Contact during a more intensive European occupation, it seems likely that this unit (and perhaps the whole site) may represent two periods of occupation, one during the early historic period and one during the late historic period. The minimal amount of historic artifacts at this site compared to T-12 attests to the likelihood that T-15 is much older than the other terrace site on the project area.

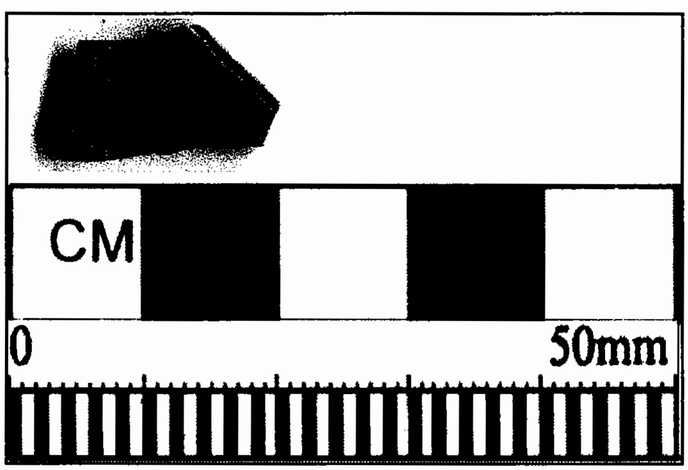


Figure 62: Ceramic Sherd Found at Site T-15.

DISCUSSION AND CONCLUSIONS

Twelve individual new sites were recorded on this project area. The sites were varied, but mostly were related to historic-era agriculture. These types of sites specifically included ditches, earthen berms, terraces, a piggery, and roads. Two of the sites were isolated finds and consisted of a marine shell and a lithic deposit. The most significant of all of the sites were T-12, a terrace and mound, and T-15, a terrace complex. These were thought to come from the early historic period and could have, at one time, been used as *lo`i*. A total of four test units were excavated within sites T-12 and T-15. These units yielded a moderate amount of historic and traditional debris. Also part of this survey was the excavation of six stratigraphic trenches. These trenches revealed no culturally-significant material.

On the whole, the most significant sites were found near the Wai`ehu Stream. The sites by Wai`ehu Stream were likely early historic sites, possibly related to *lo`i*. All of the LCA claims for this property came from the northern portion of the property, near the stream. There was some report of *lo`i* being in this area. Either way, the stream was a natural source of perennial water, a resource needed for *lo`i* or sugar and macadamia nut production. Because the stream was such a desirable location for farming, it is possible that features built in traditional times could have been reused over time and well into the historic era.

The others sites were generally scattered about the project area, and the formerly-designated Spreckels Ditch bounded the southern portion of the property. These sites were related to historic agriculture. The project area was significantly altered for sugar cane and macadamia nut production. This massive land altering would have destroyed any traditional sites in these areas, should they ever have been located here. The stratigraphic trenches attest to this fact. Although they were mostly excavated near the stream, in the assumed population center of the project area, none of them yielded any culturally-significant material. Much of the stratigraphy consisted of fill. In an area dominated by large-scale agriculture, the chances of relocating any subterranean sites seems most unlikely.

SIGNIFICANCE ASSESSMENTS

Twelve sites were identified on the project area during Inventory Survey (in addition to the Spreckels Ditch). The site has been evaluated for significance according to the broad criteria established for the State and National Register of Historic Places. The five criteria are classified below:

Criterion A: Site is associated with events that have made a significant contribution to the broad patterns of our history

Criterion B: Site is associated with the lives of persons significant to our past

Criterion C: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction

Criterion D: Site has yielded or has the potential to yield information important in prehistory or history

Criterion E: Site has cultural significance; probable religious structures or burials present (State of Hawai`i criteria only)

All twelve sites identified on the project area are considered to be significant under Criterion D because they have the potential to yield information important to prehistory and history. Table 5 shows how the temporary sites described in this report are grouped and numbered as state site numbers.

Table 5: State Site Numbers and Corresponding Temporary Site Numbers.

Sate Site No.: Site Description	Temp. Site No.
50-50-04-5522: Sugar Cane Agriculture Modifications (Ditches, Berms, Roads)	T-1, T-3, T-6, T-7, T-10, T-11, T-13
50-50-04-5523 Isolated Find of Lithics	T-4
50-50-04-5524 Isolated Find of a Marine Shell	T-5
50-50-07-1508 Spreckels Ditch	T-9
50-50-04-5525 Terrace and Mound (Ag)	T-12
50-50-04-5526 Piggery	T-14
50-50-04-5527 Terrace Complex	T-15

RECOMMENDATIONS

Although these sites were considered significant because of their ability to yield information about history or prehistory, they are no longer considered significant. Excavation at the most important sites (T-12 and T-15) yielded information recorded in this report that adequately accesses the value of the sites. The recording of the isolated find sites (T-4 and T-5) as well the remaining historical agriculture sites amply cover their necessity to history and are therefore also no longer deemed significant. Additionally, all six stratigraphic trenches were culturally sterile, implying that the rest of the subterranean realm on the property is also culturally insignificant. However, the eastern portion of the property (nearest to the highway) may still have the potential to yield inadvertently discovered human remains. Two cemeteries and beach sand (known in Hawai`i to contain traditional human burials) are separated from the eastern portion of the project area by the highway only. Because there is still a chance of uncovering burials or important subsurface traditional sites, monitoring on this eastern portion of the property is recommended.

REFERENCES

Athens, J.S.
1997 Hawaiian Native Lowland Vegetation in Prehistory. In *Historical Ecology in the Pacific Islands: Prehistoric Environment and Landscape Change*, ed. By P.V. Kirch and T.L. Hunt. Yale University Press, New Haven.

Awai, E.S., H.L. Baker, A.Y. Ching, *et al.*
1967 *Detailed Land Classification – Island of Maui.* Land Study Bureau, University of Hawaii, Honolulu.

Cheever, Rev. H.T.
1851 *Life in the Sandwich Islands: or, The Heart of the Pacific, As it Was and Is.* A.S. Barnes (New York) and H.W. Darby (Cincinnati).

Chinen, J.J.
1961 *Original Land Titles in Hawaii.* Copyright 1961 Jon Jitsuzo Chinen.

Clark, D., and J.F. Balicki
1988 *Preliminary Research Report: The Maui Archaeology Project of Waihee.* Department of Anthropology, The Catholic University of America, Washington, D.C.

Cordy, R.H.
1996 *Settlement Patterns of Wailuku Ahupua`a from Mahele Records.* Paper Presented at the 9th Annual Conference for the Society of Hawaiian Archaeology in Wailea, Maui.

1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands.* Academic Press, New York.

1978 *Cultural Reconnaissance of Hydroelectric Power Plant Sites in Waihee Valley, Maui and Lumaha`i Valley, Kauai: Archaeological Survey.* B.P. Bishop Museum, Honolulu.

Creed, V.S.
1993 *Settlement Pattern for Waikapū, Wailukū District, Maui, Hawaii.* Volume 1. Cultural Surveys Hawaii. Kailua, Hawai`i.

Daws, G.
1968 *Shoal of Time: History of the Hawaiian Islands.* University of Hawai`i Press. Honolulu

Dega, M.F.

2003 *Archaeological Inventory Survey in the Intermediate Dry Zone of Wailuku, Wailuku Ahupua`a, Wailuku (Kula) District, Maui Island, Hawai`i (TMK:3-5-001:portion of 001).* Scientific Consultant Services, Inc., Honolulu.

Donham, T.K.

1996 *A Summary of Archaeological Finds in Wailuku Showing Settlement Patterns.* Paper Presented at the 9th Annual Conference for the Society of Hawaiian Archaeology in Wailea, Maui.

1989 *Archaeological Inventory Survey, Proposed Waihee Golf Club Project Area, Lands of Waihee and Wai`ehu, Wailuku District, Island of Maui.* PHRI Report 549-062589. Prepared for Wailuku Ocean Front Hawaii, Inc.

Dorrance, W.H., and F.S. Morgan

2000 *Sugar Islands: The 165-Year Story of Sugar in Hawaii*, Mutual Publishing Co., Honolulu.

Emory, K.P.

1921 *An Archaeological Survey of Haleakala.* B.P.Bishop Museum Occasional Papers 9 (11):237–259.

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens

1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* U.S. Dept. of Agriculture, Soil Conservation Science and University of Hawai`i Agricultural Experimentation Station. Washington D.C., U.S. Govt. Printing Office.

Fredericksen, E.M.

1997 *Report on Archaeological Monitoring of North Waihe`e Water Source Project, Phase III Transmission Line, Wai`ehu and Waihe`e Ahupua`a, Wailuku District, Maui Island (TMK: 3-2-08, 09, 13, 17)*, prepared for Mr. David Craddick, County of Maui Board of Water Supply, by Xamanek Researches, Pukalani, HI.

Fredericksen, E.M., and D.L. Fredericksen

2002 *Archaeological Inventory Survey of Puuohala Mauka Residential Subdivision, Wailuku* Ahupua`a, *Wailuku District, Maui Island, (TMK 3-3-2:por. 1).* On File, State Historic Preservation Division: Kapolei.

2000 *Archaeological Inventory Survey For the Wai`ehu Kou Sewer Line Corridor, Wai`ehu* Ahupua`a, *Wailuku District, Maui Island (TMK: 3-2-3).* On File, State Historic Preservation Division: Kapolei.

1996 *Archaeological Data Recovery Report on Site 50-50-04-4127, Lower Main and Mill Streets, Wailuku Ahupua`a, Wailuku District, Maui Island (TMK 3-4-39: por. 81 & 82).* Ms. on file State Historic Preservation Division, Honolulu.

Handy, E.S. and E.G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum, Bulletin 233. Honolulu.

Herbst, D.R., S.H. Sohmer, and W.L. Wagner
1990 *Manual of the Flowering Plants of Hawai'i*. Vols. 1,2. University of Hawaii Press: Honolulu.

Jones, B., J. Pantaleo, and A. Sinoto
1996 *An Archaeological Inventory Survey for the North Waihee Wells Waterline Project, Waihee and Wai`ehu Ahupua`a, Wailuku, Maui*. Aki Sinoto Consulting.

Kamakau, S.
1992 *Ruling Chiefs of Hawaii*, Revised Edition, Kamehameha Schools Press, Honolulu.

Kame`eleihiwa, L.
1992 *Native Lands and Foreign Desires: Pahea La E Pono Ai?* Bishop Museum Press. Honolulu.

Kelly, M., Y. Sinoto, and R. Cordy
1978 Archaeological Investigations at Wai`ehu Heights Subdivision, Wai`ehu, Maui. Bishop Museum.

Kirch, P.V.
1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.

Kirch, P.V. and M. Sahlins
1992 *Anahulu: The Anthropology of History in the Kingdom of Hawaii*. Vols. 1 and 2. University of Chicago Press. Chicago, IL.

Kuykendall, R.S.
1938 *The Hawaiian Kingdom.*. Vol.I. University of Hawai`i Press. Honolulu.

Pearson, R.J., P.V. Kirch, and M. Pietrusewsky
1971 An Early Prehistoric Site at Bellows Beach, Waimanalo, Oahu, Hawaiian Islands. *Archaeology and Physical Anthropology in Oceania* VI(3):204-234.

Price, S.
1983 Climate. In *Atlas of Hawaii*, ed. By Warwick Armstrong. The University Press of Hawaii, Honolulu.

Pukui, M.K., and S.H. Elbert
1992 *Place Names of Hawaii*. University of Hawaii Press, Honolulu.

Sterling, E.P.
1998 *Sites of Maui.* Bishop Museum Press, Honolulu.

Stokes, J.F.G.
1918 *Report on the Heiau of Maui.* Transcipt on file at the B.P. Bishop Museum, Honolulu.

Thrum , T.G.
1917 "Maui's Heiaus and Heiau Sites Revisited," *Hawaiian Annual for 1917.* Honolulu.

Waihona `Aina Corporation
2003 Mahele Database, www.waihona.com. Kaneohe, HI.

Walker, W.
1931 *Archaeology of Maui*, Manuscript. Bishop Museum, Honolulu.

Wilcox, C.
1996 *Sugar Water: Hawai`i's Plantation Ditches.* University of Hawai`i Press, Honolulu.

Yent, M.
1983 *Halekii-Pihana State Monument Phase I: Archaeological Testing and the Development of Interpretive Themes.* Ms. on file State Historic Preservation Division, Honolulu.

PROJECT 425 STERLING KIM 240-ACRE INVENTORY SURVEY WAIEHU, MAUI

Field Bag	Survey Transect	Site	Feature	Unit	Depth (cmbs)	Cultural Material	Measurements	Lot Count	Remarks
1	-	-	SSF-1	ST-1	40-55	Charcoal with Matrix	111.8 grams	-	-
2	-	T-4	-	-	Surface	Basalt Debitage	-	1	Interior flake
3	-	T-5	-	-	Surface	Invertebrate Gastropod	29.6 grams	1	*Conus* sp., extremely weathered
4	86	-	-	-	Surface	Ceramic Body Sherd	-	1	Interior and exterior glazed white, unidentifiable blue underdesign
5	86	-	-	-	Surface	Bottle Glass Body Sherd	-	1	Olive green color
6	85	-	-	-	Surface	Stoneware Body Sherd	-	1	Interior and exterior glazed brownish/ black
7	89	-	-	-	Surface	Bottle Glass Base Sherd	-	1	Amber color, base embossed: … **G C** o
8	109	-	-	-	Surface	Bottle Glass Body Sherd	-	1	Olive green color
9	135	-	-	-	Surface	Stoneware Body Sherd	-	1	Interior and exterior glazed brownish/ black
9	135	-	-	-	Surface	Stoneware Base Sherd	-	1	Interior and exterior glazed brownish/ black
10	135	-	-	-	Surface	Stoneware Base Sherd	-	1	Interior and exterior glazed with slight bluish tint (possible salt glaze), interior decorated with bold blue, unidentifiable design, exterior decorated with double thin blue lines
11	155	-	-	-	Surface	Bottle Glass Body Sherd	-	1	Olive green color
12	135	-	-	-	Surface	Bottle Glass Body Sherd	-	1	Aqua marine color
13	134	-	-	-	Graded Surface	Whiteware Rim Sherd	-	1	Interior and exterior glazed white
13	134	-	-	-	Graded Surface	Whiteware Body Sherd	-	1	Interior and exterior glazed white, exterior decorated with underdesign of blue flora
14	155	T-4	-	-	Surface	Basalt Flake with Polish	Length: 2.10 cm, Width: 2.07 cm, Thickness: 0.94 cm	1	One polished surface

PROJECT 425 STERLING KIM 240-ACRE INVENTORY SURVEY WAIEHU, MAUI

Field Bag	Survey Transect	Site	Feature	Unit	Depth (cmbs)	Cultural Material	Measurements	Lot Count	Remarks
15	135	T-4	-	-	Surface	Volcanic Glass Debitage	-	1	Non-diagnostic flake
16	155	-	-	-	Surface	Whiteware Body Sherd	-	1	Interior and exterior glazed with slight bluish tint, interior decorated blue, unidentifiable patterns underglaze
17	-	-	-	-	Graded Road Surface	Bottle Glass Body Sherd	-	1	Amber color
17	-	-	-	-	Graded Road Surface	Bottle Glass Body Sherd	-	1	Olive green color
18	-	T-12	A	TU-1	I	Whiteware Body Sherd	-	1	Interior and exterior glazed white, crackled, exterior hand painted blue floral pattern under the glaze
19	-	T-12	A	TU-1	II	Bottle Glass Body Sherds	-	5	A, B, C - Clear D - Clear, painted words: … ***alit*** E - Olive green color
19	-	T-12	A	TU-1	II	Window Pane Glass Sherd	-	1	Flat
19	-	T-12	A	TU-1	II	Stoneware Body Sherd	-	1	Interior and exterior glazed black
19	-	T-12	A	TU-1	II	Non-Diagnostic Iron	-	1	-

Field Bag	Survey Transect	Site	Feature	Unit	Depth (cmbs)	Cultural Material	Measurements	Lot Count	Remarks
20	-	T-12	-	-	Surface	Glass Bottle	Overall Height: 19.1 cm Body Height: 10.5 cm Mouth Diameter (inner): 1.6 cm Base Diameter: 5.3 cm	1	Complete, amber glass beer bottle, automatic machine made (base and two sides), crown top finish with skirted collar, sloped and embossed shoulders, textured side near base, flat and embossed base. Body embossed near base. Shoulder embossment: **NO DEPOSIT ☆ NO RETURN NOT TO BE REFILLED**. Body embossment: **34**. Base embossment: 1st line: **S** manufacturer's stamp **4**, 2nd line: **30**, 3rd line: **4801**, 4th line: **I-WAY**. Bottle manufacturer: Glass Containers, Inc. Bottle manufacture date (based on utilization of manufacturer's stamp): post 1945. The manufacturer's stamp is a capital G placed vertically and connecting to the top of a capital C.
21	-	T-12	-	-	Surface	Glass Bottle	Overall Height: 20.4 cm Body Height: 10.5 cm Mouth Diameter (inner): 1.6 cm Base Diameter: 5.2 cm	1	Complete, amber glass beer bottle, automatic machine made (base and two sides), crown top finish with skirted collar, sloped and embossed shoulders, flat, textured and embossed base. Shoulder embossment: **NO DEPOSIT ☆ NO RETURN NOT TO BE REFILLED.** Base embossment: 1st line: **4241**, 2nd line: **1** manufacturer's stamp **53**, 3rd line: **69**. Bottle manufacturer: Metro Glass Company of Jersey City, NJ. Bottle manufacture date (based on manufacturer's stamp): post 1949. The manufacturer's stamp is a capital M encompassed by a hexagon.
22	-	T-12	-	-	Surface	Porcelain Base Sherd	-	1	Interior and exterior glazed slight bluish tint, interior decorated with an overglaze, painted orange crab

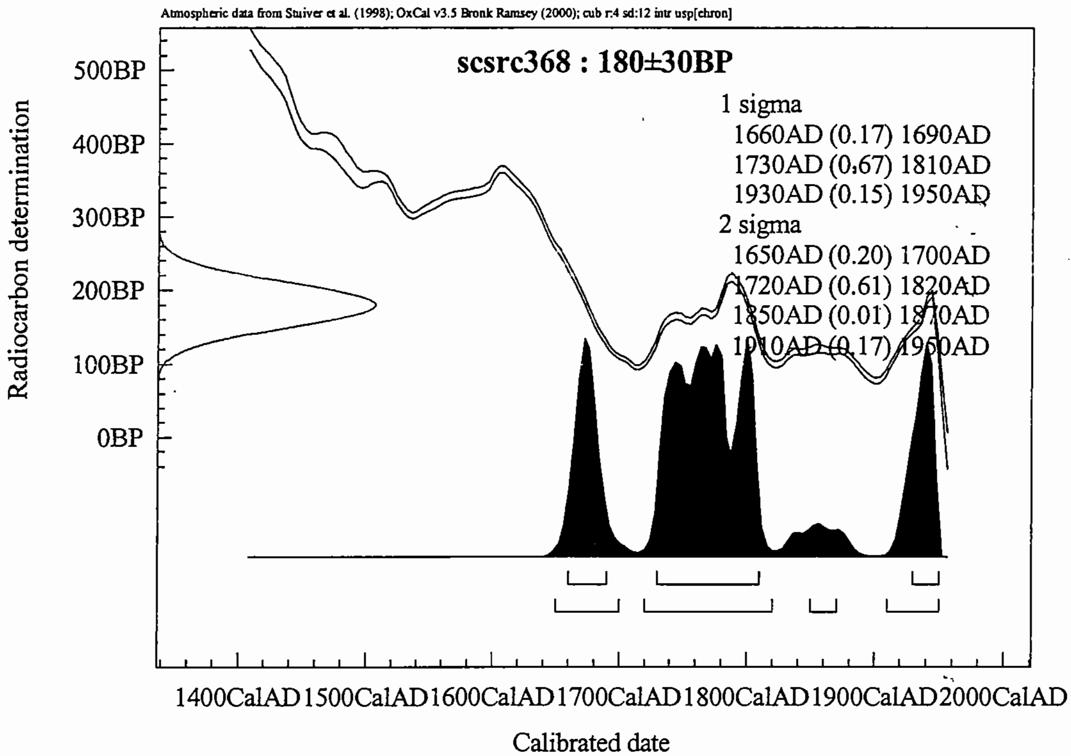
Field Bag	Survey Transect	Site	Feature	Unit	Depth (cmbs)	Cultural Material	Measurements	Lot Count	Remarks
23	-	T-12	-	-	Surface	Bottle Glass Base Sherd	-	1	Textured and embossed. Base embossment: 1st line: **20** manufacturer's stamp **3**, 2nd line: **11 D**, 3rd line: **3462-C**. Base diameter: 8.0 cm. Bottle manufacturer: Owens Illinois Glass Co., of Toledo, Ohio. Bottle manufacture date (based on utilization of manufacturer's stamp): 1929-1954. The manufacturer's stamp is a vertical oval with a horizontal diamond intersecting. A capital I is located within the intersection.
24	-	T-15	B	TU-4	I	Whiteware Rim Sherd	-	1	Interior and exterior glazed slight bluish tint, interior decorated with blue spots under the glaze;
25	-	T-15	B	TU-4	I	Coral	10.7 grams	5	Found between 30 and 40 cmbs
26	-	T-15	B	TU-4	II	Charcoal with Matrix	5.7 grams	-	Found between 35 and 41 cmbs
27	-	T-15	A	TU-2	I/2	Charcoal	0.5 grams	-	Found between 10 and 15 cmbs
28	-	T-15	A	TU-2	I/3	Charcoal	2.3 grams	-	Found between 20 and 30 cmbs
29	-	T-15	A	TU-2	I/4	Charcoal	0.8 grams	-	Found between 30 and 40 cmbs
30	-	T-15	A	TU-2	I/5	Charcoal with Matrix	0.9 grams	-	Found between 40 and 53 cmbs

Dr. Robert L. Spear | Report Date: 3/1/2004

Scientific Consultant Services, Inc | Material Received: 1/30/2004

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 188746	150 +/- 30 BP	-23.3 o/oo	180 +/- 30 BP

SAMPLE : SCSRC368
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1655 to 1695 (Cal BP 295 to 255) AND Cal AD 1725 to 1815 (Cal BP 225 to 135)
Cal AD 1920 to 1950 (Cal BP 30 to 0)


Atmospheric data from Stuiver et al. (1998); OxCal v3.5 Bronk Ramsey (2000); cub r:4 sd:12 intr usp[chron]
scsrc368 : 180±30BP
1 sigma
1660AD (0.17) 1690AD
1730AD (0.67) 1810AD
1930AD (0.15) 1950AD
2 sigma
1650AD (0.20) 1700AD
1720AD (0.61) 1820AD
1850AD (0.01) 1870AD
1910AD (0.17) 1950AD
Radiocarbon determination
500BP
400BP
300BP
200BP
100BP
0BP
1400CalAD 1500CalAD 1600CalAD 1700CalAD 1800CalAD 1900CalAD 2000CalAD
Calibrated date

Appendix D

Archaeological Inventory Survey of Roadway Extension

SCS Project 468-1a

AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT ON THE PROPOSED IMI KALA STREET AND NEKI PLACE EXTENSION ROUTES IN WAILUKU, WAILUKU AHUPUA`A, WAILUKU DISTRICT, ISLAND OF MAUI, HAWAI`I [TMK: 3-3-02: PORTION OF 001 AND 3-4-32: PORTION OF 001]

Prepared by:
Guerin Tome, B.A.
and
Michael Dega, Ph.D.
July 2004

Prepared for:
Sterling Kim
187 Haulani Street
Pukalani, HI 96768

Copyright © Scientific Consultant Services, Inc. 2004. All rights reserved.

SCIENTIFIC CONSULTANT SERVICES Inc.

HAWAII

711 Kapiolani Blvd. Suite 975 Honolulu, Hawai`i 96813

ABSTRACT

Archaeological Inventory Survey, including selected subsurface testing, was conducted on selected portions of land in Wailuku, Maui for the Imi Kala Road and Neki Place Extensions. Portions of the Imi Kala Road Extension route was located on lands formerly used for the cultivation of *lo`i* while other portions were located in abandoned fields of macadamia nut. The Neki Place Extension crossed a portion of an old cane haul road used during the days of sugar cane cultivation. With the exception of a single soil retention rock wall that was probably constructed during the historic period of Wailuku, no archaeological sites were located on the Neki Place road extension. However, the Imi Kala Road Extension road route crossed over three historic features: a historic bridge (50-50-04-5564), Spreckels Ditch (50-50-07-1508) and an un-named irrigation ditch (50-50-04-5566) probably utilized during times of sugar cultivation. The former *lo`i* fields located under the proposed Imi Kala Road Extension nearest the historic bridge were designated State Site Number 50-50-04-5565. Adequate documentation of these four archaeological sites have been obtained and no further archaeological work has been deemed necessary.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

At the request of Sterling Kim, Scientific Consultant Services (SCS), Inc. performed an Archaeological Inventory Survey on the proposed Imi Kala Street and Neki Place Extension Routes within the *ahupua`a* of Wailuku, Wailuku District, Island of Maui, Hawai`i (TMK: 3-3-02: portion of 001 and 3-4-32: portion of 001). Fieldwork was conducted between May 18 and 20, 2004 by SCS archaeologists John Risedorf and Guerin Tome, B.A. under the direction of the Principal Investigator, Michael Dega, Ph.D. The Archaeological Inventory Survey was performed to investigate the presence/absence of archaeological features on the subject parcel and if found, assess features for function, construction methods and locate subsurface midden deposits.

GEOGRAPHIC SETTING

The multi-acre project area is located between *c*. 49 and 85 meters (160–240 foot) above mean sea level (amsl) on the northeast side of West Maui (Figure 1 and 2). The project area is bordered by Iao Stream on the south, Kahekili Highway on the west and north flanks, and an old abandoned, unnamed cane haul road on the east. Piihana Road runs through a portion of the project area. Natural features of the project area included relatively flat areas with moderately sloped terrain in the project area directly above Piihana Road. Artificial terrain features include the Spreckels Ditch (State Site 50-50-07-1508) and an unnamed ditch (State Site 50-50-04-5566) running parallel to Kahekili Highway.

PROJECT AREA SOILS

According to Foote *et al.* 1972:91, the project area is situated within the Iao clay (IcB) and cobbly silty clay (IbB). Iao clay, with three to seven percent slopes, exists on smooth alluvial fans and valley fill. Permeability of these soils is moderately slow, runoff is medium, and the erosional hazard is slight to moderate. Roots in this type of soil can reach to depths of greater than 1.5 meter. The texture of the surface layer for Iao cobbly silty clay differs from Iao clay.

Subsurface testing of both soil types on the project area revealed both undisturbed and imported matrices. The trench stratigraphy above Piihana Road in the northern portion of the project area, in which former macadamia nut lands were located, varied between two and three layers of soil. Trench stratigraphy above Piihana Road in the southern portion of the project area

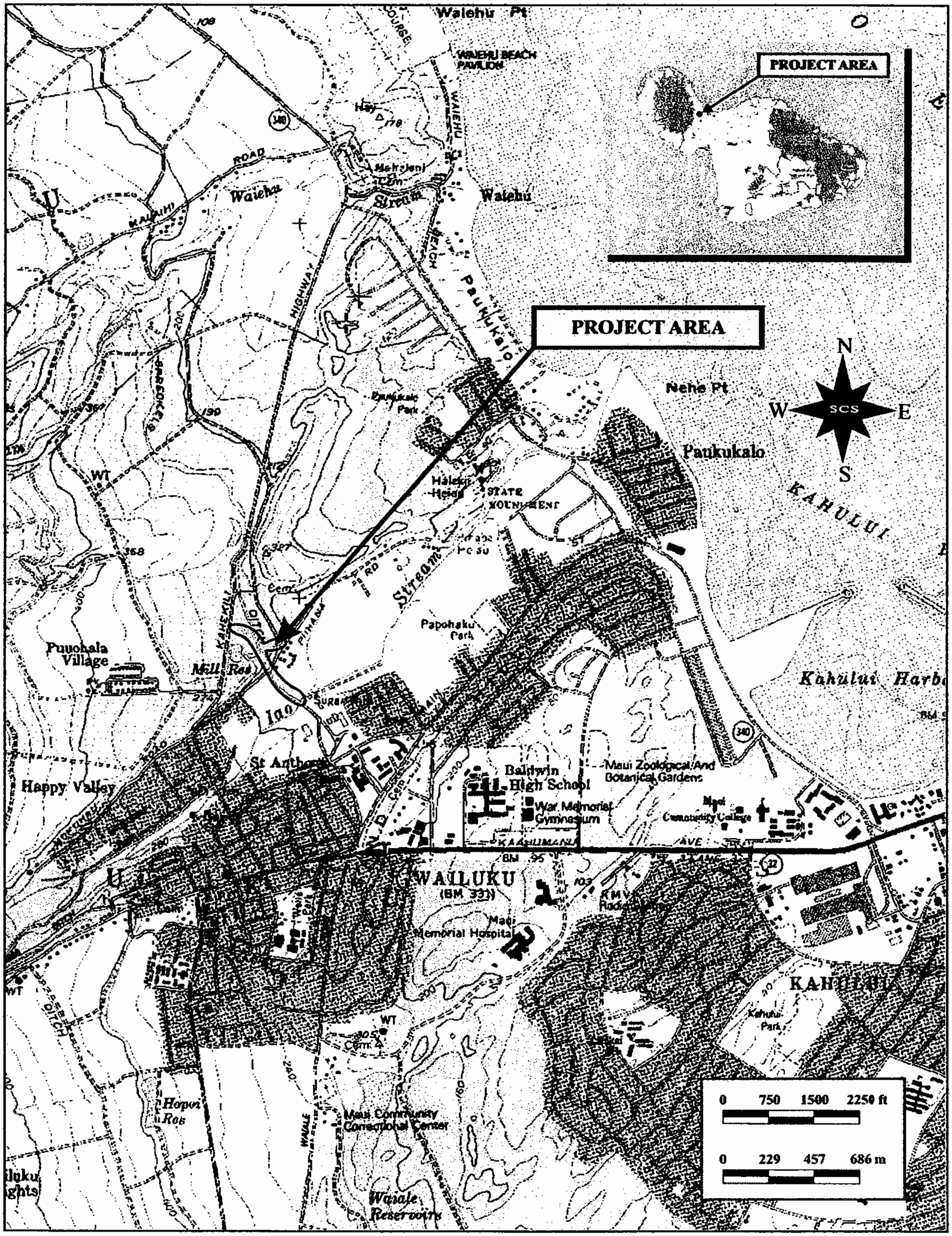


Figure 1: USGS Map of Project Area.

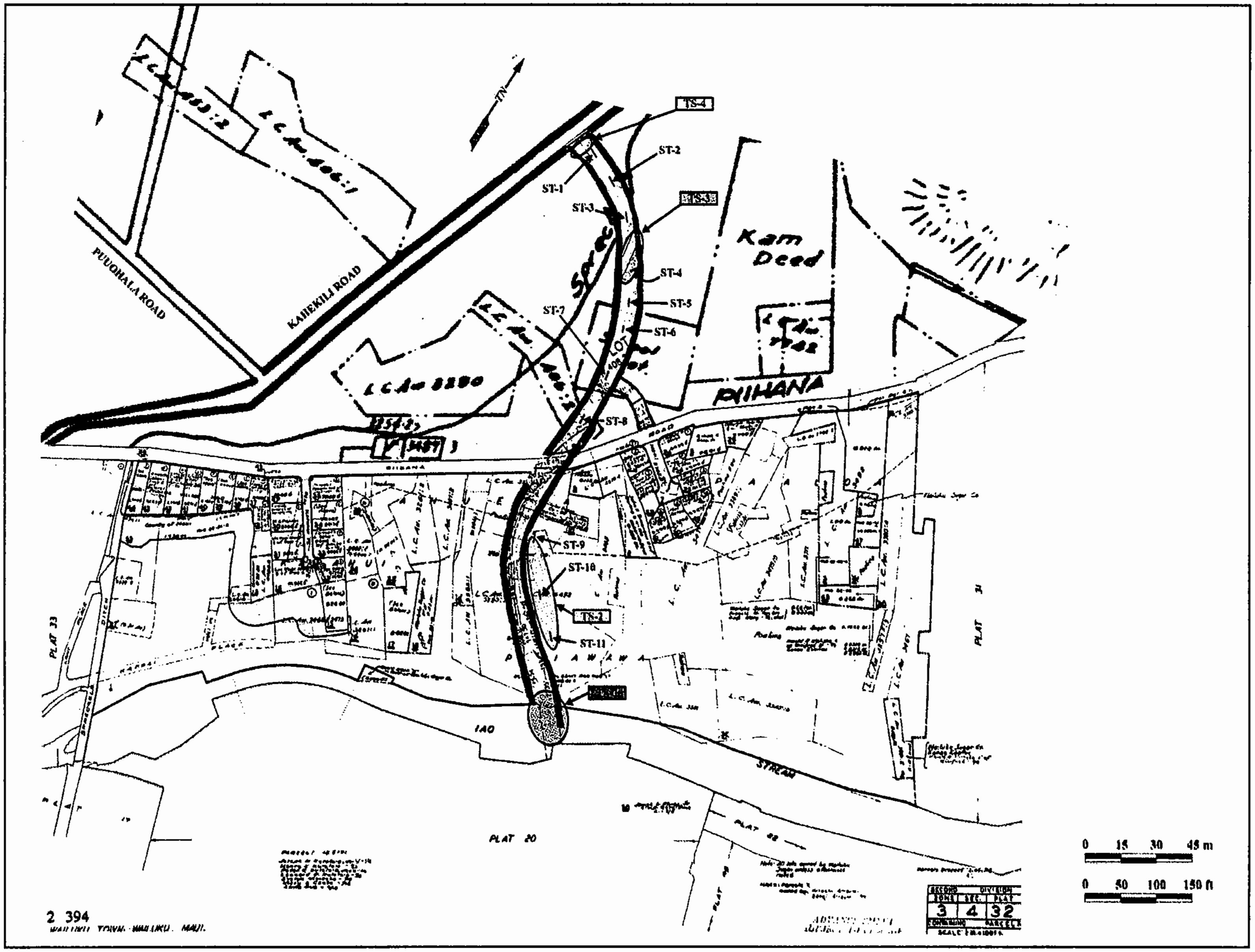


Figure 2: Tax Map Key Showing Project Area Location.

displayed three to five layers, most of which was attributed to the cane haul road where many trenches were placed.

PROJECT AREA VEGETATION

With the exception of a few native plant species such as *`ilima* (*Sida fallax*), *kaliko* (*Euphorbia heterophylla*), and *puakala* (*Argemone glauca*), vegetation displayed on the project area was mainly non-native. Localized only at the northern portion of the project area was macadamia nut (*Macadamia integrifolia)* and longleaf ironwood (*Casuarina glauca*). Scattered throughout the project area, alien species included *koa haole* (*Leucaena leucocephala*), partridge pea (*Chamaecrista nictitans*), castor bean (*Ricinus communis*), golden crown-beard (*Verbesina encelioides*), chinese violet (*Asystasia gangetica*), African tulip (*Spathodea campanulata*), stick tights (*Bidens pilosa*), wild tomato (*Lycopersicum esculentum*), broomweed (*Sida rhombifolia*), lion's ear (*Leontis nepetifolia*), sourbush (*Pluchea carolinensis*), false mallow (*Malvastrum coromandelianum*), *kuku* (*Amaranthus spinous*), Florida beggarweed (*Desmodium tortuosum*), Jamaican vervain (*Stachytarpheta jamaicensis*), bitter gourd (*Momordica charcantia*) and various introduced grasses.

CLIMATE

The area in which the subject parcel lies is the wet region of Maui's northeast coast. Rainfall indicators, according to Price (1983:62), relayed that the project area could receive between 20 and 25 inches during the winter months of December through February. Higher elevations within the Wailuku Ahupua`a are prone to receive more precipitation due to fog drip and lower temperature climates. The frequency of the northern portion of the project area (where the abandoned macadamia nut fields are) receiving upland wash was minimal as irrigation ditches (such as the one paralleling Kahekili Highway and Sprekels Ditch) diverted water toward other destinations. Based on oral accounts, the southern portion of the project area was quite wet as former lands of *kalo* (taro) were harvested there during pre-Historic and early post-Contact (A.D. 1778+) times.

TRADITIONAL AND HISTORIC SETTING

The *ahupua`a* of Wailuku is located on the northeastern side of West Maui in the district of Wailuku. The project area is situated on the southeastern slope of Maui's second largest volcano, Pu'u Kukui, which rises to over 1,764 m (5,788 feet) amsl. Sterling (1998:74) states Wailuku, translates to "Water of destruction" in the Hawaiian language. Pukui and Elbert (1981) submit that *wailuku* was reported as a name "for an *ulua* fishing line" and for the name of chrysanthemum.

Īao Valley, and by extension, Wailuku Ahupua`a and Wailuku District, are frequently mentioned in historical texts and oral tradition accounts as being politically, ceremonially, and geographically important areas during traditional times (Cordy 1981, 1996; Kirch 1985). Wailuku was considered a "chiefly center" (Sterling 1998:90) with many of the chiefs and much of the area's population residing near or within portions of `Īao Valley. The many *heiau* constructed in the area point to the ceremonial and/or religious importance of the area during pre-Contact times. During historic times, the large concentration of Land Commission Awards granted in lower `Īao Valley attest to a sizeable population base and the importance of the lands for cultivation through time. More recent land use in the area included sugar cane cultivation during the late 19th century, military use of the area during World War II, and amily housing and water channels at present.

PREHISTORY

Archaeological settlement data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward sides of the main islands, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). In the Waihe`e and Waiehu areas of Maui, adjacent to and northwest of the current project area, Kirch (1985:87) notes that "a number of coastal dune midden sites have been reported, and at least one of these contained pearl-shell fishhooks similar to those from the Bellows Site, eroding from the wave-cut midden." (The Bellows site, located on the windward coast of O`ahu, has yielded dates of occupation, albeit controversial, from A.D. 300–600 [Pearson *et al.* 1971], one of the earliest dated sites in the Hawaiian Islands.) Research within Wailuku Ahupua`a—especially near `Īao Valley (windward locations)—indicates that the area was likely settled between *c.* A.D. 1100 (Kirch 1985:142) and A.D. 1200 (Fredericksen and Fredericksen 1996).

One of the earliest references for `Īao Valley itself refers to a Maui king in power during the A.D. 1400s (Sterling 1998:84). The king, Kaka`e, was held in such reverence that commoners could not look upon him without suffering punishment by death. King Kaka`e thus became a hermit within `Īao Valley during the 1400s so that his subjects could live without fear. It was supposed that this king that also created a royal burial grounds (*Kapela*), an enigmatic place that was designated for himself and for worthy successors as a sacred burial area.

Connolly (1974:5) states that the pre-Contact valley [`Īao] had a large population base with "most people residing in a settlement near `Īao Needle". Supposedly, the subsistence base of this population consisted of fish and taro, with Kahului Harbor and the coast close by and *lo`i* systems lining `Īao Valley's stream banks. Prehistoric ditches or *`auwai* were utilized in taro cultivation (Connolly 1974:5). Sterling (1998:86) adds that two *`auwai* within the valley "have existed immemorially and were evidently constructed for the purpose of irrigating *kalo* on the plains which stretch away to the northward and southward of the [`Īao] river. Several minor *`auwai* have, since ancient times, tapped the river at different points lower down and spread the water through the lands in the gulch on either side of the river bed." Handy (in Sterling 1998:63) further notes that "From Waihee and Wailuku Valley, in ancient times, was the largest continuous area of wet taro cultivation in the islands." Cheever (1851:124) writes: "The whole valley of Wailuku, cultivated terrace after terrace, gleaming with running waters and standing pools, is a spectacle of uncommon beauty to one that has a position a little above it."

Recent archaeological research (Fredericksen and Fredericksen 1996:52) has revealed that habitation sites along what is now Lower Main Street in Wailuku, "are associated with the rich taro producing lands in the Lower `Īao River flood plain, and the extensive cultivation systems present in `Īao Valley." These habitation sites have been dated to the A.D. 15th through 17th centuries. The `Īao Valley area was not only renowned for its agricultural base during prehistoric times but its ceremonial and political base as well (see also Cordy 1996; Donham 1996).

Halekii Heiau, part of the Halekii-Pihana Heiau complex, was constructed during the mid and late 18th century (Sterling 1998:89). These monuments (State Site No. 50-50-04-522) are located along the northwest flank of the current project area and are described as very important to Hawaiian history. Yent (1983:7) notes an interesting cycle where Kamehameha I's wife was born there, Kahekili lived there, and Kekaulike died there. Thrum (1909:46) reported that Kamehameha I evoked his war god at Pihana Heiau after his warriors defeated Kalanikupuli's forces during the Battle of `Īao in 1790. The two *heiau* are primarily associated with Kahekili, who is connected with the Halekii-Pihana complex between A.D. 1765 and 1790, and Kamehameha, during his conquering of Maui in 1792 (Yent 1983:18).

Importantly, Halekii and Pihana Heiau are the only remaining pre-Contact Hawaiian structures of religious and historical importance in the Wailuku-Kahului area that are easily accessible to the public (Estioko-Griffin and Yent 1986:3). As stated, the area within and adjacent to the current project is known not only for its religious and/or ceremonial significance, but for its political prominence as well.

The Fredericksen's (1996:52) report that politically, Wailuku [village] was known as a central settlement for high ranking chiefs and their retinue. The Wailuku area was also witness to many battles, from the Battles of `Īao and Sand Hills to the Battles of Kepaniwai and Kakanilua. The most famous battle was at Kepaniwai where in July 1790, Kamehameha I finally wrested control of Maui Island. Kamehameha I and his warriors landed at the Kawela portion of Kahului Bay and proceeded up `Īao and other valleys to score a decisive victory. *Wailuku*, meaning 'water of destruction,' succinctly describes the area in which many of these major battles occurred. The Kauahea area of `Īao Valley (southeast of `Īao Stream below Pihana Heiau), warriors apparently dwelt and were "trained in war skills and there was a boxing site in the time of Kahekili" (Sterling 1998:89).

HISTORICAL `ĪAO VALLEY

The Wailuku area, as Kirch (1985:134) also notes, was an important center of political development during late prehistoric and early historic times and was the seat of powerful chiefs, including Kahekili, arch-rival of Kamehameha. Kamehameha I's unification of the Hawaiian Islands in 1790 brought Maui under the political control of its first non-Maui chief during July of that year. The last king of Maui was Kahekili II, son of King Kekaulike, both supposedly having been interred at the sacred burial grounds in upper `Īao Valley. By the early historic period, significant natural and cultural changes had taken place, not only due to contact with westerners, but also because of internal social and environmental restructuring and external social and environmental factors (*e.g.*, foreign species being introduced as well as foreign ideologies). These combined to have a severe impact on Hawaiian environments, land-tenure, and social structures.

Several periods of various land utilization strategies occurred within `Īao Valley and and near the present project area. Between 1778 and 1848, traditional land use occurred within `Īao Valley, albeit on a smaller scale, as the "Conquest" period began and the Sandalwood and whaling trades dominated political and commercial activity within the islands (Kirch and Sahlins 1992). Quite another conspicuous effect of the growing influence of foreigners in the Hawaiian Islands was the systematic division of lands, the Great Māhele of 1848. The Land Commission oversaw land divisions of three groups: Crown Lands (king), Konohiki Lands, and Government Lands, all of which were, in theory, open to the prerogative of native tenants. The awarded land claims, known as Land Commission Awards (LCA), bordering `Īao Valley, particularly those adjacent to the project area, were numerous in quantity and concentrated on the plateau above the stream valley, along the top of its sidewalls (see Figure 3).

Sterling (1998:86) notes that "the district of Wailuku was once thickly settled, *kuleanas* to the number of over 400 were granted to natives and others. A large portion of these cultivated *kalo* with the aid of water from the river." LCAs impacted by the project area include LCA numbers 406:2, 3290:2 and 3, and 4452 (Figure 3). With the exception of LCA 406:2 located in the mid-section of the project area, the three remaining LCAs were located in the southern portion of the project area where the once abundant *lo'i* fields lay. Although claimants of these three particular LCAs mainly utilized their lands for the cultivation of *kalo* (taro), it was unclear where exactly the claimant for LCA 4452 had his *kalo* patches. Of interest was LCA 3290 whose *kalo* patches were designated *poalima*. *Poalima* lands were lands farmed by commoners for chiefs, and these lands were worked only on Fridays (Pukui and Elbert 1986:158, 334). Unfortunately, the claimant of LCA 3290 did not reveal the name of the chief overseeing the *poalima*. In a study of land use west of the project area, Burgett and Spear (2003) noted that Wailuku area residents submitted 199 land claims and 127 of these were awarded by the Land Commission (Waihona `Aina 1998) in 1848. As such, an immense number of LCAs were encountered during archival research of the project area and environs (Waihona `Aina 1998).

LCAs occurring adjacent to and in the project area were predominantly focused upon agricultural pursuits. The LCA information lists several categories of land use within and near the project through time, from prehistoric times through at least the middle of the 19th century. These include: *lo`i* systems (pondfield cultivation of irrigated taro), *kula* lands (dry land, not wet or taro land); *hala* clumps (*Pandanus odoratissimus* or screw pine; the leaves provide material for weaving baskets or mats); *po`alima* (chiefly plantations; named such as workers generally worked on a chief's plantations specifically on Fridays). Several land divisions parcels were also claimed, from *`ili* (subdivision of *ahupua`a* lands) to *mo`o* (land subdivision of an *`ili*) and *apana* (land division of a *kuleana*). LCAs 406 and 3290 list house sites within their awarded claims.

Traditional land utilization within and adjacent to the `Īao Valley project area was, on an initially small scale, replaced by sugar cane cultivation during the 1850s. This small-scale cultivation was begun by Kamehameha III and further intensified by foreign plantation managers and owners such as Peck and others (see Sterling 1998:86). Many of the awarded LCAs in the area were under sugar cane cultivation by the mid 19th century (*e.g*, LCA 406). By the late 1800s, much of the land within and near `Īao Valley was planted in sugar cane. Sugar cane

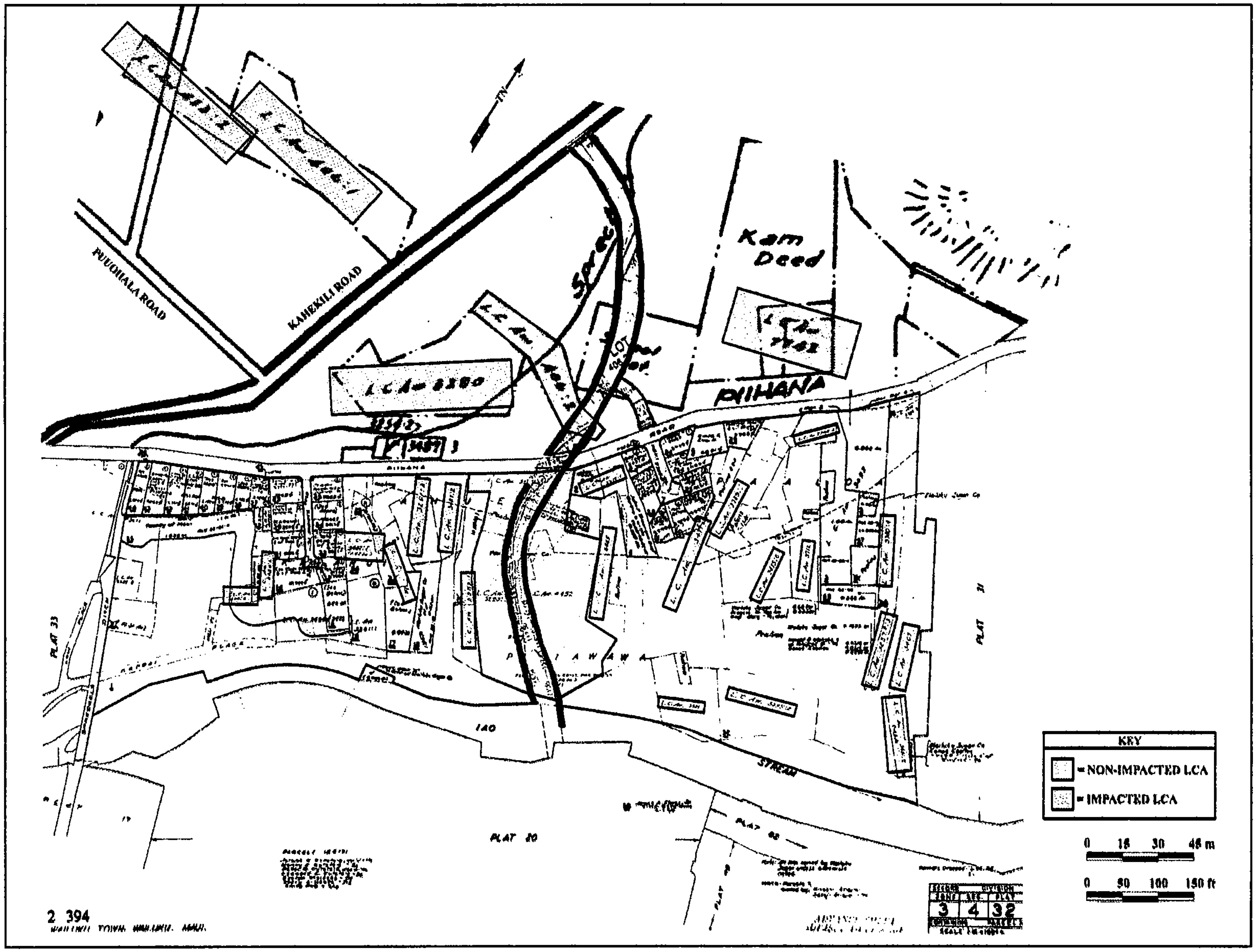


Figure 3: Tax Map Key Showing Land Commission Awards (LCA) Locations within Wailuku Ahupua`a.

fields extended along the borders of `Īao Valley, within the valley, and even occurred between the Halekii-Pihana Heiau site. Connolly (1974:5) notes that in the early 1900s, the sugar cane industry dominated commerce and land use in the `Īao Valley area; it created a fair amount of water irrigation ditches, terraces, free standing walls, historic house sites, and mill structures. Agricultural terracing and a Portugese worker's camp were located in the lower stream valley. The Portugese laborers "lived in the stream bed area, growing taro and other vegetables in the *lo`i* and working as laborers on the plantation. This population lived in a worker's camp until the flood of 1916" (Connolly 1974:5). This flood presumably ended habitation practices within lower `Īao Valley.

In 1912, a rock crusher was installed in `Īao Valley by Mr. Willie Crozier, an entrepreneur who was resolved to supply all of the rock needed for construction projects on Maui. This crusher, however, was also destroyed in the 1916 flood. The flood itself, generated within `Īao Valley, demolished taro *lo`i*, the rock crusher, the Portugese Camp, and, among other things, portions of the two *heiau*. Yent (1983:7) suggests that major erosion of both Halekii and Pihana Heiau was due to the 1916 flood. The western half of Halekii was eroded down the steep valley slope and the eastern half was eroded by `Īao Stream. Importantly, archaeological remnants in the valley were dramatically affected by the flood.

Sugar cane cultivation continued in and near the valley after the flood though, with plantations rebuilding the water systems feeding the sugar cane fields (Connolly 1974:6). Cultivation of sugar cane dominated land use of the project area environs through the middle of this century. During World War II, military training was done in *mauka* `Īao Valley areas while ranching also occurred. Remnants of these activities (and earlier historic occupations) include iron broilers and concrete foundation walls (large ovens), concrete-lined trenches, and concrete house pads (Bordner 1983:6–9). During the late 1980s, the upper portion of the project area transitioned from sugar cane to macadamia nut production and in the late 1990s, production fell and the fields of mac nut were abandoned (Veith 1999). Presently, the project area is bordered by residential housing units on Piihana Road, commercial buildings, and encompassment by abandoned macadamia nut fields.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Several archaeological projects have occurred closer to Wailuku on the flanks of `Īao Valley, all of which are important in determining traditional and historic-period settlement patterns within the general area (see Donham 1996). One study has been conducted directly within `Īao Valley near the current project area. It was an archaeological survey conducted in 1974 by Connolly for the `Īao Valley Flood Control Project.

Thrum (1909) conducted the first archaeological survey within Wailuku Ahupua`a. He first identified the much investigated Halekii and Pihana Heiau. In addition to Thrum's work at the monumental structures, Stokes mapped the site in 1916. Walker also recorded the site in 1931, after his island-wide survey of Maui in which he identified many *heiau* within Wailuku Ahupua`a. Emory (1959) was the next archaeologist working at this important site. During this time he reconstructed portions of Halekii and rendered another map of the *heiau*. The most recent work at the site was conducted by Yent (1983, 1984, 1995) who undertook systematic survey, mapping, and excavations as part of a restoration plan. Yent's (1995) work yielded explicit plan views of the site and detailed profiles of the *heiau,* as well as revealed construction techniques utilized to build the features.

Prior to the modern era, the only large-scale survey of Wailuku Ahupua`a and environs, albeit biased towards coastal structures, was conducted by Walker (1931). Recently, many other archaeological projects have been conducted in the area and have yielded much data regarding settlement pattern and land utilization within the *ahupua`a*. Kirch (1985:144) notes, however, that "more intensive study of these important regions will help to unravel the sequence of economic, social, and political change that led to the development of the powerful Maui chiefdoms witnessed by Cook and others."

Connolly (1974), as part of the initial `Īao Valley Flood Control Project (Phase I), conducted archaeological survey on a parcel located *mauka* the present project area. Connolly's survey augmented a preliminary reconnaissance of the study area by K. Moore of Bishop Museum in April 1974, the latter noting the presence of stone structural remains thought to be taro or *lo`i* terraces. During the survey, Connolly recorded two historic complexes composed of a substantial amount of terraces, free-standing walls, ditches, historic house foundations, and several stone mounds.

Identified by Connolly (1974) and distinguished as State Site No. 50-50-04-2978 (Wallace System Complex) and 50-50-04-2979 (North Terrace System Complex), the former site, located on the south stream bank of `Īao Valley, contained a site composed of twenty terraces, two irrigation ditches, one free-standing diversionary wall, and two house foundations. The North Terrace System Complex consisted of a wet-land taro system represented by six taro terraces, two free-standing walls, and two stone mounds of unknown function. Connolly believed both sites (and all features) to have been constructed during historic times. The sites were presumably constructed by Portuguese workers living in a camp within the valley. Several interesting artifacts were also recovered during the survey and represent traditional taro processing: one fractured basalt *poi* pounder and one unfinished basalt *poi* pounder.

During May 1981, Bordner (1983) conducted archaeological reconnaissance and limited subsurface investigations at the Waiehu Housing Development. The Waiehu Housing Development abuts the Halekii and Pihana Heiau site. The reconnaissance revealed past World War II military use of the area (training grounds) and ranching activities. Artifacts representing this period included an iron broiler and concrete foundation walls (large ovens), a concrete-lined irrigation trench (sugar cane), concrete house pads, and several other mid-20th century structures. Limited subsurface testing in the sandy matrix of the parcel failed to yield any significant cultural layers. Bordner (1983) concluded that it was unlikely that much traditional agricultural activity occurred on the parcel as the sandy matrix was not the type of soil in which taro could be cultivated. Instead, only evidence of historical land use was documented.

Yent (1983, 1995) conducted systematic survey, mapping, and excavations at the *heiau* site (State Site 50-50-04-522) during several field excursions between 1983 and 1995. The site, recommended for inclusion in the National Register of Historic Places, lies on the northwest side of `Īao Valley Stream, or adjacent and northwest of the present project area. As stated previously in this document, the *heiau* site was especially important during traditional times as a ceremonial loci. The two *heiau* are located on a lithified sand dune ridge to the northwest of `Īao Stream. Both structures suffered damage due to erosion caused by `Īao Stream and the eroding sand dune (Yent 1983:1). These two complex structures have been approximately dated to the mid to late 18th century, before foreigners arrived in the Hawaiian Islands. Yent (1983, 1984, 1995) and Estioko-Griffin and Yent (1986) provide a more detailed description of the sites' interpretations, results, and recommendations.

The archaeological work conducted near the current project area was completed by the Fredericksens (1996) on Lower Main Street and Mill Street in Wailuku. This project area lies approximately 500 m southeast of the current `Īao Valley study location. Excavations at State Site No. 50-50-04-4127 revealed two extensive, subsurface cultural deposits, both "overlain by fill from historic earthmoving activities associated with the construction of the Kahului Railroad and Lower Main Street" (Fredericksen and Fredericksen 1996). While the upper cultural deposit was disturbed by the aforementioned activities, the lower layer contained intact pre-Contact features and artifacts associated with habitation. Artifacts associated with fishhook manufacture, lithic tool utilization and production, and food preparation were recovered from Layer II deposits. The deposits were dated and results suggested the site was occupied during the late pre-Contact period (A.D. 1570–1780). Importantly, this habitation site is likely associated with the lower `Īao River flood plain in which taro was presumably produced. Thus, habitation occurred above the valley floor while taro production for households occurred on the rich but narrow alluvial flood plains of `Īao Valley.

Finally, Cordy (1996) and Donham (1996) provide overview studies of prior archaeological work conducted in the area. Cordy (1996) discussed an overview of *Māhele* documents on land patterns in `Īao Valley that clearly showed the lower valley region contained irrigated taro fields throughout the flood plain and houses and associated grave sites at the base of the sand dunes bordering the sides of the flood plain. Donham (1996) also summarized that house sites occur along the base of the sand dunes although the population did move *mauka* through time.

These sampled archaeological studies provide much insight into the nature of traditional and historical activities occurring within and near the current `Īao Valley project area. Through past archaeological research, oral traditions, and historical records, the chronology and settlement pattern of the valley may be brought into focus.

The settlement pattern and timing of land utilization may be conveniently (and arbitrarily) divided into several general periods: traditional/pre-Contact settlement, the early historic period/early post-Contact, the recent historic, and present land use. Together, these periods create a synthesis of land use in and near the project area as well as provide a basis on which researchers explored succinct research questions during reconnaissance and sampling work.

SETTLEMENT PATTERN AND LAND USE PERIOD

Wailuku Ahupua`a and its coastal environs are thought to have been initially settled around A.D. 1100 to 1200. Through time, settlement expanded to more inland locales, such as within various portions of `Īao Valley itself. The Wailuku area is considered to have been a chiefly and ceremonial center during pre-Contact times. Settlement, burial grounds, coastal exploitation of marine resources, and *lo`i* systems in `Īao Valley were supposedly common during pre-Contact times. Between A.D. 1500 and 1700, archaeological data indicates that habitation occurred near `Īao Valley, with the valley itself utilized as taro-producing lands. The numerous *heiau* attest to the significance of the area (Halekii and Pihana Heiau) and war gods were invoked by Hawaiians at the temples (*e.g.*, by Kamehameha I, for example). Many battles were fought within `Īao Valley, most poignantly the Battle of `Īao in which Kamehameha I gained complete control of the island, displacing the Maui chief before him. The unification of the Hawaiian Islands by Kamehameha I, coupled with an increasing influx of foreigners in the islands, ushered in the early historic period.

Early Historic Period

Besides the unification of the islands, perhaps the most significant development following Contact with Westerners was the Great Māhele of 1848. Many awards were distributed in areas bordering `Īao Valley. Most land in that area was being utilized for the cultivation of taro and *hala* trees, and for house sites resting near agriculture production areas. The LCAs listed for the project area and environs were likely used on a continuous basis from pre-Kamehameha I times at least through the middle to late 19th century.

Another significant development was the cultivation of sugar cane, which began in the `Īao Valley area during the 1850s. Sugar cane became the dominant crop cultivated in the area and provided occupational opportunities for both local and non-local residents. With sugar cane cultivation came irrigation and processing structures across the landscape like irrigation ditches, mills, and other infrastructures supporting the cash crop production. Sugar cane cultivation continued through the 20th century.

Recent Historic Period and Present Land Use

During the 20th century, sugar cane cultivation continued on an intensive scale. A Portugese worker camp providing a residence for plantation workers was located in `Īao Valley. The 1916 flood erased this camp and the nearby rock crusher. After the flood, the sugar cane plantations rebuilt many of the irrigation ditches and mill stations that were destroyed. Sugar cane continued to be the dominant activity in the `Īao Valley area, although small taro plots were still being cultivated. To the southwest and *mauka* of the current project area, land was utilized during World War II as a military training area. In addition, ranching became a viable activity in the `Īao Valley area, particularly in *mauka* areas below the precipitous cliffs of the West Maui mountain range. At present, lands surrounding the project area are utilized for family housing and business buildings. The Halekii and Pihana Heiau area has been preserved and restored. The project area is currently overgrown with vegetation and remains relatively non-utilized at present. During the late 20th century, the upper portion of the project area during saw a change in cash crops from sugar cane to macadamia nut until cheaper alternatives doomed the crop and the industry.

Overall, the settlement pattern of the project area and environs suggests a range of site types associated with various landforms (see Cordy 1996 and Donham 1996 for settlement pattern summaries). For instance, irrigated *kalo* fields would occur on the flood plains where alluvial soil and hydrological output are both present in sufficient quantities (and quality) to allow for successful cultivation. Related to a wholly different soil type, traditional subsurface habitation deposits with associated burial loci occur at the base of sand dunes adjacent to the flood plains. Sand dunes occur on both sides of the stream valley flood plain. Traditional activity areas were also utilized during historic times. For example, sugar cane cultivation occurred on an industrial level in flood plain reaches from the 1850s. Even later, portions of the valley were utilized during World War II as training areas. A survey of all topographic features associated with the valley has yielded variable land use patterns through time. The present survey sought to refine these patterns if evidence was indeed available.

METHODOLOGY

FIELD METHODOLOGY

Multiple field tasks were completed during this Archaeological Inventory Survey. First, pedestrian survey was conducted in order to identify archaeological sites and assess project area geographical features. The project area was divided into three sections and dividing those sections were man-made features such as waterways and existing roads. Section One was located from the northern end of Imi Kala Street to Piihana Road. Section Two was located from Piihana Road to the intruding Spreckels Ditch (State Site Number 50-50-07-1508). Section Three was located from the Spreckels Ditch to the existing Kahekili Highway. Vegetation within the project area was identified using Merlin (n.d.), Pope (1968), Kepler (1992, 1997), Whistler (1995), and Pratt (1998). Interval spacing of five meters between SCS personnel was employed to ensure adequate coverage during the survey. During the pedestrian survey, results were complied on standard graphing paper as well as with digital photography. Each site was plotted on an overall project area plan view map. All measurements were recorded in metric. Finally, mechanically excavated stratigraphic trenches (ST) were placed in order to locate and investigate the vertical depth of such archaeological deposits. Soil stratigraphy encountered during excavation was documented utilizing metric graph paper and United States Department of Agriculture (USDA) Munsell soil color charts. If found, portable archaeological materials—soils sampled included—were collected and recorded with applicable provenience and placed in plastic and paper bags for laboratory analysis.

LABORATORY METHODOLOGY

All field notes, digital photographs, and collected archaeological materials were curated at the SCS laboratory in Honolulu. All stratigraphic profiles have been drafted for presentation within this report. Representative plan view sketches showing location and morphology of identified sites/features/deposits were illustrated. All retrieved artifact and midden samples are cleaned, sorted, and analyzed. Marine gastropods and bivalves are identified using applicable references. Significant artifacts are scanned or photographed and classified for qualitative analysis. All metric measurements and weights are also recorded for quantitative analysis. Midden samples are minimally identified to the lowest possible taxonomic classification (*e.g.*, bivalve, gastropod mollusk, echinoderm, fish, bird, and mammal). All data are clearly recorded on standard laboratory forms that included numbers and weights (as appropriate) of each constituent category. Selected soil samples containing organic materials were sent to Beta Analytic, Inc. for radiocarbon dating.

INVENTORY SURVEY RESULTS

The Inventory Survey identified a total of three new archaeological sites as well as the previously documented Spreckels Ditch (State Site Number 50-50-07-1508). State Site Number -5564 was the bridge that crossed over Iao Stream; Site -5565 was the *lo'i* fields identified during trenching within Section One; Spreckels Ditch divided the upper portion of the project area into Sections Two and Three; Site -5566 was the unnamed ditch running parallel to Kahekili Highway (Figure 4). Within Section One of the project area, the once abundant *lo'i* fields documented during the 1800s and the early 1900s was partially covered by an old cane haul road used during the heyday of sugar cane cultivation and most likely served as a route to the Wailuku Sugar Company Mill located nearby. Section Two, located in an abandoned macadamia nut field, did not contain any archaeological sites. The border between Section Two and Three, however, did reveal the previously documented Spreckels Ditch. The Inventory Survey of Section Three documented an unnamed waterway running parallel to Kahekili Highway. This unnamed waterway was most likely constructed during the sugar cane era as it displayed sluice gates that opened into non-project areas, peripheral portions of Section Three. All new archaeological sites were documented with only the former *lo'i* fields being subsurface tested. In addition to the *lo'i* field testing, stratigraphic trenches were also placed throughout the remainder of the project area to determine the human alteration of the existing soils. The results are described below.

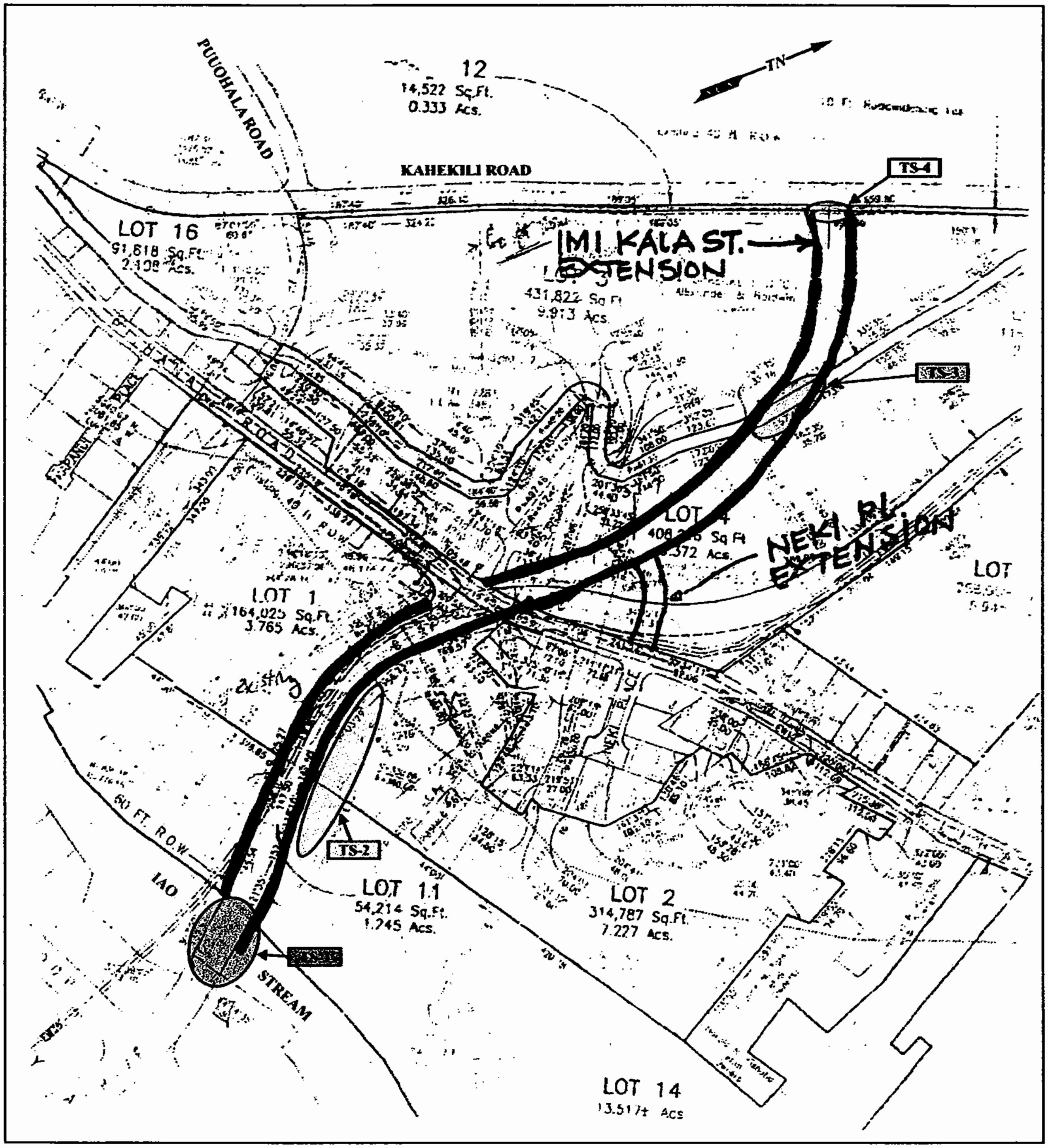


Figure 4: Project Area Map Showing Locations of Identified Archaeological Sites and Stratigraphic Trenches 1 through 11.

SECTION ONE

Section One was located on the lands formerly used for sugar cane cultivation. Currently, unpaved roads branch off the now minimally used cane haul road. Local residents use Section One as a thoroughfare to get to the light industrial sector of Wailuku. Two archaeological sites were identified within Section One: the historic bridge (State Site Number 50-50-04-5564) used during the cultivation of Wailuku's sugar cane past and the former *lo'i* field remnant (State Site Number 50-50-04-5565) orally documented during traditional and historic times. A total of three stratigraphic trenches were placed within Section One to confirm the presence of the historically documented *lo'i* fields and to obtain a more precise date of use from carbon samples. Documentation of the historic bridge was accomplished through digital photography and paper documentation.

SITE 50-50-04-5564

Site -5564 encompassed an approximate area of 186 m² and consisted of a single, historic bridge (Figures 5 and 6). The site was located approximately 30 m northwest of the Imi Kala Street *cul-de-sac* and it crossed `Īao Stream. Situated in a southeast-northwest (120°/305°) direction, the bridge was constructed utilizing concrete, iron/steel and wood. Basalt blocks were incorporated with massive amounts of cement to form the bridge's two middle and stream bank supports while wooden planks, iron/steel I-beams, and additional concrete was used to construct the traveling surface (Figures 7 and 8). Located directly under the traveling surface of the bridge were utility lines (*i.e.,* water, sewer), which served the residents of the area. During its heyday, the bridge not only served the area's now defunct Wailuku Sugar Mill but the area's local residents as well. Documentation of Site –5564 was limited to paper and photographic description.

SITE 50-50-04-5565

Site -5565 encompassed an approximate area of at least of 75 m² and consisted of three sediment contacts of the once abundant *lo'i* fields known to the area (see Figure 4). Site -5565 was located under at least 2 m of imported fill for the construction of an old cane haul road utilized during the cultivation of sugar cane. The identification of Site -5565 was attributed to documented oral and historic accounts of the Wailuku area with confirmation through

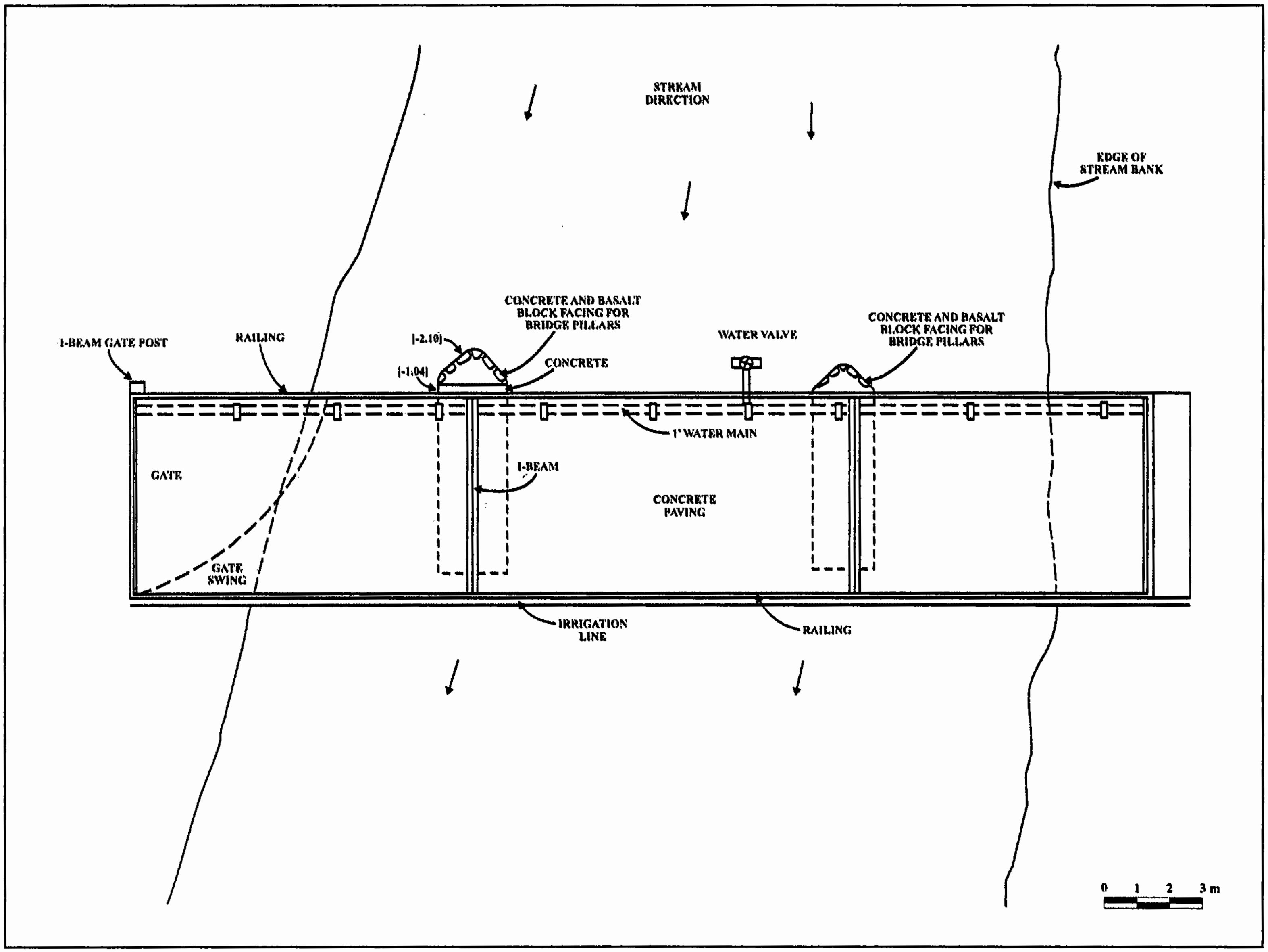


Figure 5: Historic Bridge Plan View Map.

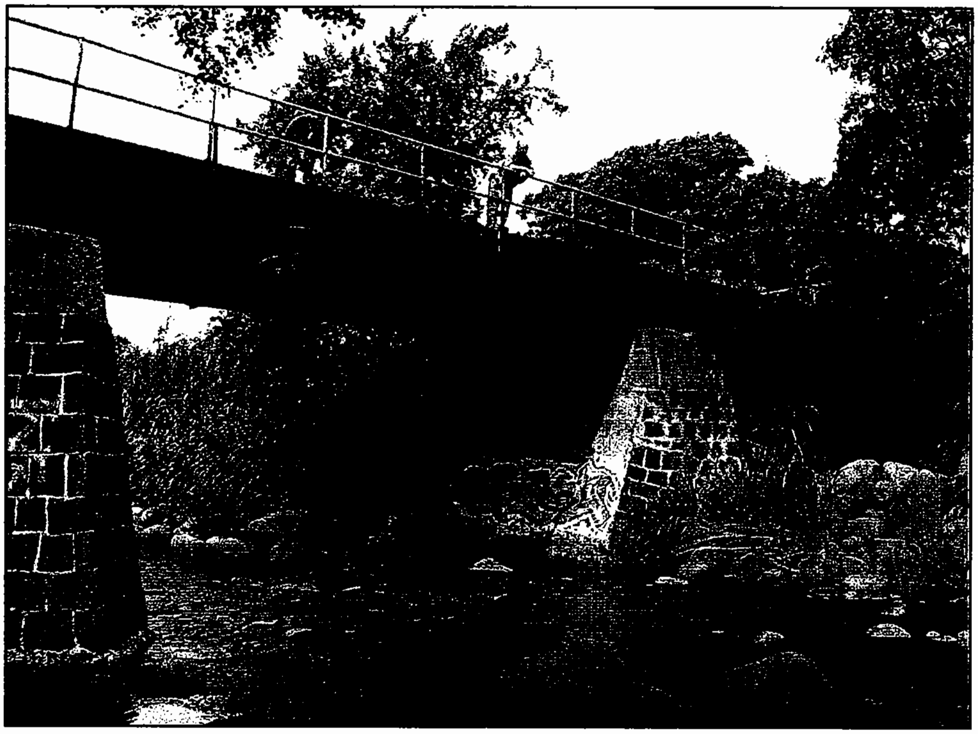


Figure 6: Photograph of Site -5564 Historic Bridge.

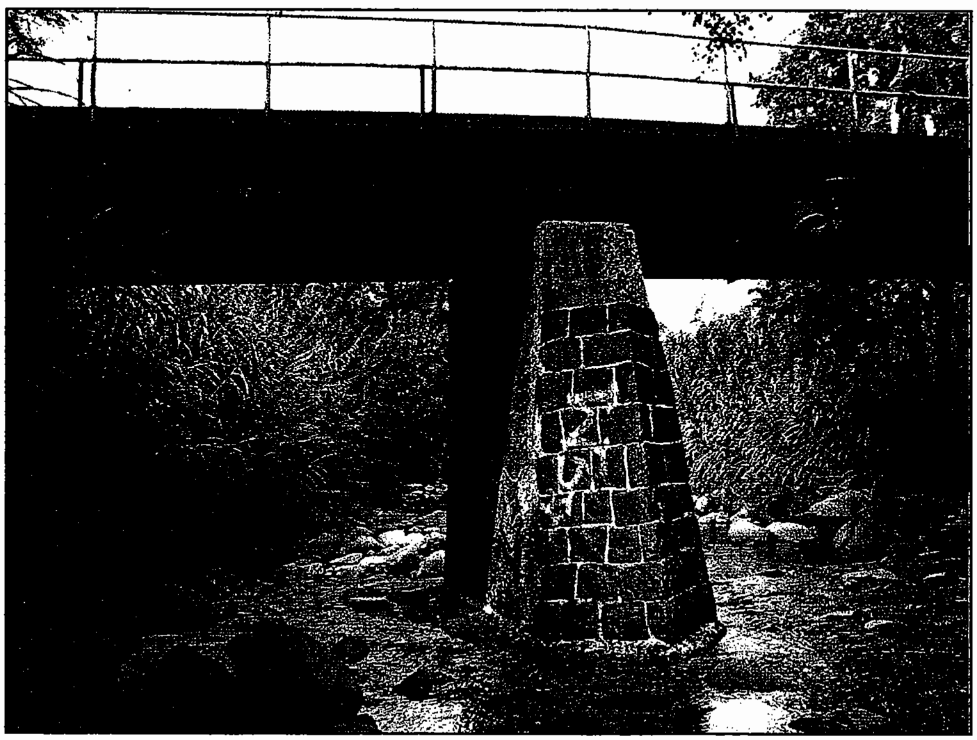


Figure 7: Photograph of Site -5564 HIstoric Bridge Structural Supports.

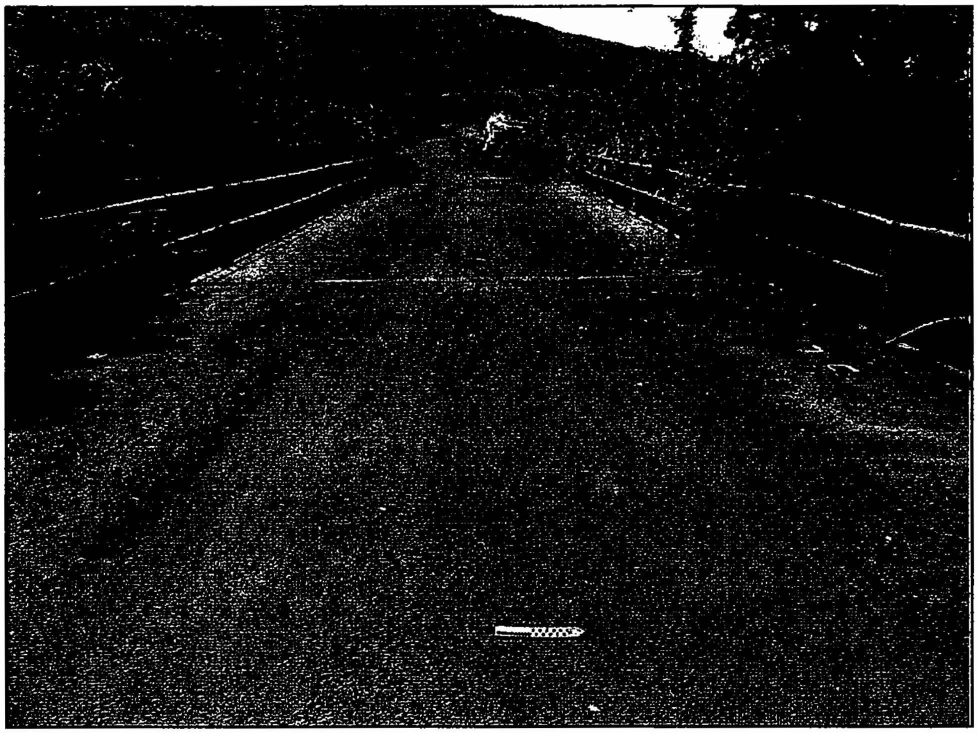


Figure 8: Photograph of Site -5564 Showing Historic Bridge Traveling Surface.

mechanical trenching activities. Stratigraphic Trenches 9, 10, and 11 were placed within the confines of Section One where the former *lo'i* fields once lay.

ST-11 was placed approximately north of Site -5565 and approximately 2 m to the side of the abandoned cane haul road (see Figure 4). ST-11 was oriented in an east-west direction at 112°/292°. Excavation of ST-11 revealed a total of five layers combining imported fill and *in situ* soils (Figures 9 and 10). Layer I (0–22 cmbs) was a semi-compact, medium to fine (5-2 mm diameter) granular structured, very dark brown (10YR 2/2, moist) silty loam with vegetative roots (less than 2 mm diameter). Layer II (22–72 cmbs) was a compact, very fine (less than 1 mm diameter) granular structured, dark yellowish brown (10YR 4/4, moist) silty sand fill. Layer III (72–151 cmbs) was a semi-compact, fine (1–2 mm diameter) granular structured, very dark brown (7.5YR 2.5/2, moist) clayey silt with basalt cobbles and small boulders some of which were water worn. Layer III was also imported fill. Layer IV (151–210 cmbs), however, was non-imported. Layer IV was a semi-compact, fine granular structured, very dark grayish brown (10YR 3/2, moist) clayey silt loam with miniscule pieces of charcoal flecking. Layer V (201–270 cmbs) was a compact, very fine granular structured, dark brown (10YR 3/3, moist) clayey silt with numerous clay iron intrusions. Also present within Layer V was charcoal flecking.

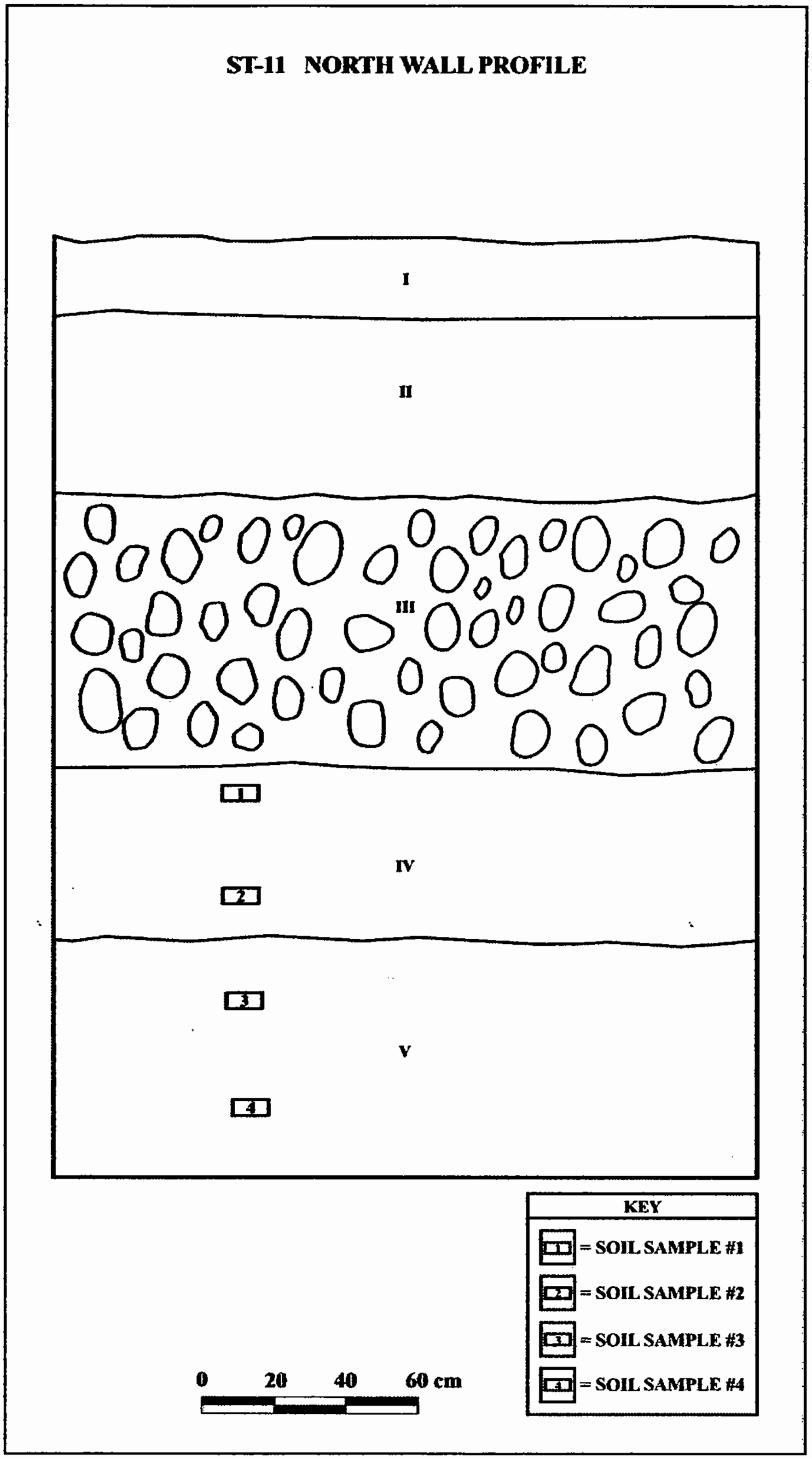


Figure 9: Site -5564, ST-11 North Wall Stratigraphic Sectional Profile Drawing.

Figure 10: Photograph of Site -5564, ST-11 North Wall Profile.

Four soil samples were collected inn sequential depths from Layers IV and V for laboratory analysis.

Also placed approximately 2 m east of the abandoned cane haul road and approximately north of ST-11, the stratigraphy of ST-10 displayed fewer layers of deposit. ST-10 was orientated in a southeast-northwest direction at 110°/290°. Two layers of imported fill and a single layer of *lo'i* deposit were found within ST-10 (Figures 11 and 12). Layer I (0–50 cmbs) was a compact, dark yellowish brown (10YR 3/3, moist) silty clay for road compaction. Layer II (50–160 cmbs) was a compact, dark yellowish brown (10YR 3/4, moist), silty clay fill mixed with water worn basalt cobbles and boulders. Red clay and beige bricks and steel rebar were also present within the fill matrix. Layer III (160–250 cmbs) was a semi-compact, very dark grayish brown (10YR 3/2, moist), silty clay. The upper portion of Layer III had a metal strap. Two soil samples were retrieved from Layer III at sequential depths for further laboratory analysis.

The third stratigraphic trench placed in Section One was ST-9. The placement of ST-9 was also placed north of ST-10 and 2 m off east of the abandoned cane haul road. Three layers of imported fill were observed overlying two layers of *lo'i* sediment (Figures 13 and 14). Layer

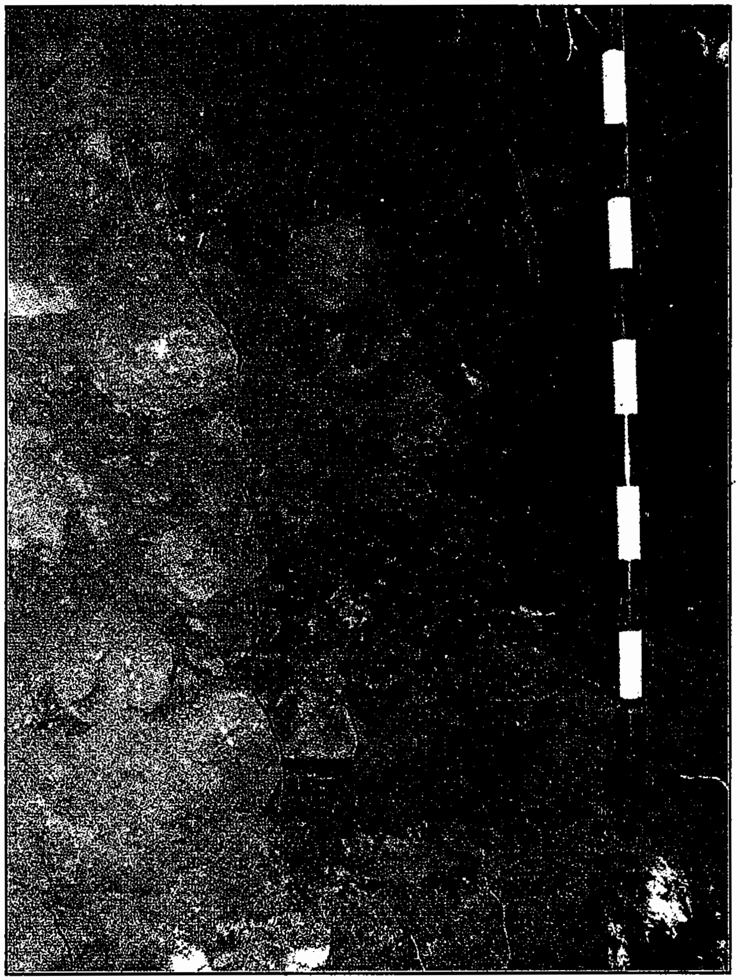


Figure 11: Photograph of Site -5564, ST-10 West Wall Profile.

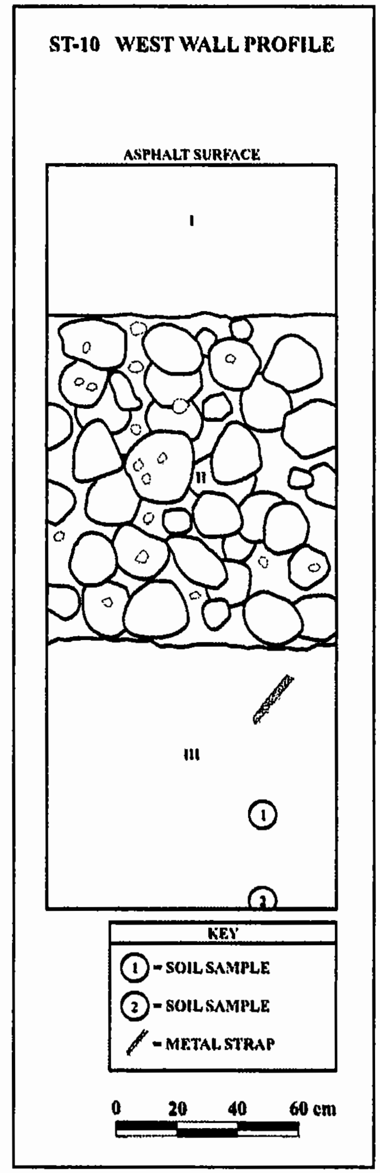


Figure 12: ST-10 West Wall Stratigraphic Sectional Profile.

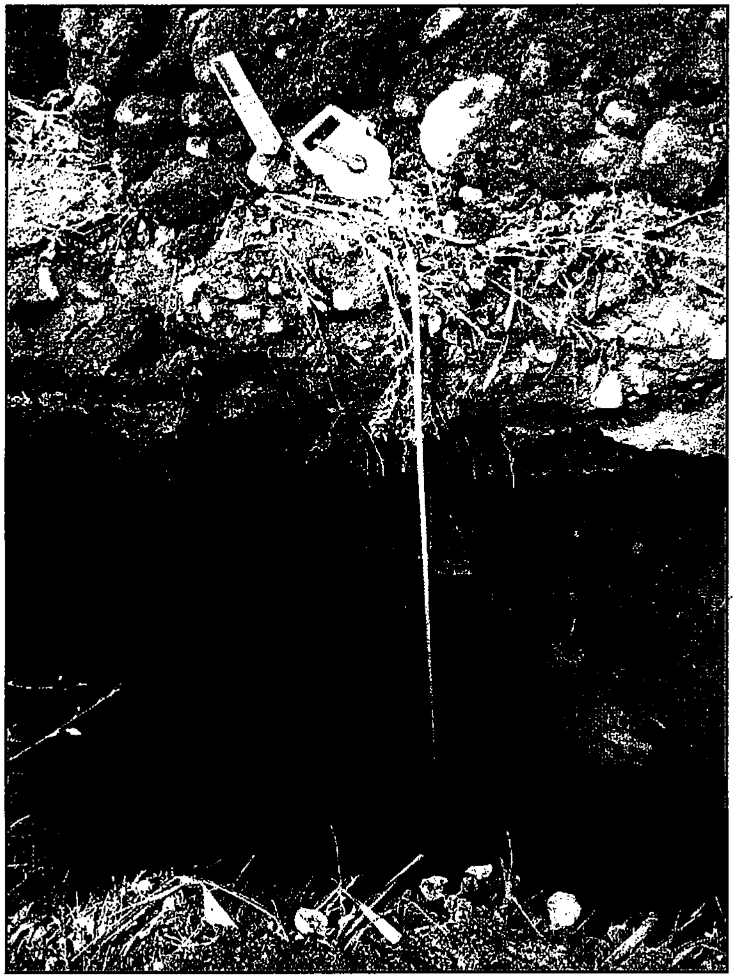


Figure 13: Photograph of ST-9 South Wall Profile.

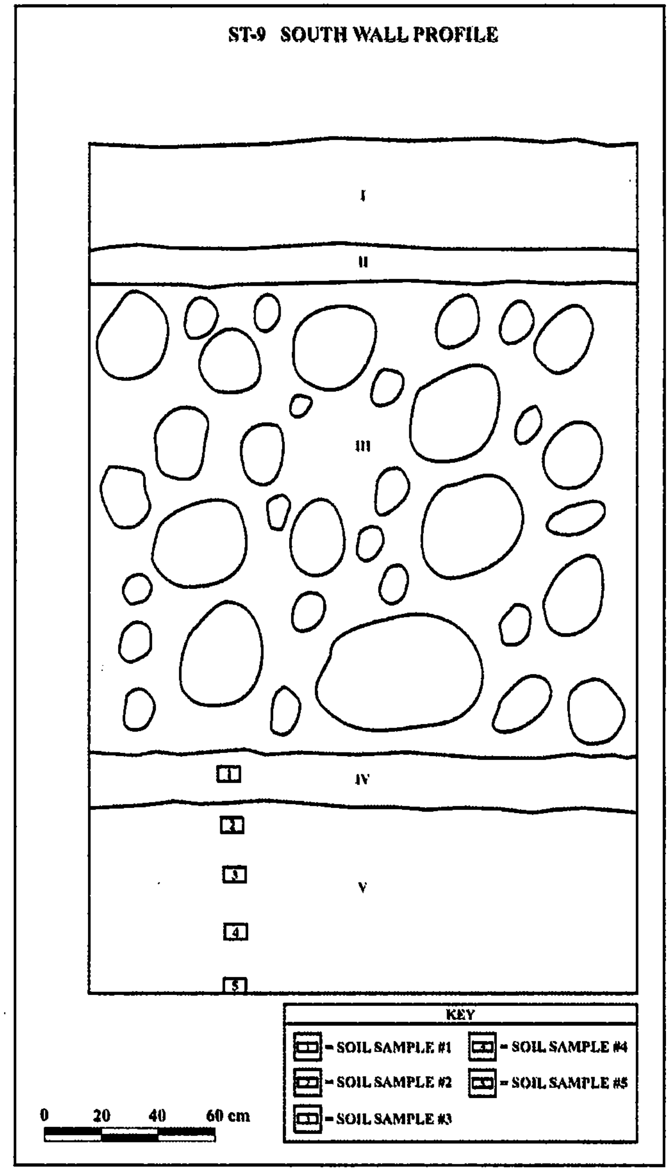


Figure 14: ST-9 South Wall Stratigraphic Sectional Profile Drawing.

I (0–40 cmbs) was a compact, medium to fine granular structured, very dark brown (7.5YR 2.5/2, moist) silty loam with water worn basalt rocks (less than 7 cm diameter). This layer was used as base course for the construction of the can haul road. Layer II (40–56 cmbs) was a compact, fine granular structured, light olive brown (2.5Y 5/4, moist), silty sand fill. Layer III (56–226 cmbs) was a semi-compact, fine granular structured, black (10YR 2/1, moist) silty loam with basalt cobbles and boulders (mainly less than 30 cm diameter with some no more than 1 m in diameter). Non-diagnostic iron/steel debris was present. Layer IV (226–246 cmbs) was a compact, fine to very fine (less than 2 mm diameter), very dark grayish brown (10YR 3/2, moist) clayey silt. Charcoal flecking was observed within this layer. Layer V (246–311 cmbs) was a compact, very fine (less than 1 mm diameter) granular structured, very dark grayish brown (10YR 3/2, moist) clayey silt with many iron inclusions and few flecks of charcoal. A single soil sample obtained at 311 cmbs within Layer V was submitted for radiocarbon dating (Beta No. 192863/SCSRC No. 378).

The result of trenching activities during the current Inventory Survey revealed that the former *lo'i* fields exist although underlain by deep fill for the construction of the cane haul road. Peripheral locations of the former *lo'i* fields near the trenching may be shallower in many locations where no foot or mechanized traffic was observed. As Section One was lastly utilized as sugar cane land, it may be conceived that the intensive sugar cane cultivation resulted in the destruction and removal of traditional archaeological sites that once existed.

SECTION TWO

Section Two was located in the former macadamia nut fields and survey of the section did not locate any surface archaeological sites (Figure 15). However, slightly to the left of the proposed Imi Kala Street Extension and slightly above Piihana Road lies a soil retention rock wall that was most likely constructed and utilized during the days of sugar cane cultivation as it paralled an abandoned cane haul road. Since the structure was not within project area limits, the soil retention rock wall was subjected to recordation using only photography and paper documentation. The soil of the Imi Kala Extension Route in Section Two was tested with five stratigraphic trenches (ST-8 through 4) excavated mechanically so as to identify human alteration.

ST-8 was placed on a slight north-south slope approximately 30 m from north side of Piihana Road. Orientated in an east-west direction at 112°/292°, ST-8 revealed no more than

Figure 15: Overview of Section Two. View to Northwest.

two soil layers (Figures 16 and 17). Layer I (0–10 cmbs) was a semi-compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) clayey loam with vegetative roots of less than 3 cm diameter. Layer II (10–200 cmbs) was a semi-compact, medium to very fine granular structured, dark reddish brown (5YR 3/2, moist) clayey silt. No archaeological materials were found.

Placed on a slight north/south slope to the north of ST-8, ST-7 also revealed two soil layers (Figures 18 and 19). Orientated in a southeast-northwest direction at 150°/330°, ST-7 produced no archaeological materials. Modern trash such as plastic and metal was strewn nearby. Layer I (0–40 cmbs) was a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt. Layer II (40–170 cmbs) was a compact, medium to fine granular structured, very dark brown (7.5YR 2.5/2, moist) silt.

The results of ST-6 mirrored that of ST-7. Placed on fairly level ground north of ST-7, ST-6 was orientated southeast-northwest at 160°/340° and displayed no more than two soil layers (Figure 20). Layer I (0–50 cmbs) was a semi-compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) clayey loam with vegetative roots (less than 2 cm diameter). Layer II (50–180 cmbs) was a semi-compact, medium to fine granular structured, dark brown (7.5YR 3/2, moist) clayey loam. No archaeological materials were observed.

Figure 16: ST-8 East Wall Profile.

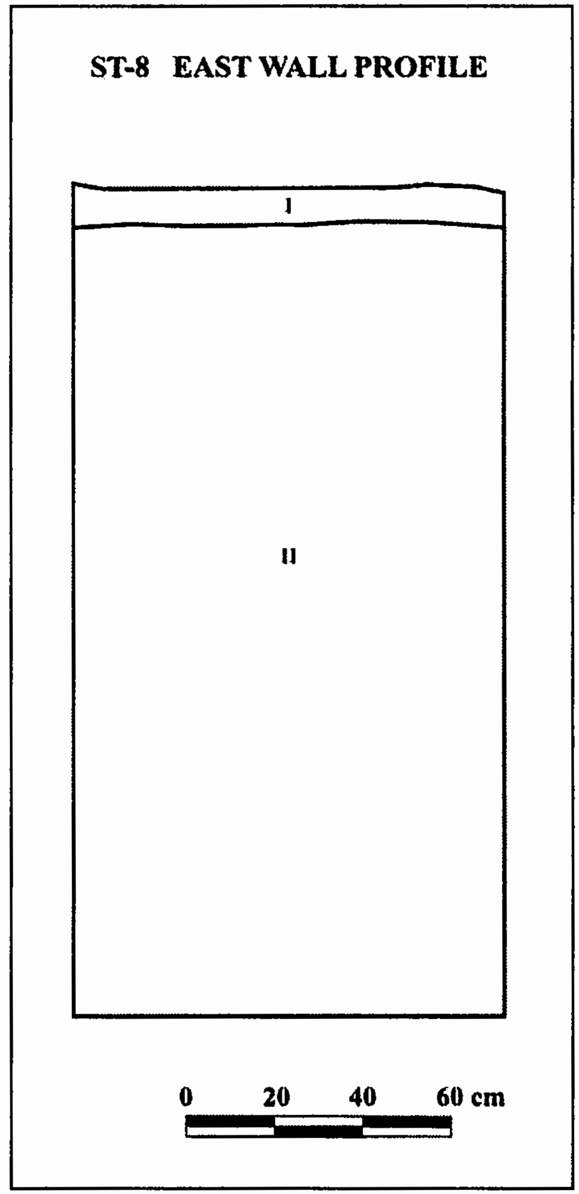


Figure 17: ST-8 East Wall Profile.

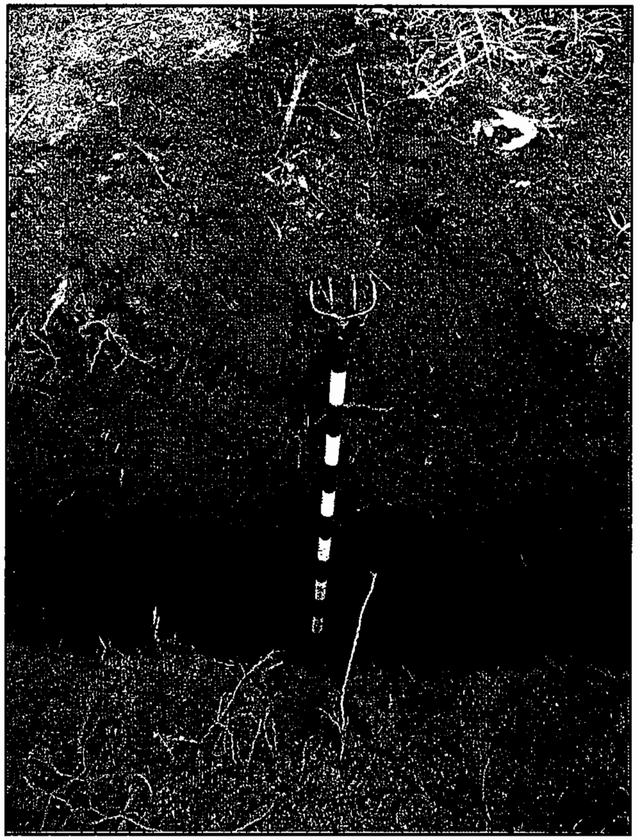


Figure 18: ST-7 North Wall Profile.

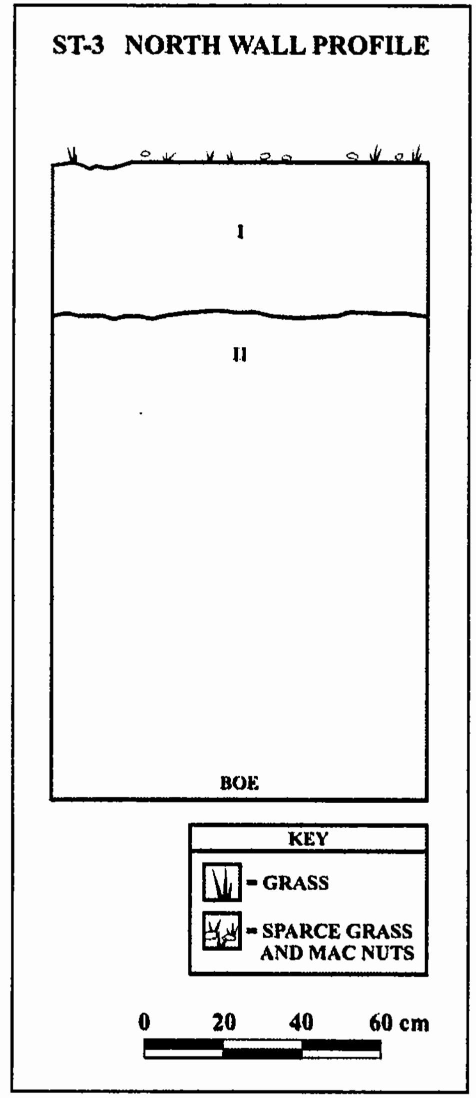


Figure 19: ST-7 North Wall Stratigraphic Sectional Profile Drawing.

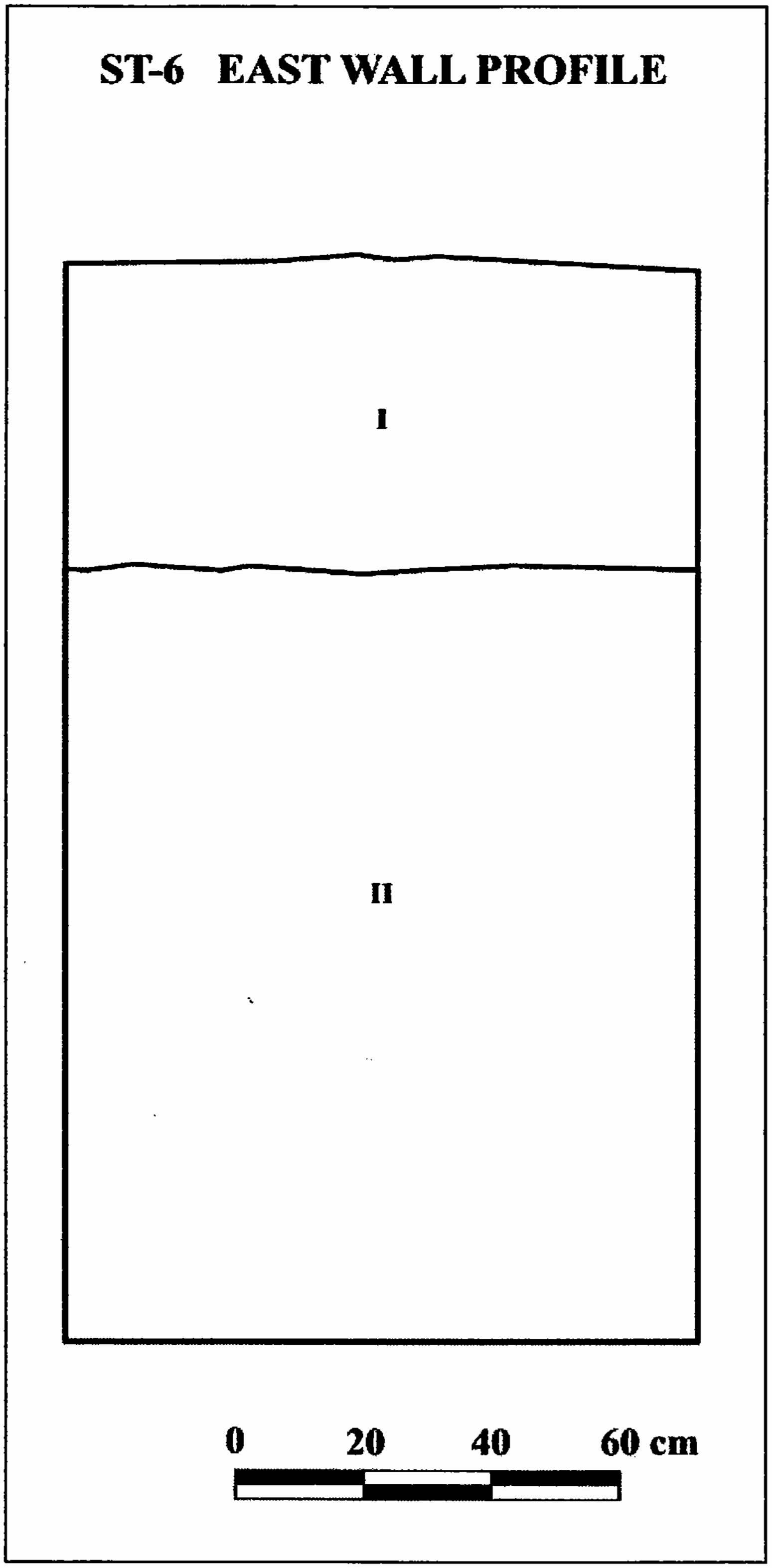


Figure 20: ST-6 East Wall Stratigraphic Sectional Profile Drawing.

ST-5 was placed on fairly level ground and orientated in a southeast-northwest direction at 134°/316°. The lack of imported soils and archaeological materials was also evident in ST-5 where only two soil layers were observed following excavation (Figures 21 and 22). Layer I (0–35 cmbs) was a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt with vegetative roots. Layer II (35–200 cmbs), although lacking vegetative roots, was also a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt.

The excavation of ST-4 was no different from ST-5. Placed north of ST-5 and a few meters south of the Spreckels Ditch (Site -1508), ST-4 was the last stratigraphic trench to be placed within Section Two of the current Inventory Survey. ST-4 was orientated in a north-south position at 11°/191° and following excavation, only two soil layers were revealed (Figure 23). Layer I (0–30 cmbs) was a semi-loose, very fine granular structured, light yellowish brown (10YR 6/4, moist) imported sand fill which may have originated from the nearby sand dunes known in northern Wailuku. Layer II (30–183 cmbs) was a compact, coarse to fine (10 to 2 mm diameter) granular structured, very dark brown (10YR 2/2, moist) clayey silt. Again, no archaeological or cultural materials were observed.

Figure 21: ST-5 West Wall Profile.

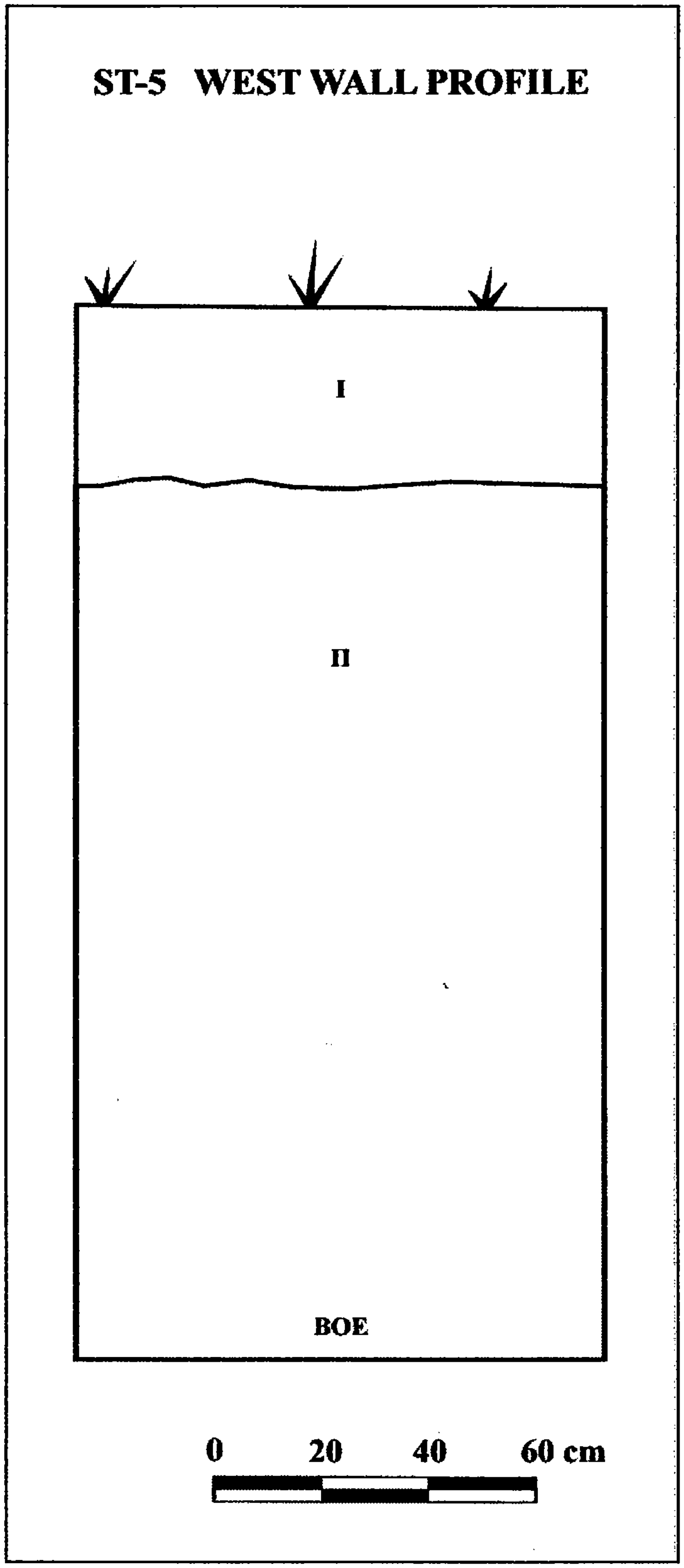


Figure 22: ST-5 West Wall Stratigraphic Sectional Drawing.

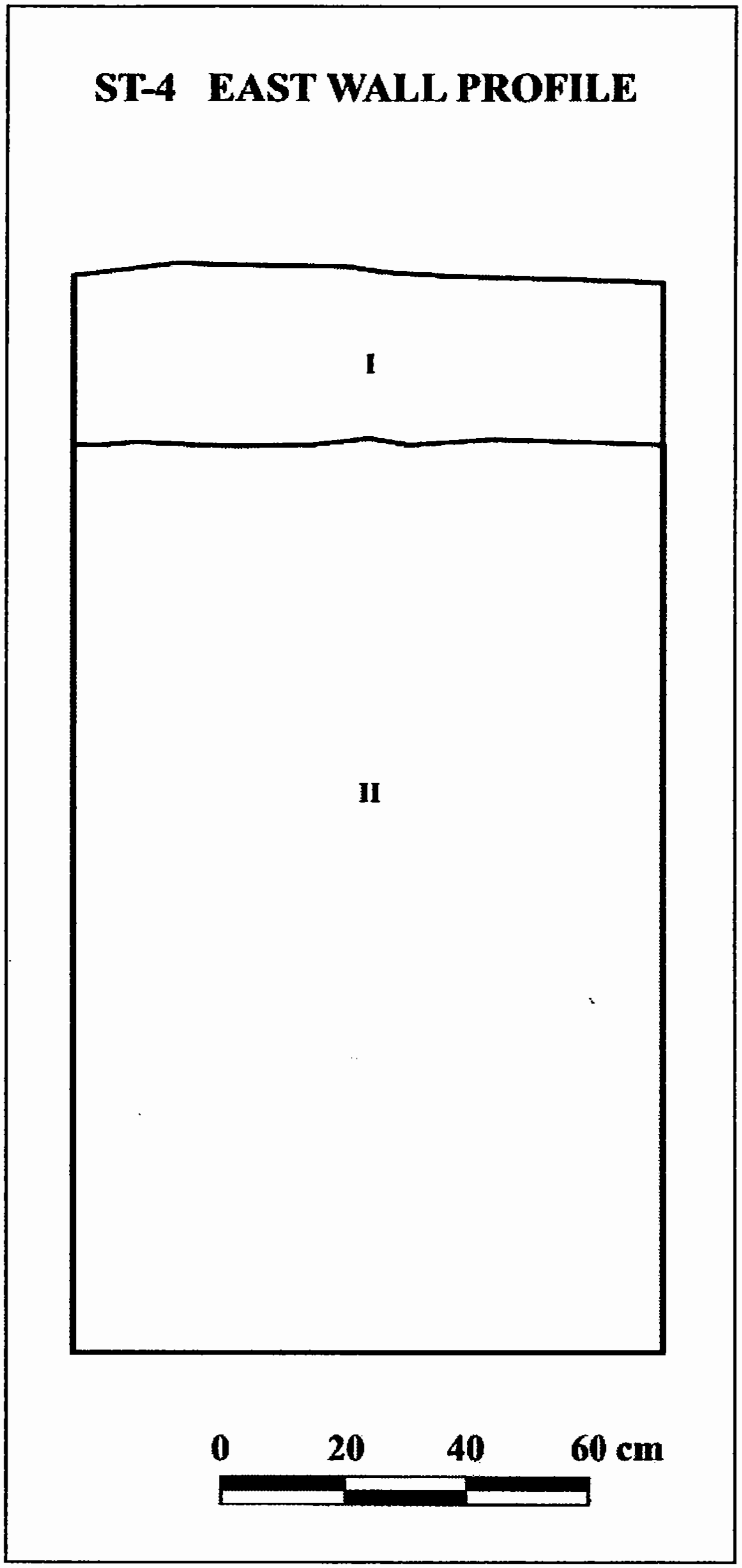


Figure 23: ST-4 East Wall Stratigraphic Sectional Profile Drawing.

The lack of subsurface archaeological materials and for that matter, any cultural material, may have been the result of the intensive sugar cane and macadamia nut cultivation that went on for a combined period of over 100+ years. The utilization of LCA 406:2 within Section Two of the proposed Imi Kala Street Extension Route could not be confirmed either through excavation or historical documents and may have been seriously altered during the cash crop cultivation of sugar cane and/or macadamia nut.

SECTION THREE

Like Section Two, Section Three was located on the lands formerly used for the cultivation of macadamia nuts (Figure 24). Bordering the south boundary of Section Three was Spreckels Ditch (Site -1508), which, at the time of the current Inventory Survey, was flowing with water (Figure 25). The area of the concrete-lined ditch that crossed the project area measured approximately 5 m across from the ditch's outside edges. The depth of the ditch was approximately 1.3 m from the top of the ditch to the bottom of the ditch. The survey of Section Three also located another irrigation ditch running parallel to Kahekili Highway (Figure 26).

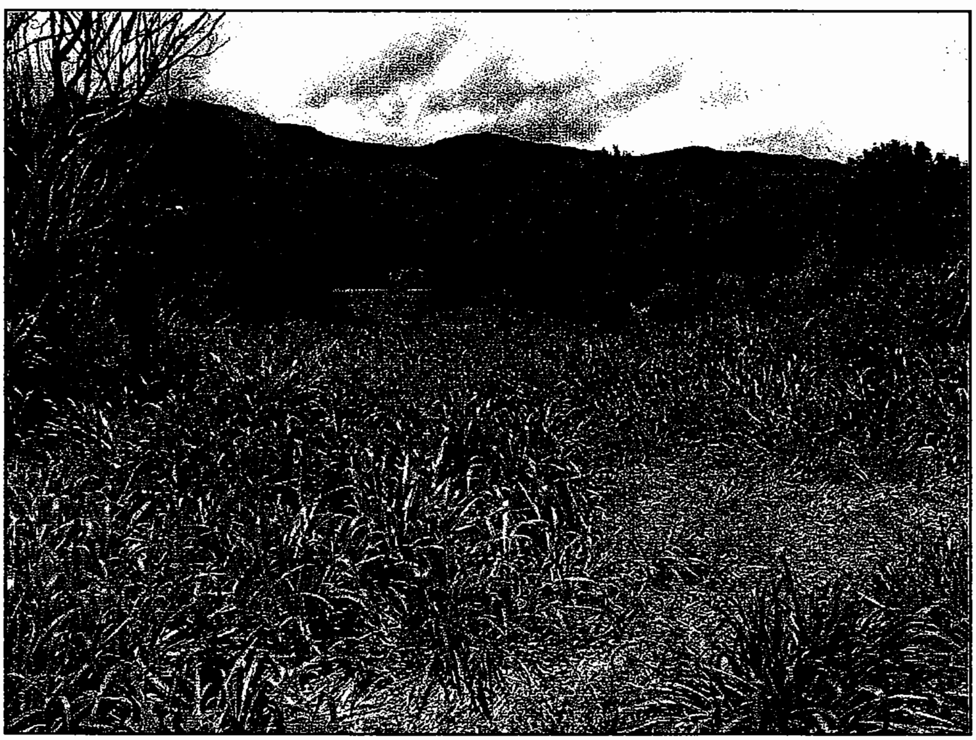


Figure 24: Overview of Section Three. View to West.

Figure 25: Photograph of Section Two and Spreckels Ditch (-1508). View to Southeast.

Figure 26: Site -5566 Concrete-lined Irrigation Ditch. View to North.

Designated State Site Number 50-50-04-5566, this portion of the concrete lined irrigation ditch was oriented in a north-south direction at 0°/180°. Although only a portion of this ditch cut through the project area, the ends (of the ditch) could not be traced to specific origins. Measuring only 75 cm wide and 35 cm deep, the ditch indicated minor support role in irrigation probably during the sugar cane era (Figure 27). Supplementing the surface survey, three stratigraphic trenches (ST-1 through 3) were placed within Section Three to investigate subsurface soils for alteration.

ST-3 was located on fairly level ground approximately 8.5 m northwest of the Spreckels Ditch. Oriented in a northeast/southwest direction at 80°/260°, ST-3's excavation revealed only three soil layers (Figures 28 and 29). Layer I (0–35 cmbs) was a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt with vegetative roots. Layer II (35–155 cmbs) was a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt with no vegetative roots. Layer III (155–200) was a semi-compact, coarse to fine granular structured, very dark grayish brown (10YR 3/2, moist) silt. No archaeological materials were observed and the lack of such supported the non-removal of trench soils for further archaeological study.

ST-2 was very much like the excavation results of ST-3. Orientated in an east/west position at 95°/275° and placed on fairly level ground, ST-2's stratigraphy revealed only three soil layers (Figure 30 and 31). Layer I (0–37 cmbs) was a semi-compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) clayey loam with vegetative roots (less than 5 cm diameter). Layer II (37–120 cmbs) was a semi-compact, medium to fine granular structured, dark brown (7.5YR 3/2, moist), clayey loam with vegetative roots (less than 1 cm diameter). Layer III (120–192 cmbs) was a compact, fine to very fine granular structured, dark brown (7.5YR 3/2, moist) clayey silt. No archaeological materials were observed and as in ST-3, the lack of such supported the non-removal of trench soils for further archaeological study.

The final trench excavated in Section Three was ST-1 with its placement being 10.2 m southeast from the edge of Kahekili Highway. Located on fairly level ground, only three soil layers were observed following the removal of the trench contents of ST-1 (Figures 32 and 33). Layer I (0–40 cmbs) was a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt with vegetative roots. Layer II (40–150 cmbs) was a compact, medium to fine granular structured, very dark brown (10YR 2/2, moist) silt without vegetative roots. Layer III (150–220 cmbs) was a semi-compact, coarse to fine granular structured, very dark grayish brown

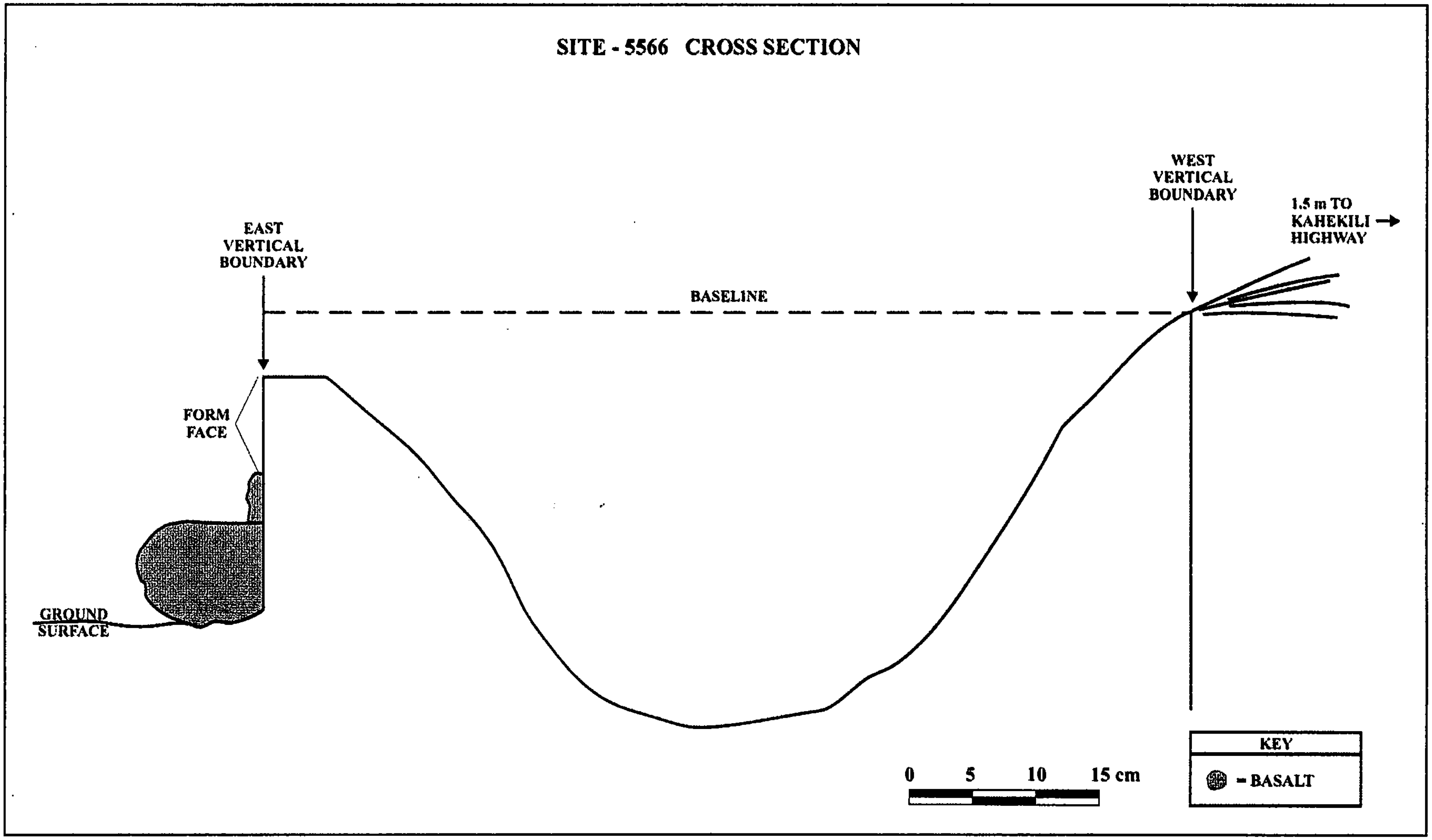


Figure 27: Site -5566 Concrete-lined Irrigation Ditch Cross-Section Drawing.

Figure 28: ST-3 North Wall Profile.

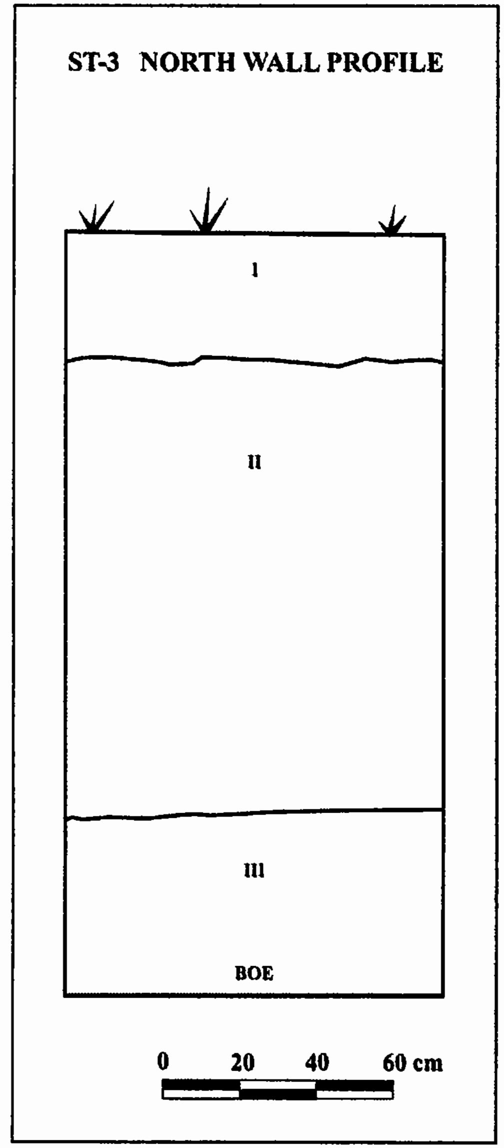


Figure 29: ST-3 North Wall Stratigraphic Profile Drawing.

Figure 30: ST-2 North Wall Profile.

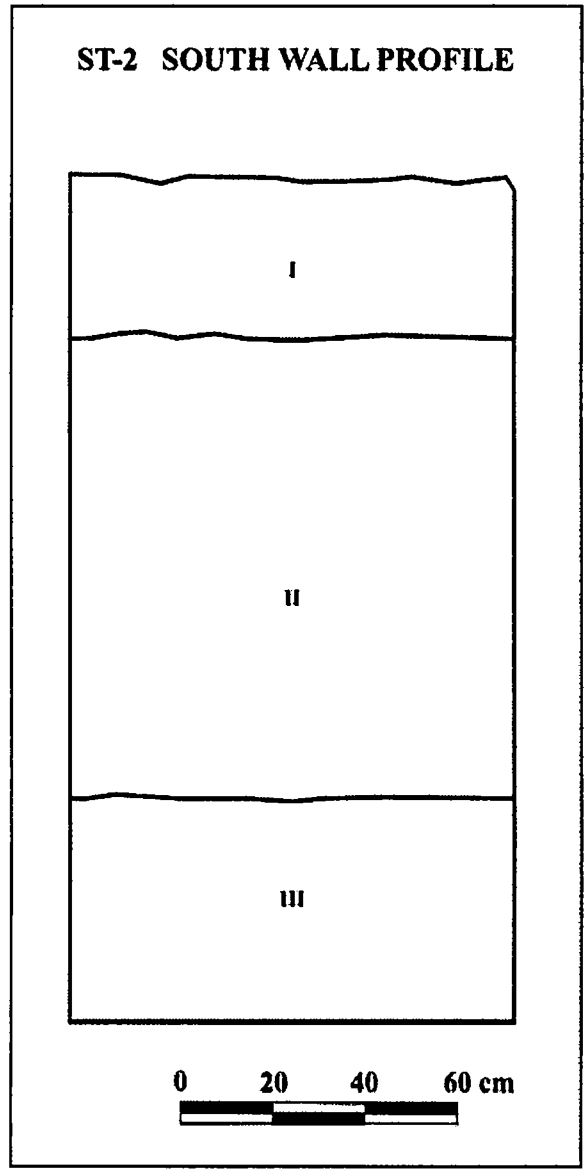


Figure 31: ST-2 North Wall Stratigraphic Sectional Profile.

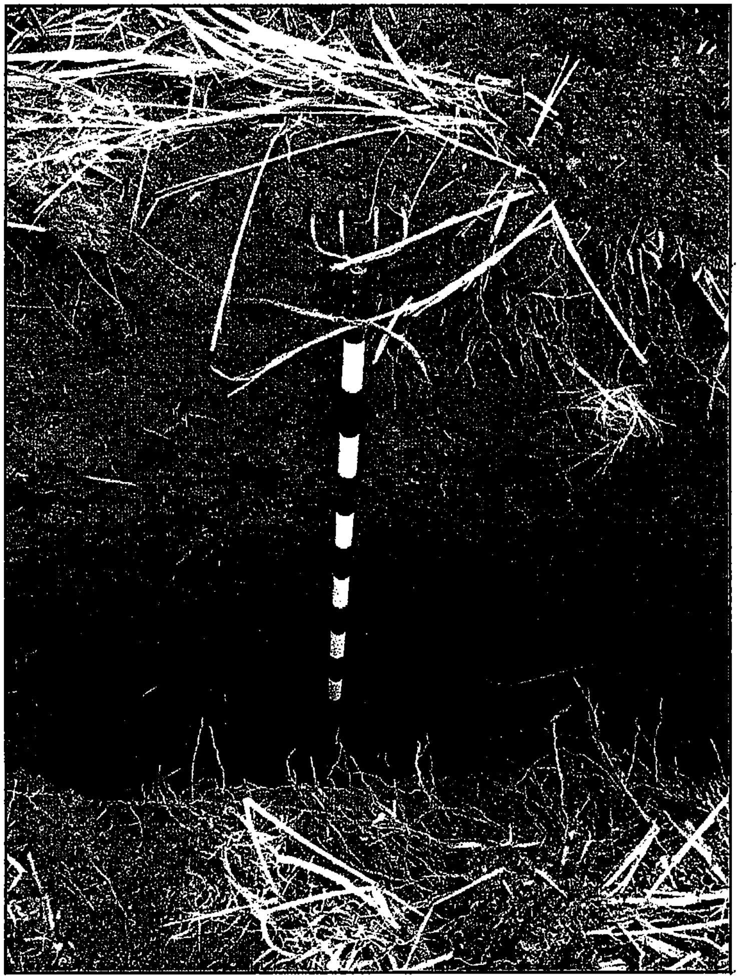


Figure 32: ST-1 North Wall Profile.

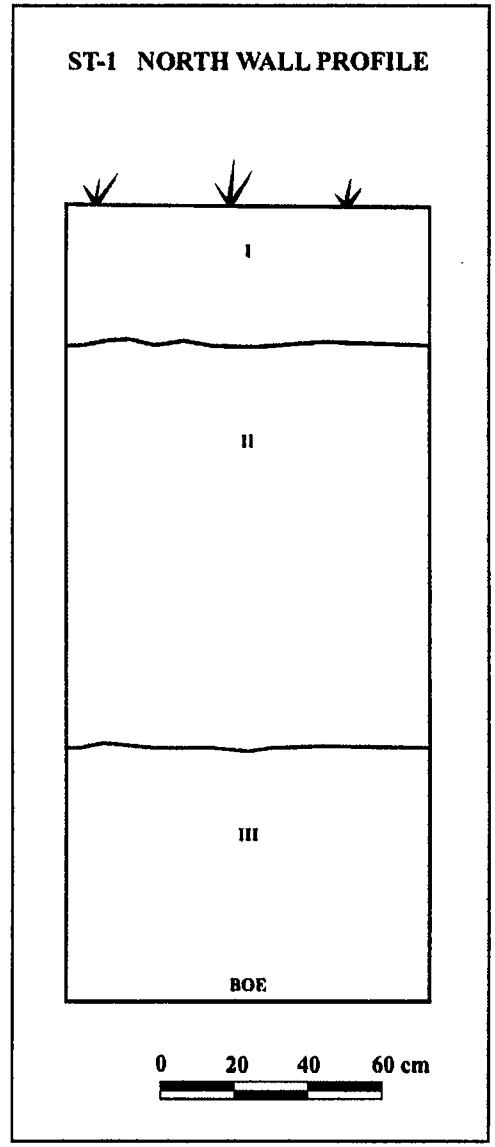


Figure 33: ST-1 North Wall Stratigraphic Sectional Profile.

(10YR 3/2, moist) silt. As in the rest of Section One's stratigraphic trenches, no archaeological materials were observed and the lack of such supported the non-removal of trench soils for further archaeological study.

As in Sections One and Two, Section Three was devoid of traditional archaeological sites and may have been the resultant of the intensive sugar cane and macadamia nut cultivation which conceivably led to the destruction and removal of such sites. The small concrete ditch (Site -5566) was most likely constructed utilized during the sugar cane era and its use terminated prior or at least early, into the short era of macadamia nut cultivation.

DISCUSSION AND CONCLUSION

The current Inventory Survey of the proposed Imi Kala Street and Neki Place Extensions identified a total of four archaeological sites of which Site -1508 (the Spreckels Ditch) was previously recorded. Site 50-50-04-5564 was the historic bridge constructed and used for the transportation of Wailuku's sugar cane industry; Site 50-50-04-5565 was the former *lo'i* fields used during pre-Contact into early post-Contact times; and Site 50-50-04-5566 was the small, concrete-lined irrigation ditch also constructed and used during the sugar cane industry and most likely stemmed into aiding the macadamia nut industry.

Eleven stratigraphic trenches were placed at various points along the proposed routes that tested subsurface soil deposits for human alteration and influence. ST-9, 10, and 11 aided the confirmation that the former *lo'i* fields once abundant in the lower portions of Iao Valley still exist and that they were under fill.

A single soil sample from ST-9 containing organic material was submitted for radiocarbon dating (Beta No. 192863/SCSRC378). This sample provided a conventional radiocarbon age of 770±40 BP. Based on Oxcal v2.18, this radiocarbon age produced a calibrated date range of 1180 to 1290 AD (at 2 sigma) and 1231 to 1272 AD (at 1 sigma). This date range indicates a relatively early period of use for the identified pond field.

With the exception of the former *lo'i* fields that were once used in pre-Contact times, no other traditional archaeological sites were found indicating that the intensive cultivation of sugar cane and macadamia nuts lead to the destruction and removal of such sites.

Based upon previous archaeological research, LCA information, and other limited archival research of historical texts, several classes of archaeological features were thought to occur within the `Īao Valley project area. The lower valley parcel, encompassing `Īao Stream and associated narrow, alluvial floodplains, was likely utilized for the cultivation of taro from traditional times. Archaeological available data relating to this agricultural practice would include, but not be limited to, stone and earthen terraces, alignments, free-standing walls, and water irrigation ditches (*`auwai*). Artifacts suggested to accompany taro production may include lithic artifacts such as basalt cores, adzes, flakes, and, as has been recovered previously, *poi* pounders. Potentially, agricultural layers from traditional times through the present would possibly be amenable to observation through the presence of oxidation and reduction layers as well as charcoal layers depicting burning or clearing episodes prior to, or after, cultivation.

As suggested by past research in the area, the `Īao Valley project parcel could have contained evidence for temporary, small scale habitation from traditional through historic times. Settlement pattern research indicated permanent habitation above the valley floor through the early 20th century and worker's camps situated near the valley floor during historic times. Archaeological remains associated with these activities could include traditional lithic remains (adzes, flakes, etc.), faunal remains (subsistence), and charcoal denoting hearths (temporary campsites, etc.). Later period occupation could be reflected not only by the preceding artifacts but also by structures associated with small-scale taro production (walls, etc.; see Connolly 1974) and historic artifacts such as metal, ceramic, and glass assemblages.

LCA information gleaned from a small sample of LCAs impacted by the project area indicated that the lower portion of project parcel was utilized for agricultural pursuits (*kalo*). Thus, archaeological available data reflecting this land use could include stone alignments, terraces, *`auwai* or ditches, and an accompanying artifact assemblage composed of lithics (basalt cores, adzes, flakes). Agricultural soils, represented by charcoal layers and/or oxidation and reduction layers, could potentially be noted, these depicting specific agricultural use of the area over time.

It was presumed that 20th century debris, reflecting military and ranching activities within the general project area and more recent activities, could also have been present within the project area.

However, a number of archaeological structural and artifactual classes listed above were not identified within the project area during the course of the present project. Briefly, this pattern is most probably due to intensive, historic-period landscape alterations within the project area and not due to the fact that the lands were never utilized from prehistoric times through the present for agricultural and/or habitation pursuits.

SIGNIFICANCE ASSESSMENTS

The four archaeological sites identified during the current Inventory Survey—one of which was previously documented (Spreckels Ditch Site 50-50-07-1508)—are subject to the broad criteria established for the State and National Register of Historic Places classified below:

Criterion A: Site is associated with events that have made a significant contribution to the broad patterns of our history

Criterion B: Site is associated with the lives of persons significant to our past

Criterion C: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction

Criterion D: Site has yielded or has the potential to yield information important in prehistory or history

Criterion E: Site has cultural significance; probable religious structures or burials present (State of Hawai`i criteria only)

Of the five criteria, all of the sites are, or were, considered significant under Criteria D for their information content. Site 1508 also fits Criteria A because it is associated with events that have made an important contribution to the broad patterns of Hawaii State history.

RECOMMENDATIONS

Site preservation is warranted only for the Spreckels Ditch (Site –1508). Sufficient data has been obtained from the remaining three sites so that they are considered no longer significant. The presence of the *lo'i* fields were confirmed by ST-9 through ST-11 and do not warrant further testing. However, Archaeological Monitoring within Section One of the project area is recommended as features such as perimeters of individual *lo'i* patches and even remnant field habitations may be encountered if excavation occurs.

REFERENCES

Bordner, R.

1983 *Archaeological Reconnaissance and Subsurface Testing: Waiehu Housing Development (TMK: 3-3-01:10 and 92)*. Environmental Impact Study Corp. Ms. on file State Historic Preservation Division, Honolulu.

Burgett, B. and R.L. Spear

2003 *Archaeological Reconnaissance Survey and Limited Subsurface Testing for the Alternative Channel Alignment, `Iao Stream Flood Control, `Iao Valley, Island of Maui, Hawai`i.* Ms. of file, SCS/CRMS, Inc., Honolulu.

Cheever, Rev. H.T.

1851 *Life in the Sandwich Islands: or, The Heart of the Pacific, As it Was and Is.* A.S. Barnes (New York) and H.W. Darby (Cincinnati).

Chinen, J,J.

1961 *Original Land Titles in Hawaii.* Copyright 1961. Jon Jitsuzo Chinen.

Connolly, R.D. III

1974 *Phase I Archaeological Survey of `Īao Valley Flood-Control-Project Area, Maui.* Ms. Report 100374, B.P. Bishop Museum, Honolulu.

Cordy, R.H.

1981 *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands*. Academic Press, New York.

1996 *Settlement Patterns of Wailuku Ahupua`a from Mahele Records*. Paper Presented at the 9th Annual Conference for the Society of Hawaiian Archaeology in Wailea, Maui.

Donham, T.

1996 *A Summary of Archaeological Finds in Wailuku Showing Settlement Patterns*. Paper Presented at the 9th Annual Conference for the Society of Hawaiian Archaeology in Wailea, Maui.

Estioko-Griffin A., and M. Yent

1986 *Management and Interpretive Plans for Halekii-Pihana Heiau State Monument* (Draft). Division of State Parks, Department of Land and Natural Resources. Ms. on file State Historic Preservation Division, Honolulu.

Foote, D.E., E. Hill, S. Nakamura, and F. Stephens

1972 *Soil Survey of the Islands of Oahu, Maui, Molokai, and Lanai, State of Hawaii.* U.S. Department of Agriculture Soil Conservation Service, Washington, D.C.

Fredericksen, E.M., and D.L. Fredericksen
1996 *Archaeological Data Recovery Report on Site 50-50-04-4127, Lower Main and Mill Streets, Wailuku Ahupua`a, Wailuku District, Maui Island (TMK 3-4-39: por. 81 & 82).* Ms. on file State Historic Preservation Division, Honolulu.

Hargreaves, D. and Bob Hargreaves
1958 *Hawaii Blossoms.* Hargreaves Company, Inc., Kailua, Hawaii.

Kepler, A.K.
1992 *Sunny South Maui. A guide to Kihei, Wailea & Makena including Kahoolawe.* Mutual Publishing Company, Honolulu.

1997 *Hawai`i's Floral Splendor*. Mutual Publishing, Honolulu.

Kirch, P.V.
1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.

Kirch P.V., and M. Sahlins
1992 *Anahulu: The Anthropology of History in the Kingdom of Hawaii*, Volume 1, Historical Ethnography by Marshall Sahlins. University of Chicago Press, Chicago.

Merlin, M.D.
N.D. *Hawaiian Coastal Plants and Scenic Shorelines.* The Oriental Publishing Company, Honolulu, Hawaii.

Munsell Color
2000 *Munsell Soil Color Charts.* Macbeth Division of Kollmorgen Instruments Corporation, Baltimore, MD.

Pearson, R.J., P.V. Kirch, and M. Pietrusewsky
1971 An Early Prehistoric Site at Bellows Beach, Waimanalo, Oahu, Hawaiian Islands. *Archaeology and Physical Anthropology in Oceania* VI (3):204-234.

Pope, W.T.
1968 *Manual of Wayside Plants of Hawaii.* Charles E. Tuttle Company. Tokyo, Japan.

Pratt, H.D.
1998 *A Pocket Guide to Hawai`i's Trees and Shrubs*. Mutual Publishing, Honolulu.

Price, S.
1983 Climate. In *Atlas of Hawaii* (2nd edition), ed. By R.W. Armstrong. University of Hawaii Press, Honolulu.

Pukui, M.K., and S.H. Elbert

1981 *Hawaiian Dictionary. Hawaiian-English. English-Hawaiian.* University Press of Hawaii, Honolulu.

1986 *Hawaiian Dictionary. Hawaiian-English. English-Hawaiian.* Revised and Enlarged Edition. University Press of Hawaii, Honolulu.

Sterling, E.P.

1998 *Sites of Maui.* Bishop Museum Press, Honolulu.

Thrum, T.

1909 *Heiaus and Heiau Sites Throughout the Hawaiian Sites*. Hawaiian Annual, Honolulu.

Vieth, Mark

1999 *Wailuku Agribusiness ends mac-nut operation; 70 jobs lost*. Hawaiian Star Bulletin. December 30. http://starbulletin.com/1999/12/30/business/story1.html

Waihona `Aina Corporation

1998 *Māhele Database*. Honolulu, Hawaii.

Walker, W.

1931 *Archaeology of Maui*. Department of Anthropology, Bishop Museum, Honolulu.

Whistler, A.W.

1995 *Wayside Plants of the Islands: A Guide to the Lowland Flora of the Pacific Islands*. Isle Botanica, Honolulu.

Yent, M.

1983 *Halekii-Pihana State Monument Phase I: Archaeological Testing and the Development of Interpretive Themes*. Ms. on file State Historic Preservation Division, Honolulu.

1984 *Additional Archaeological Testing at Halekii-Pihana State Monument, Paukukalo-Waiehu, Wailuku, Maui*. Ms. on file State Historic Preservation Division, Honolulu.

1995 *Archaeological Restoration Plan: Portion of Pihana Heiau, Halekii-Pihana Heiau State Monument, Paukukalo, Wailuku, Maui (TMK: 3-4-30: 4)*. Ms. on file State Historic Preservation Division, Honolulu.

Appendix E

Cultural Impact Assessment

Ka ʻĀina O Ka Makani Hōʻeha ʻIli

"The wind that hurts the skin"

Photograph taken by Rowell Kim

View overlooking project, with Mauna Kahalawai (West Maui Mountains) in the background.

Hale Mua Subdivision

TMK (2) 3-3-02; portion of 001 (Lot C)

Waiehu/Waiheʻe, 240.087 acres

FINAL REPORT

Mitigating Measures

(100 meters, full-time monitoring, fronting Kahekili Highway)

Prepared for:

Hale Mua Properties LLC
187 Haulani St.
Pukalani, Hawaiʻi 96768

Prepared by:

CKM Cultural Resources
157 Alea Place
Pukalani, Hawaiʻi 96768

Ka ʻĀina O Ka Makani Hōʻeha ʻIli

"The wind that hurts the skin"

Title Page

Hale Mua Subdivision

TMK (2) 3-3-02: portion of 001 (Lot C)
Waiehu/Waiheʻe 240.087 acres

FINAL REPORT

Mitigating Measures
(100 meters, full-time monitoring, fronting Kahekili Highway)

April 2004

Prepared for:
Hale Mua Properties LLC
187 Haulani St.
Pukalani, Hawaiʻi 96768

Prepared by:
CKM Cultural Resources
157 Alea Place
Pukalani, Hawaiʻi 96768

Ka ‘Āina O Ka Makani Hō‘eha ‘Ili

“The wind that hurts the skin”

Table of Contents

Ka ʻĀina O Ka Makani Hōʻeha ʻIli

"The wind that hurts the skin"

Abstract

(1)In accordance with the Office of Environmental Quality Control guidelines, the study will describe potential impacts from further development, along with measures that could be employed to mitigate those impacts. (The contractor will coordinate with the archaeologist characterizing the site to evaluate the cultural significance of historical resources identified during an archaeological inventory, and will assist in the development of a general preservation plan for those resources.)

(2)It will also include a Traditional Practices Assessment that will meet the requirements of the O.E.Q.C. The study shall also address the requirements of the Office of Hawaiian Affairs, in regards to cultural impacts. Specifically, the document will address potential effects on Hawaiʻi's culture, and traditional and customary rights, as described in the legislation known as Act 50 of 2000, and it shall meet the requirements of the HRS Chapter 343, which calls for an environmental assessment of cultural resources in determining the significance of a proposed project. Furthermore, Articles IX and XII of the State Constitution, other state laws, and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups.

A Hawaiian cultural resource evaluation revealed that the project site is located in Waiehu, mauka of Kahekili Highway. The 240.087 acre site begins on the Waiheʻe side of Waiehu stream, heads toward the Wailuku direction, and stops at the Spreckels Ditch. It then continues along the Spreckels Ditch, intersects the Kahekili Highway, and then runs along the Kahekili Highway to the point of beginning. According to the people that I have interviewed, the property was

previously used to grow sugar cane (as far as they can recall), and was later converted to macadamia nut farming.

As the cultural research will show, this property and its surrounding area were well used by the ancient and early day Hawaiians for cultivation of taro and other plants that sustained them. This study will also cover the historical facts, which will include primordial events where gods and goddesses roamed in and around this property, and accounts of ancient battles that were fought by the great *ali'i*[1] of Hawai'i.

For the last 45 years, I have been called upon to rebury the *iwi o na kūpuna* (bones of our ancestors) that were disturbed during construction of buildings, pipe installations, and earth moving situations around this property and other places on Maui. This property is located directly across (in the mauka direction), approximately 40 yards, from the Waiehu Heights Subdivision.

As a former resident of Lower Waiehu, I was familiar with the people that lived on the makai side of the sand dune and knew of the fact that the dune was a Hawaiian burial ground. While living in Waiehu, I saw several picket fences with wooden crosses, which were located on the top and to the mauka side of the dune that faces this property. In 1978, tractors plowed the trees and bushes from the dune in preparation to build a subdivision. Old timers called me at my Pukalani residence that evening after they plowed, saying that they saw "spirits" walking without legs and "floating" on the dunes. After hearing these same accounts from several residents in the area, I called the developer, Mrs. Kay Abdul, and spoke to her about what had been seen. She was not impressed by their sightings. About a week had passed when I received a phone call from a tractor operator, Mr. Sonny Kuaana (who has since passed on). He related that he had been "cat skinning" (clearing) the top of a dune and his tractor fell into a cave containing several burial coffins. Upon checking the scene of this incident, I noticed that the "cave" contained several coffins, and one which had broken open showed a human skull which had been damaged by the tractor. Appeals were made to the contractor to preserve the burial in place and that they should stop construction, but the appeals were not respected. Archaeologists from the Bishop Museum arrived from Oahu and checked the site. They determined that there were about 20 burials, and after making test

---

[1] Ali'i - royalty, Kings and Queens of Hawai'i

pits, they declared that there were no more burials. Mr. Henry Maio, who has long passed away, had informed me that there are caves in the dunes. When he was a young boy, he had gone into the caves and witnessed the burials, because his grandfather was the keeper of the burials. The developers did not take this information to heart and continued with their grading.

About 9 months had passed when I received a phone call from Mr. Norman Garcia, the owner of Norman's Mortuary in Wailuku. He said, "Eh Charlie, what am I going to do with all these bones from Waiehu. They're all in beer boxes, and the rain disintegrated some of the boxes, and the bones are washing down the drain." I went to visit Mr. Garcia, along with Bernice Hokuana, whose great grandmother was buried on the dune. We stepped into the garage of the mortuary where the beer boxes were stored, and it was quiet a shock to see the disrespect in the way that the developer had treated the bones. There were approximately 79 sets of Hawaiian remains in the boxes.

I filed a suit against the contractor (Fong Construction) with the County Of Maui and they were charged with desecrating Hawaiian graves. After paying a large amount of money to the Hokuana family, a settlement was reached and all of the graves were moved to the Hokuana family burial grounds in Ku'au. This incident occurred through 1978 and 1979. For more information, see attached report titled, "The Archaeological Investigation at Waiehu Heights Subdivision, Waiehu, Maui, by Marion Kelley, Yoshihiko Sinoto and Ross Cordy, BPBM Dept. of Anthropology". The pictures from this report will not be submitted because of poor quality. Please refer to information on "Protecting Native Hawaiian Burials", which is attached to this report.

Although this project site is presently covered with macadamia nut trees, and previously was planted with sugar cane, there is a strong possibility that iwi (bones) could still be encountered when the land is cleared and graded. In the past, elsewhere on the island, burials have been found in areas that were used for growing sugarcane and pineapple. One case in particular occurred in 2003 in Olowalu (site #50-50-03-5939), where an intact burial was discovered in a former sugarcane field. Also, a possibility because of this project sites location is the fact that, in ancient taro patches, remains were buried in the banks of the patches.

Recently, over the last several weeks, clearing was done by the Maui County workers within the property, on the Wailuku side of the Waiehu Stream and Kahekili Highway. The work involved removing brush and cleaning the stream banks. A large amount of sand deposits were noticed in this exposed area, showing the possibility or possible presence of human burials.

Due to these reasons, CKM Cultural Resources is recommending full-time monitoring in the areas where Kahekili Highway runs parallel to the project site, 100 meters inward toward the mauka/Wailuku direction from Lower Waiehu Stream. This recommendation is also due to the fact of the close proximity this project site has to the Waiehu Heights sand dune, and in certain places it is only about 40 to 60 yards away.

Note: As much as possible, throughout this report, the spellings of Hawaiian vocabulary and place names have been standardized to present orthography.

Ka ʻĀina O Ka Makani Hōʻeha ʻIli

"The wind that hurts the skin"

Outline

I. INTRODUCTION – Hū Ka ʻEhu O Ka Wai[1]

II. GEOGRAPHICAL INFORMATION – Ka Wehewehe O Nā Wahi[2]

- **a. Surrounding ʻili[3]**
- **b. Surrounding ahupuaʻa[4]**

III. CULTURAL AND HISTORICAL INFORMATION - Ka Waiwai ʻO Hawaiʻi[5]

- **a. Waiehu[6]: Landing for wars**
  - **1. Areas in Waiehu important to the Battle**

IV. INTERVIEWS OF INFORMANTS

---

[1] Lit. "Bursting forth is the spray of water." This literal translation is a poetical interpretation of the word "introduction". The implication of "bursting forth" is implied as a "beginning". Hence, the poetical reference for "introduction".

[2] Lit. "The information of the areas."

[3] Land section, next in importance to ahupuaʻa and usually a subdivision of an ahupuaʻa.

[4] Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (puaʻa), or because a pig or other tribute was laid on the altar as tax to the chief. (Pūkuʻi et al. Section A)

[5] Lit. "The richness of Hawaiʻi." History, in traditional times, was seen as a keepsake, something to be cherished. The terminology "waiwai" means rich. Hence, a person who could recollect history was one who was "rich."

[6] To bring clarity to the name "Waiehu", some may write the name as Waiʻehu or Waiehu. But, both names are one in the same.

---

[7] Lit. "The lusciousness of the fauna."

[8] Lit. "Receding are the sprays of water." This literal translation is a poetical interpretation of the word "conclusion". The implication of "receding" is implied as an "ending". Hence, the poetical reference for "conclusion".

Ka ʻĀina O Ka Makani Hōʻeha ʻIli

"The wind that hurts the skin"

Introduction - Hū Ka ʻEhu O Ka Wai

The scope of this report will focus on the area of Waiehu. More specifically, the area focused on in this report encompasses 240.087 acres, bearing the Tax Map Key (2) 3-3-02: portion of 001 (Lot C). This ʻili belongs to the ahupuaʻa of Wailuku. Waiehu is a place of great historical and cultural wealth.

Today, according to recent census data, Waiehu has a population of 7,310 individuals. The physical space of Waiehu is approximately 4.3 square miles.

The specific area of which this report is written for is located in Upper Waiehu and borders the wahi[1] of Kou. Kou was famous for its multitude of kou (*Cordia subcordata*), an indigenous flowering tree.

The strong wind of the area is called *ka makani hōʻeha ʻili* (the wind that hurts the skin), which is also the title of this report. Waiehu has much mountainous terrain, most of which is made up of sand dunes[2]. When the wind would become strong, it would blow the granules of sand and prick the skin. Hence, the term *hōʻeha ʻili* – to hurt the skin.

---

[1] Area; place

[2] Mountain like formations made up of sand.

Geographical Information - Ka Wehewehe O Nā Wahi[1]

On their way to Maui, Kamehameha's[2] men chanted the subsequent lines:

> **'O Hāna mai Ko'olau a Kaupō.**
> **Na Waiehu mai ka pali o Kapulehua a ka pali o 'A'alaloa.**
> **'O Lāhaina I ka malu 'ulu o Lele.**
> **I hea I Waikapū o ka makani kokololia?**
> **Wailuku I ka malu he kuawa...**
>
> **(English Translation)**
>
> ***'Tis Hāna from the Ko'olau to Kaupō.***
> ***It is Waiehu, from the cliffs of***
> ***Kapulehua to the verdant cliffs of 'A'alaloa.***
> ***'Tis Lāhaina in the 'ulu garden of Lele.***
> ***Where is Waikapū of the gusty wind?***
> ***Placed at Wailuku is the shelter of the valleys.***

Kamehameha's men chanted this after a prophecy that Kamehameha would one-day rule this island. Mentioned in this chant is the poetical boundary of Waiehu. *It is Waiehu, from the cliffs of Kapulehua to the verdant cliffs of 'A'alaloa.* Using the natural features of the land, Hawaiians were able to demarcate the boundaries of certain areas. Land division in this way was a characteristic of the ahupua'a system.

Waiehu is surrounded by many 'ili in the area. As mentioned earlier in this report, Kou is an area that is in close proximity to Waiehu. Waihe'e, 'Īao, Paukūkalo, and Kahului are other 'ili that surround the Waiehu area.

---

[1] The information of the areas.

[2] Kamehameha was the only King in Hawaiian history to unite all inhabited islands in the Hawaiian archipelago under one rule. He will be spoken of in the later portion of this report.

H.T. Cheever wrote in his, "Life in the Sandwich Islands," of the famous "Nā Wai 'Ehā" ("the four waters"). Yet, Cheever correlates his description of Nā Wai 'Ehā as the areas named after the infamous war(s), which will be covered in more detail at a later point in this report.

> **There are, in this ahupua'a, four streams in succession from the different gorges of the mountain, significantly named, it is thought, from the events of battles which have transpired upon them. Waikapū – the water where the conch was blown, and the engagement began. Waiehu – the water where the combatants smoked with dust and perspiration. Wailuku – The water of total rout and defeat, where the army melted away. (H.T. Cheever, 59)**

While this paragraph assumes and contends that the areas were named after this fashion, such is not the case. Many references exist to prove that the names of the Nā Wai 'Ehā are traditional and not names made after the war.

In Waikapū's case, stories that date back to when the akua[3] frolicked on these islands show that Waikapū was still known as Waikapū, and not by any other name. Therefore, it could not have been because of any type of war that this area was named as such. W.K. Kaualililehua wrote about it in the *Ka Nūpepa Kū'oko'a*, one of Hawai'i's more popular newspapers in the late 19th century. Kaualililehua wrote:

> **Aia ka wahi o Waikapū, ua kapa 'ia I kēia wahi nei o nā po'e I hala ua hō'inoa ai, a pa'a 'ia a hiki I kēia lā. (English Translation) *The Wai-ka-pū now being discussed was named by some of the ancients and it remains by this name to this day.* (Ka Nūpepa Kū'oko'a)**

By this account alone, this report concludes that Waikapū has always been called as such.

---

[3] Gods and goddesses

In the instances of Wailuku, Waihe'e, and Waiehu, the following chant, which comes from the Pele[4] Collection[5], speaks of her travels in both physical and spiritual form. In one case, Pele travels to the ahupua'a of Wailuku, which references all the places put in question by Cheever's assumption that the aforementioned names were named as such because of the wars between 1750-1790. Such is not the case, as Pele's travels happened well before any war in the area:

'O ka'u lehua la	My lehua Blossom
I uka o ka nalu Ka'akau	In the uplands, above the surf Of Ka'akau[6].
Aia la o Waihe'e I ka poli	There is Waihe'e, placed in the Valley.
Polipoli o Waiehu, ma Kapulehua	Protected is Waiehu It's protection seated at Kapulehua
Aia ho'i la, 'O Wailuku la	And so it is at Wailuku
Ka lehulehu la,	The generations
Hāhai ka Maka onaona la	Followed by those of innocent eyes[7].

[4] Pele is famously known as the "Goddess of Fire". Pele is said to have come from the land of Polapola (or Borabora, as some may know it today). She was a human with special powers and came from a family that was gifted as such. When Pele lost the battle to her sister, Nāmakaokaha'i – "Goddess of the Ocean", Pele imbued her spiritual essence and became stronger and more powerful. Today, we continue to see the battle between Nāmakaokaha'i and Pele at the water's edge on the island of Hawai'i.

[5] The term "Pele Collection" is in reference to all of Pele's travels throughout the islands, in both physical and spiritual form.

[6] Name of surf at Waihe'e.

[7] Hāhai ka Maka onaona la (Followed by those of innocent eyes) – This is a poetical reference to the youth. "Innocent eyes" were terms applied to youth, as youth is a sign of innocent eyes. The term "maka" can also be used or translated as "face."

Cheever's assumptions of the naming of these areas are worth examination. And as such, it has been provided through historical means that the aforementioned names are in fact traditional and not named because of war-like circumstances as provided by Cheever's contentions.

Cultural and Historical Information - Ka Waiwai ʻO Hawaiʻi[1]

Having clarified the specific areas and names, the report must make mention of the wars in the area of Wailuku and how Waiehu was an integral part of this.

Whenever dealing with areas that are very specific and copious, such as the area for which this report was created, it is often the case that records are extremely difficult to find, or they are not found at all. The emphasis for this section of the report will examine Waiehu's proximity to the various wars, and what, if any, sites played crucial roles as such.

1765

The battle of Kalaeʻiliʻili was staged between Waiheʻe, Kou, and Waiehu. This battle lasted for two days between the chiefs of the Waiheʻe area and a guard, Kahahana, of Keʻeaumoku's clan. The battle came to fruition because the descendants of Chief Kekaulike Kalanikuʻihonoikamoku deprived Kahahana of his catch of fish.

Kahahana took issue with the management styles and fought for it. No one side came out with an advantageous position. But, in the end, Keʻeaumoku and his men fled to Molokaʻi.

Mid 1700's

In the mid-1700's, a warrior chief from the island of Hawaiʻi, Kalaniʻōpuʻu[2] attempted to seize the reign of Maui from Chief Kahekili.

Kalaniʻōpuʻu traveled to Maui with his famed ʻAlapa and Piʻipiʻi warriors, who were trained and skilled to destroy upon command. The wish of this warrior chief was to destroy all men Kahekili had in his fleet. Little did Kalaniʻōpuʻu know that Kahekili's warriors were well prepared for any type of battle as well.

---

[1] Lit. "The richness of Hawaiʻi." History, in traditional times, was seen as a keepsake, something to be cherished. The terminology, "waiwai" means "rich". A person who could recollect history was one who was "rich."

[2] Also known as Kalaiʻōpuʻu.

The upper slopes of Waiehu were the plotting grounds for Kalani'ōpu'u's fleet of destructive warriors. Kahekili was aware of these warriors who were planning to cease his leadership of Maui.

Kahekili traveled to Pihanakalani heiau and Hale-Ki'i heiau, which were located on a sand dune in Waiehu. While there, Kahekili conducted his protocol to evoke the right mana[3] for him and his men to be successful.

Battle soon ensued, and Kahekili's prior homage to evoke the right mana had worked. Kahekili's men were very successful.

Kalani'ōpu'u, devastated over the loss of his famed 'Alapa and Pi'ipi'i clans, lamented. A name for this battle was given, *'Ahulau ka Pi'ipi'i I Kakanilua* – "completely slaughtered were the Pi'ipi'i at Kakanilua".

<u>1790</u>

Some forty to fifty years later, a well-trained young chief, by the name of Pai'ea Kamehameha, returned to Maui to finish the job of his fellow warrior, Kalani'ōpu'u. At this time, Kahekili had left the island of Maui under the charge of his son, Kalanikūpule. Kalanikūpule, as some may say, was not the warrior that his father was.

Kamehameha, on the other hand, was a valiant soldier who learned much from his mentor, Kekūhaupi'o, who was renowned for his strength and prowess in warfare. He trained Kamehameha from childhood to be a fearless warrior. He continued to serve as mentor and confidant to Kamehameha, and the two remained loyal to each other, like brothers, throughout their lives.

When Kamehameha arrived in 1790, his battalions landed at Kahului for the purpose of taking control of Maui. The amount of canoes were so enormous that the canoes lined up from where the present day Kahului Harbor is located, and stretched all the way to the surf spot known as "Churches".

---

[3] Spiritual and physical strength.

True to his word, Kamehameha ordered his warriors to turn their canoes upside-down in the sand and remove the *ama* (floats) and the *'iako* (booms). This would be a battle of honor, a battle to the finish, with no thought whatsoever of paddling away to safer territory. All or nothing. Kamehameha knew how to ignite the fire of loyalty and brotherhood in the bosom of his warriors.

The battle against Kalanikūpule and his forces worked its way up into the valley of 'Īao. Prior to his engagement in the war, Kamehameha, who was stationed in Waiehu and Kauāhea, took a trip to Pihanakalani and Hale Ki'i. He took with him the feathered god-like image, Kūka'ilimoku (Snatcher of the Islands). Kamehameha conducted his protocol and Kūka'ilimoku provided all the right signs that there would be a successful war waged against Kalanikūpule.

With the thunder of cannons and the sound of the war conch (pū kauā), Hinamakanui, thousands off warriors and common citizens of Maui were completely overwhelmed and tried to escape. It is said that they clawed the steep hillsides in desperation, but fell helplessly into the stream. The lifeless bodies ended up damming the waters of Wailuku. Hence the name, Kepaniwai – the damming of the waters. One noted account, in Steven Desha's "Kamehameha and his Warrior Kekūhaupi'o", made reference to the amount of carnage that dammed the water. "The lives lost were so great that it filled enough of the 'Īao stream to allow the water to flow back up into the stream."

This battle is duly noted as one of great leadership for Kamehameha. Before their entrance into Wailuku major, while situated in the upper Waiehu area, Kamehameha gathered his *pū'ali koa* (warriors) and uttered these famous words, "*I mua e nā pōki'i a inu I ka wai 'awa'awa, 'a'ohe hope e ho'i mai ai*[4]*.*" Kamehameha was eventually successful and conquered Maui.

This report would like to address some inaccuracies found in the Archaeological Inventory Survey (AIS), as completed by SCS, Inc. On page 13 of the AIS, it speaks of the successes of Kahekili as one who was able to defend his capital. "Kahekili successfully defended his capital in Wailuku throughout the 1770's, until his defeat at the hands of Kamehameha's forces." In order to create a more factual

---

[4] "Go forward young brothers and drink of the bitter waters, there is no retreat."

basis for this report, it must be clarified that Kamehameha never fought Kahekili in any battle on the island of Maui.

Kamehameha's battle was with Kahekili's son, Kalanikūpule. Kahekili had left the rule to his son, Kalanikūpule, while he ruled O'ahu. Kahekili soon passed in 1794.

Waiehu Today

Today, Waiehu's landscape is one of a fading macadamia nut and sugar economy that for so long cultivated such crops. The infrastructures of lifestyles past are evident throughout the landscape. Waiehu serves as home to many people of various backgrounds.

Native Plants – Ka Nohona Uluwehi[1]

At one point in Waiehu's history, kalo (taro - *Colocasia esculenta*) was abundant in the area. Many places besides Waiehu depended on the kalo that grew there. E.S.C. Handy writes:

> So far as I can learn Kula supported no Hawaiian taro, and the fishermen in the section must have depended for vegetable food mainly poi brought from Waiehu, Waikapū and Waihe'e...

As Handy points out, Waiehu was not only counted on for just their kalo source, but other vegetable items as well. It must also be mentioned that the "Nā Wai 'Ehā" area, more specifically Waiehu, had the largest taro patches in all of the islands.

Another plant that has grown in this area is 'ulu (breadfruit - *Artocarpus incisus*). Again, according to Handy, she explicates in her study:

> The southern shores of western Maui were perhaps second only to Puna, Hawai'i, as a favorable locality for breadfruit culture. Brigham [Ka Hana Kapa, 123] wrote in 1911 that 'at Lāhaina on Maui, were as fine trees forty years ago as any I have seen in Sāmoa or Fiji.' Lāhaina is referred to in mele as *ka malu ulu o Lele*, 'the breadfruit shade of Lele.' There was also much breadfruit in the lower inhabited areas of the great valleys from Olowalu, through Waikapū. The extent of the reach of this plant, proved to thrive in the upper regions of Waiehu and Waihe'e.

As evident by this statement, 'ulu was a very important crop, and a large bulk of it grew in the upper Waiehu area.

Pili (*Heteropogon contortus*) grass was also quite common in these areas because of the climate conditions. Pili liked to grow in arid and dusty conditions, of

---

[1] Lit. "The lusciousness of the fauna."

which parts of Waiehu had such conditions. This grass was useful to Hawaiians in that the dried grass would be made into bunches and used to thatch the roofs of homes in the area.

One of the more familiar plants that grew there, and can be seen growing in the area until this very day, is the wiliwili tree (*Erythrina sandwicensis*). Many people may be familiar with this tree because of the bright red seeds that are contained within its pods. Today, these seeds are known for their use in making beautiful leis and other adornments. However, to ka poʻe kahiko (people of old), the seeds were not the important part of the plant. Instead, it was the wood that they used to make bowls, posts for homes, and other items.

One of the ground covers used to keep some of the sand of the Waiehu area from creating "the wind that hurts the skin" was pāʻū o Hiʻiaka (*Jacquemontia ovalifolia*). This was a ground-covering vine with abundant tubular flowers that ranged in color from light blue/purple to white. This plant did not need much water, which in turn made the dry sand dunes of Waiehu and it's surrounding areas a perfect place of growth for pāʻū o Hiʻiaka. If one were to travel near the sand dunes of Waiehu today, they would notice pāʻū o Hiʻiaka growing in the area.

While Hawaiians of the past used pāʻū o Hiʻiaka for curing keiki (children) of ea (thrush, a mouth disease), this plant is better known for the moʻolelo (story) that explains its name. Long ago, Pele, the volcano goddess, took her youngest sister, Hiʻiaka, to the ocean. As Pele was out amongst the waves fishing, or some say surfing, the sun climbed higher and hotter in the sky. Meanwhile, Hiʻiaka waited patiently on the shoreline for her sister. A plant near Hiʻiaka, seeing that the keiki's tender young skin was being burned by the sun's merciless rays, took pity upon Hiʻiaka and extended its vine-like branches to shield her. When Pele returned from the ocean, she discovered Hiʻiaka covered and protected by the plant. In gratitude, Pele gave the plant its name, pāʻū (skirt) o Hiʻiaka (of Hi'iaka).

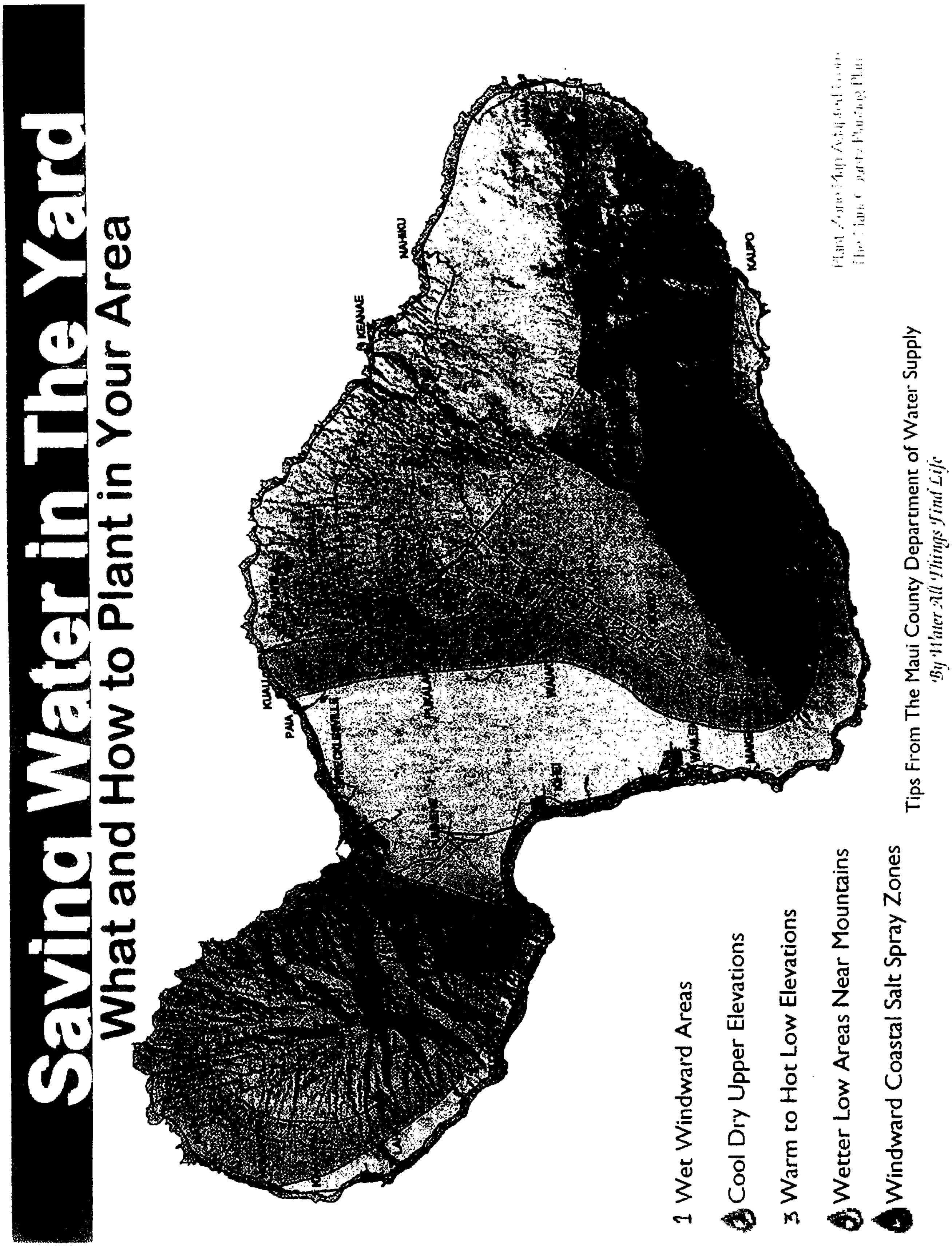
Another blossoming plant that may have resided in this area is the ʻaʻaliʻi (*Dodonaea viscosa*) bush. This hardwood native shrub is indigenous to the islands and grows well in dryer climates. Ranging in heights from one to thirty feet, this shrub/tree is found growing at elevations up to 8,000 feet and in wind-swept open country. In today's day and age, ʻaʻaliʻi is being used to reforest the island of Kahoʻolawe. This island's water plate was cracked in half from missile testing by

the U.S. government in the late 1960's and '70's. Kaho'olawe is not able to retain water because of the cracked water plate, yet the 'a'ali'i plants are growing and flourishing on the island.

Another plant that grew in the area is called huehue (*Cocculus trilobus*), also known as 'inalua. This plant produced an extremely purple berry which was collected and smashed to produce a dye for kapa (bark cloth made from the wauke tree- *Broussonetia papyrifera*) with colors ranging from a deep, dark purple to periwinkle.

'Iliahi (sandlewood - *Santalum freyecinetianum*) also grew here in the higher, wetter regions of Waiehu. However, there is hardly any sandalwood left due to the opium-sandalwood trade of the mid-1800's. This area, as well as the "upcountry area", had become desolate because of the lack of 'iliahi.

Note: Plant Zone Map of Maui, Descriptions of Various Maui County Planting Zones, Recommended Plants for Zone 4, and Places to Purchase Native Plants are being submitted here for reference purposes.



Plant Zone Map of Maui

ZONES

The Maui County Planting Plan has compiled a system of 5 zones of plant growth for Maui County. The descriptions of zones and maps for these zones are as follows:

Zone 1:
Wet areas on the windward side of the island. More than 40 inches of rain per year. Higher than 3,000 feet.

Zone 2:
Cool, dry areas in higher elevations (above 1,000 feet). 20 to 40 inches of rain per year.

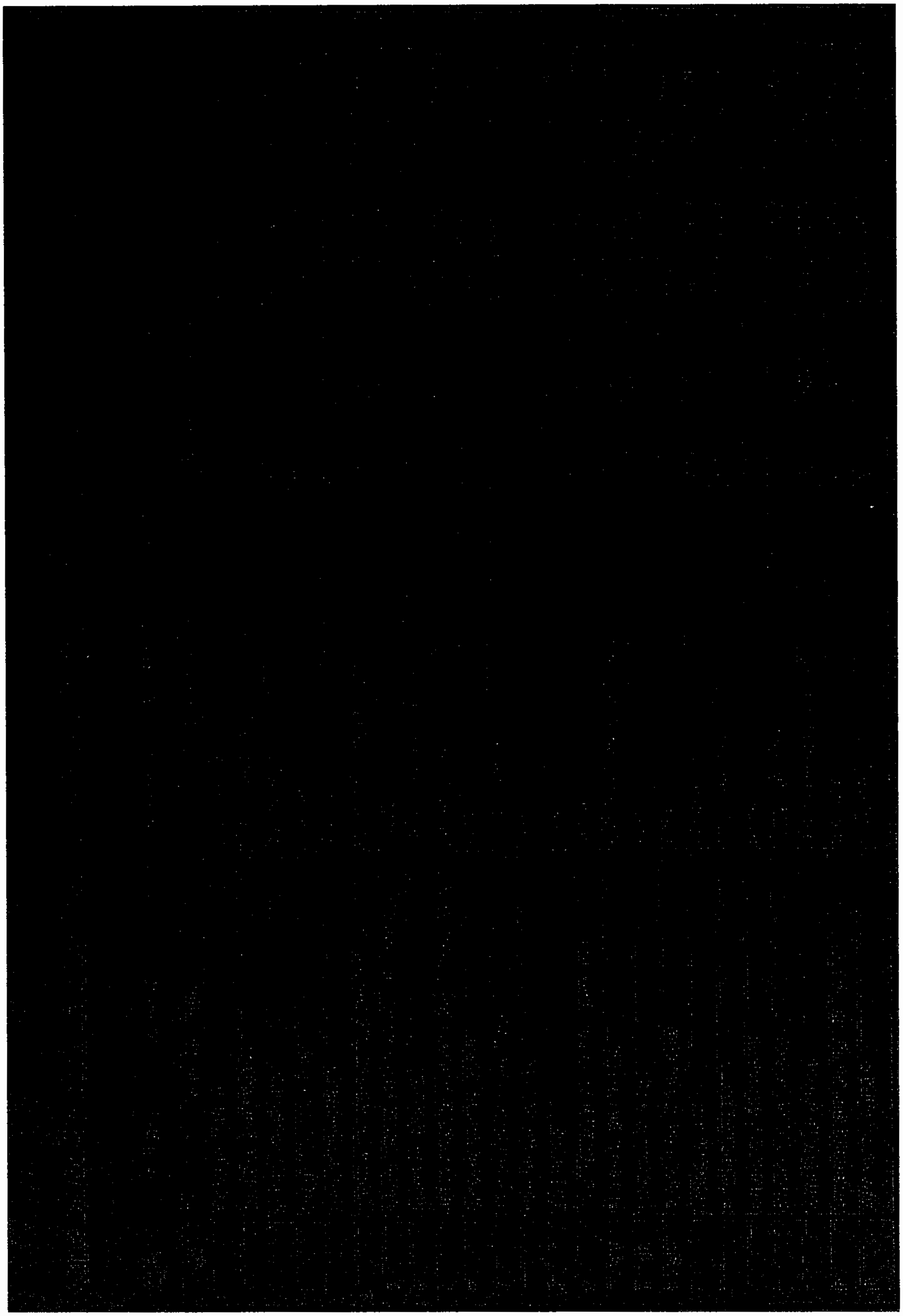
Zone 3:
Low, drier areas, warm to hot. Less than 20 inches of rain per year. Sea level to 1,000 feet.

Zone 4:
Lower elevations which are wetter due to proximity of mountains. 1,000 to 3,000 feet.

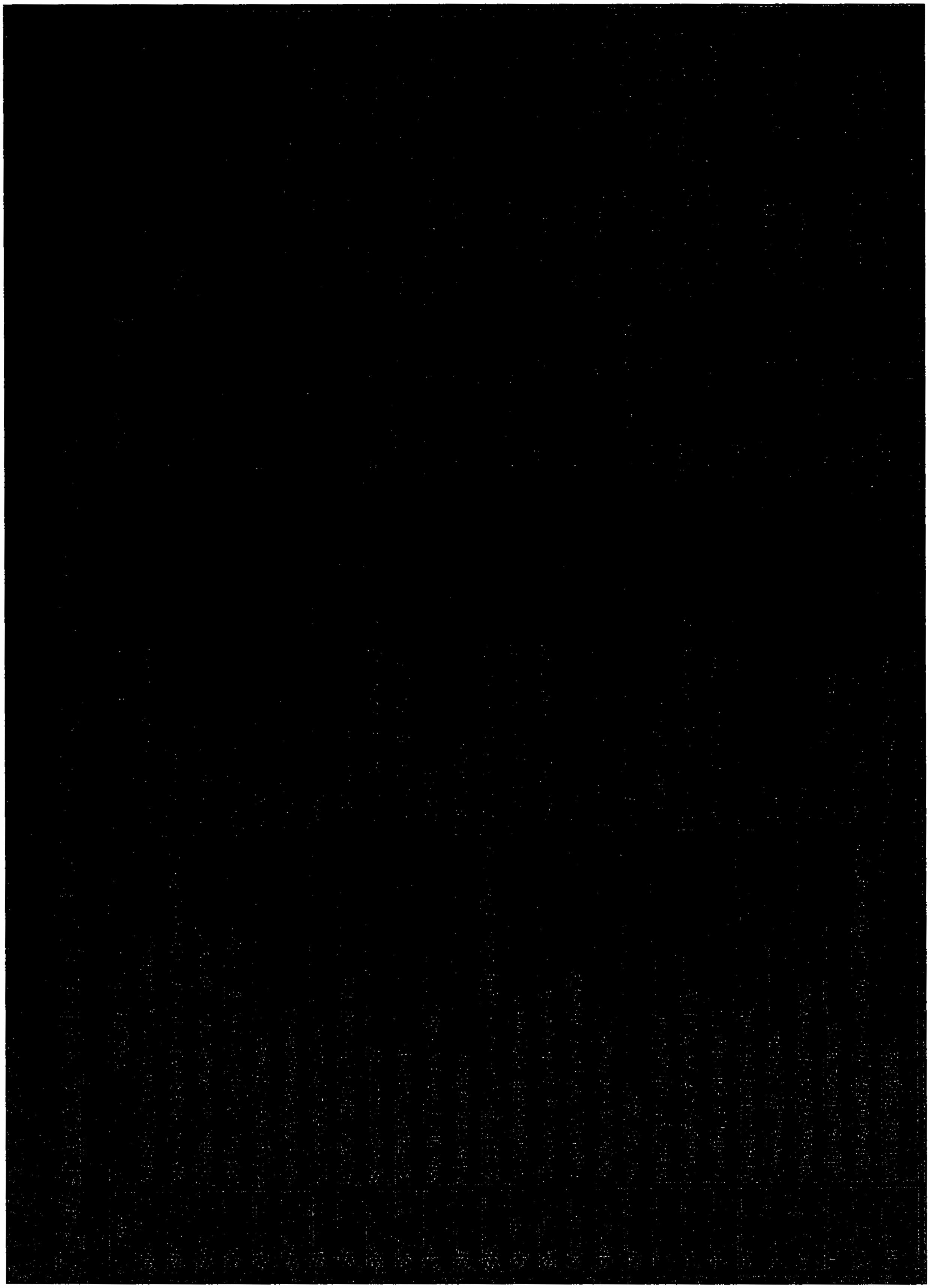
Zone 5:
Salt spray zones in coastal areas on the windward side.

These zones are to be used as a general guide to planting for Maui County. In addition to looking at the maps, read the descriptions of the zones and decide which zone best fits your area. Plants can be listed in more than one zone and can be planted in a variety of conditions. For best results, take notes on the rainfall, wind, sun and salt conditions of your site. Use the zones as a general guide for selection and read about the plants to decide which best fits your needs as far as care and or function.

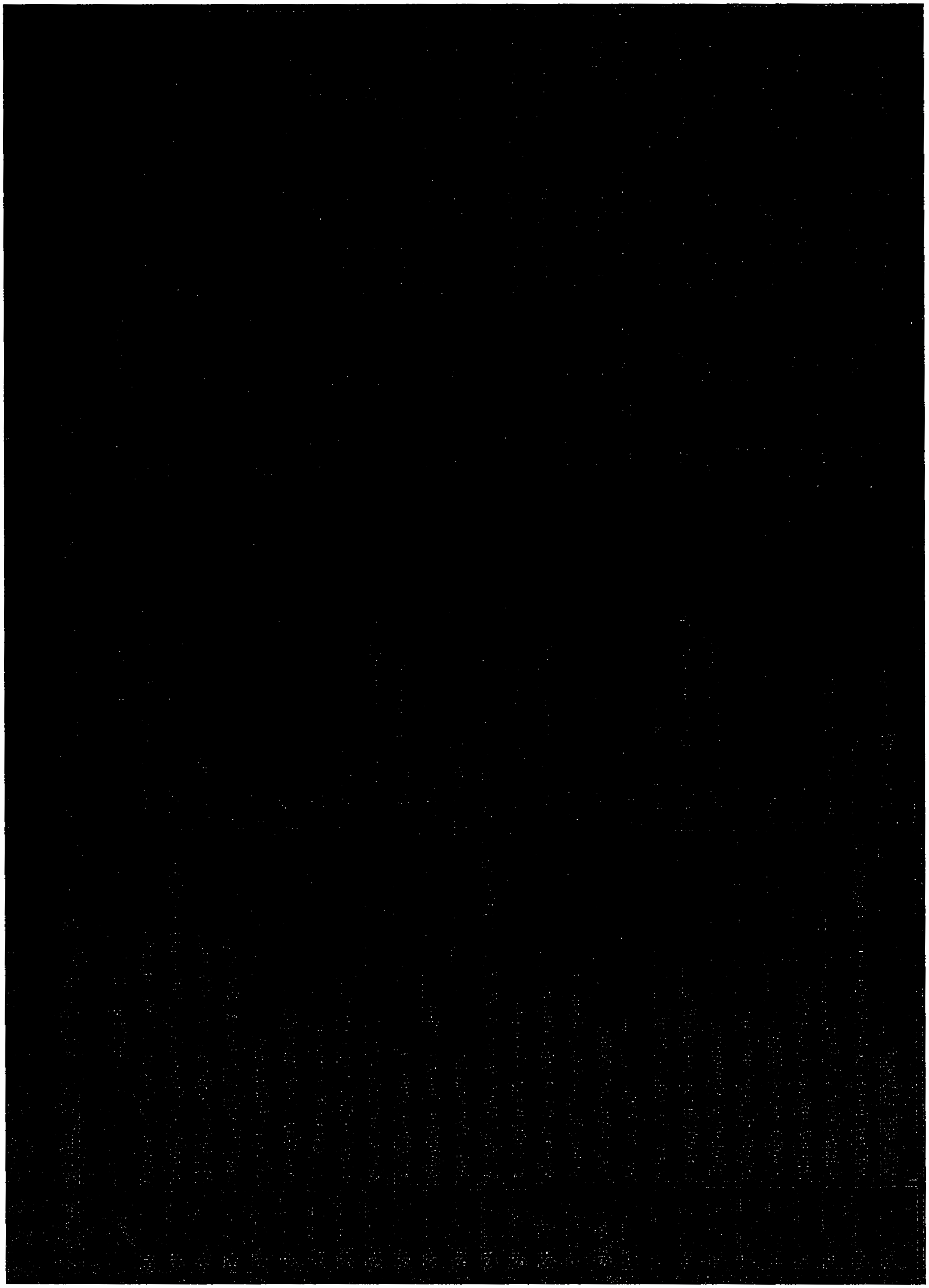
Descriptions of Various Maui County Planting Zones



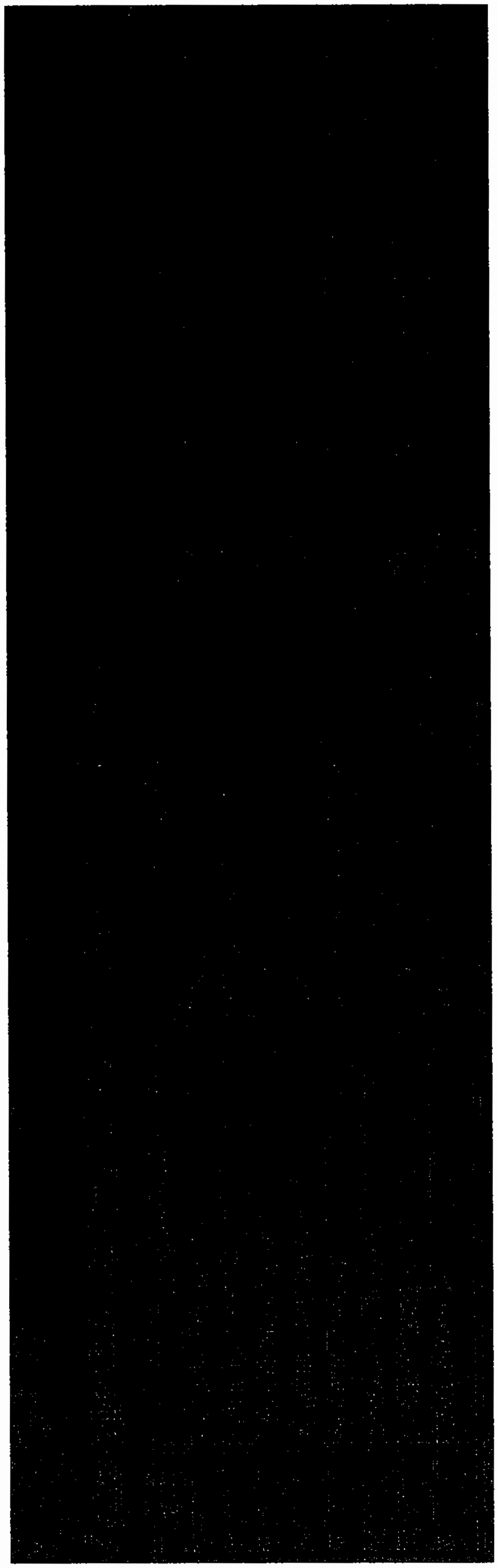
Recommended Plants for Zone 4 (1)



Recommended Plants for Zone 4 (2)



Recommended Plants for Zone 4 (3)



Recommended Plants for Zone 4 (4)

PLACES TO BUY NATIVES ON:

Maui:

1. **Hoolawa Farms** — **575-5099**
   P O Box 731
   Haiku HI 96708
   The largest and best collection of natives in the state. They will deliver, but it's worth the drive to go and see!
   Will propagate upon request

2. **Kula True Value Nursery** — **878-2551**
   Many natives in stock
   Get most of their plants from Hoolawa Farms
   They take special requests

3. **Kihei Garden and Landscape** — **244-3804**

4. **Kihana Nursery, Kihei** — **879-1165**

5. **The Hawaiian Collection** — **878-1701**
   Specialize in Sandalwood propagation
   Will propagate special requests

Places to Buy Native Plants

Ka ʻĀina O Ka Makani Hōʻeha ʻIli

"The wind that hurts the skin"

Interviews of Informants

Marcello S. Dadez
Retired Police Officer - County of Maui
2041 Kahekili Highway, Waihe'e, Maui, Hawaiʻi

March 24, 2004 at 2:30p.m., interviewed at his place of residence:

He stated that he moved to Waihe'e in the 1960's and can remember when there was sugar cane on the project property. Later, they had macadamia nuts growing there. He does not have any knowledge of Hawaiian practices on the property.

Ester Kailihiwa Santos
Childcare Specialist - Kahale A Ke Ola
516 Kaimana St., Kahului, Maui, Hawaiʻi

March 27, 2004 at 10:30a.m., interviewed at 2087 Mokuhau Rd., Wailuku:

She related that she was born and raised in Waihe'e and remembers the project area because she passed it almost everyday throughout her life. She also remembers when there were sugar cane fields growing in the project area, and later they planted macadamia trees for the nuts. She did not have any information about Hawaiian practices on the property, except for the burials that were found in front of the project property, at Waiehu Heights.

Ernest F. Santos
Retired
2087 Mokuhau Rd., Wailuku, Maui, Hawai'i

March 27, 2004 at 10:30a.m., interviewed at his home:

He related that he was born in Upper Waihe'e Valley on June 3, 1920. His father used to take care of the water ditches that were used to irrigate the sugar cane. The only thing left on the property is an old Portuguese bread oven, and it is still there today. There was no electricity, and instead, kerosene lamps were used. He recalls that the Spreckels Ditch ran from Waihe'e Valley, through the Waiehu valleys, to the reservoir in Waikapū. He went on to say that he remembers the property and traveled throughout the area. He did not know of any Hawaiian ceremonies that took place on the property or any burials that might be there, and had nothing further to add.

Susan Kanegai Lord
Housewife
P.O. Box 95, Wailuku, Maui, Hawai'i 96793
Residence Upper Waiehu

March 28, 2004 at 10:40a.m., interviewed on Kahekili Highway, fronting the Chinese cemetery (across this project property), Waiehu:

She was born on the project property on March 6, 1943 in Upper Waiehu. Her property is in the middle-top of the property on Maluhia Road, which is accessed from a cane haul road. They own 3 acres within the project property and have been promised by the owner, Sterling Kim, that he will give them access to their property. Prior to the macadamia nuts, the project area was into sugar cane. She does not personally know of any burials. However, she heard that there are burials on the project property where the Kapalu family lived, and that the Miyahira boys knew of a burial site in the project area. She stated that they told the archaeologist about the burials, but he could not find it. {refer to Eric Ogg's statement (the archaeologist who did they survey)} She continued by saying that their property was ***kuleana wai***[1], so they have several taro patches on their

---

[1] Kuleana wai-water rights

property. Also, Mary Kaina, who is her neighbor on Maluhia Road, might have some information on the burials within the project area.

Mary J. Kapalu Kaina
Clerk – Takamiya Market
P.O. Box 3204, Wailuku, Hawai'i 96793-8204
Maluhia Road, Upper Waiehu, Maui

March 28, 2004 at 6:15p.m.:

She was born in the project area on June 26, 1942. She grew up in the area and did not have any indication of burials on the site. She mentioned that her boyfriend, Robert Kaipo Houpo, worked on the property in the past and might have information.

Robert Kaipo Houpo
Equipment Operator – HC&S Co.
P.O. Box 3204, Wailuku, Hawai'i 96793-8204
Maluhia Road, Upper Waiehu, Maui

March 28, 2004:

He was born on April 17, 1951 in Upper Waiehu and has lived all of his life in the area. He had worked in the cane field when cane was the crop and took care of the water ditches in the area. He remembers seeing stone piles but had no indication that there were any burials in the area, and had nothing further to add.

Lawrence Miyahira
Detailer – Associated Steel
P.O. Box 765, Wailuku, Maui, Hawai'i
(Upper Waiehu)

March 28, 2004, at 3:30p.m., interviewed by telephone:

He related that he was born and raised on the project area, and could remember playing on the project site and seeing a "pile of stones" which resembled graves. He did not know for sure if it was a burial, or who might be buried there. He mentioned to the archaeologist about seeing the pile of stones, but does not know if anything was found. He did not know of any other pertinent information concerning this subject property.

Eric Ogg
Archaeologist – Scientific Consultant Services Inc.
95-178 Kahela St., Mililani, Oahu, Hawai'i 96789

March 29, 2004 at 8:30a.m., interviewed by telephone from Schofield Barracks on Oahu:

He related that he was told the same information by Susan and Malia, who live on the 3 acres within the project area. He stated that he could not find any burials or possible burial sites, and did a pedestrian survey throughout the project area. There were no surface features that indicated the presence of burials. He had nothing further to add.

AUTHORS NOTE: In speaking with the owner, Mr. Sterling Kim, he was apprised of the informant's statements. He related that the configuration of the house lots and the agricultural lots are situated in areas where burials might be present. However, the present activities would amount to the agricultural activities that have been occurring on the property in the past. Should any burials be found, the situation will be handled according to the mandates of Sec. 6-E of the H.R.S. (Refer to Conceptual Plan for Hale Mua Subdivision attached to this report.)

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

seeking the knowledge to push us forward

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka 'Aina o Ka Makani Ho'ehu'ili

PERSON INTERVIEWED: Marcello S. Dadez

DATE OF INTERVIEW: 3/24/04

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: MARCELLO S. DADEZ
Print Name

Signature: Marcello S. Dadez

Date: 3/25/04

2041 KAHEKILI HWY., WAIHEE

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Marcello S. Dadez

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

IMI NA IKE NA MEA E PAHU IA MAKOU IMUA
(Seeking the knowledge to push us forward)

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka 'Aina O Ka Makani Ho'eha'ili

PERSON INTERVIEWED: Esther Kailihiwa Santos

DATE OF INTERVIEW: 03/27/04

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: Esther Kailihiwa Santos
Print Name

Signature: Esther Kailihiwa Santos

Date: 03 27 04

516 Kaimana St
Kahului

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Esther Kailihiwa Santos

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

IMI NA I KA NA'AUAO E PAHE IA MAKOU IMUA
seeking the knowledge to push us forward

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka Aina O Ka Makani Hoohaiili

PERSON INTERVIEWED: ~~Ferrest~~ F. Santos

DATE OF INTERVIEW: 3/27/04 10:30 AM

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: Ernest F. Santos
Print Name

Signature: Ernest Santos

Date: 03/27/04

2087 Mokuhau Rd
Wailuku

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Ernest F. Santos

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

IMI NA I KA NA AUAO E PAHI IA MAKOU IMUA
seeking the knowledge to push us forward

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka 'Aina O Ka Makani He 'Eha 'ili

PERSON INTERVIEWED: Susan Kanegai Lord

DATE OF INTERVIEW: 3/28/04

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: Susan Kanegai Lord
Print Name

Signature: Susan K Lord

Date: 3-28-04

P.O. Box 95
Wailuku, Maui
Hi 96793

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Susan Kanegai Lord

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

[illegible]
Seeking the knowledge to push us forward

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka Aina O Ka Makani Ho'olohe'ili

PERSON INTERVIEWED: Mary J. Kapalu Kaina

DATE OF INTERVIEW: 3/29/04 6:15 pm

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: MARY J. KAPALU KAINA
Print Name

Signature: Mary J Kaina

Date: 3/29/04

P.O. BOX 3204
Wailuku, Hi 96793-3204

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Mary J. Kapalu Kaina

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods).
Blessings, Weddings, Lectures
and Ho'oponopono

IMUA I KA NA'AUAO E PAHU IA MAKOU IMUA
(seeking the knowledge to push us forward)

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka 'Āina O Ka Makani Ho'eha'ili

PERSON INTERVIEWED: Robert Kaipo Houpo

DATE OF INTERVIEW: 3/28/04

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: Robert Kaipo Houpo
Print Name

Signature: Robert K. Houpo

Date: 3-28-04

P.O. Box 3204
Wailuku, Hi 96793-8204

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Robert Kaipo Houpo

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

[illegible]
seeking the knowledge to push us forward

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka ʻAina O Ka Makani Hā Ehaʻili

PERSON INTERVIEWED: Lawrence Miyahira

DATE OF INTERVIEW: 3/28/04 330pm

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: By Phone - [illegible]
Print Name

Signature: ____________________

Date: 3/28/04

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Lawrence Miyahira

CKM CULTURAL RESOURCES

Specializing in Cultural Impact Statements
(using State of Hawaii O.E.Q.C. methods),
Blessings, Weddings, Lectures
and Ho'oponopono

(seeking the knowledge to push us forward)

INTERVIEW SUMMARY AND CONSENT

JOB NAME: Ka 'Āina O Ka Makani Ho'ōla Sili

PERSON INTERVIEWED: Eric Ogg

DATE OF INTERVIEW: 3/29/04 — 8:30AM

INTERVIEWER: **CKM Cultural Resources: C.K. Maxwell Sr.**

PURPOSE OF INTERVIEW: **Cultural Impact Assessment**

I hereby give permission to CKM Cultural Resources to use the information from this interview in preparing a cultural impact assessment report for the subject project. I understand that appropriate credit will be provided in the cultural assessment report. I further understand that I will be able to review the summary of the interview report prior to publication.

By: By Phone
Print Name

Signature: ____________________

Date: ______________________

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place · Pukalani, Maui, HI 96768
Phone: (808) 572-8038 · Fax: (808) 572-0602 · Cell: 870-3345
Email: kale@moolelo.com · Website: www.moolelo.com

Interview Consent Form for Eric Ogg

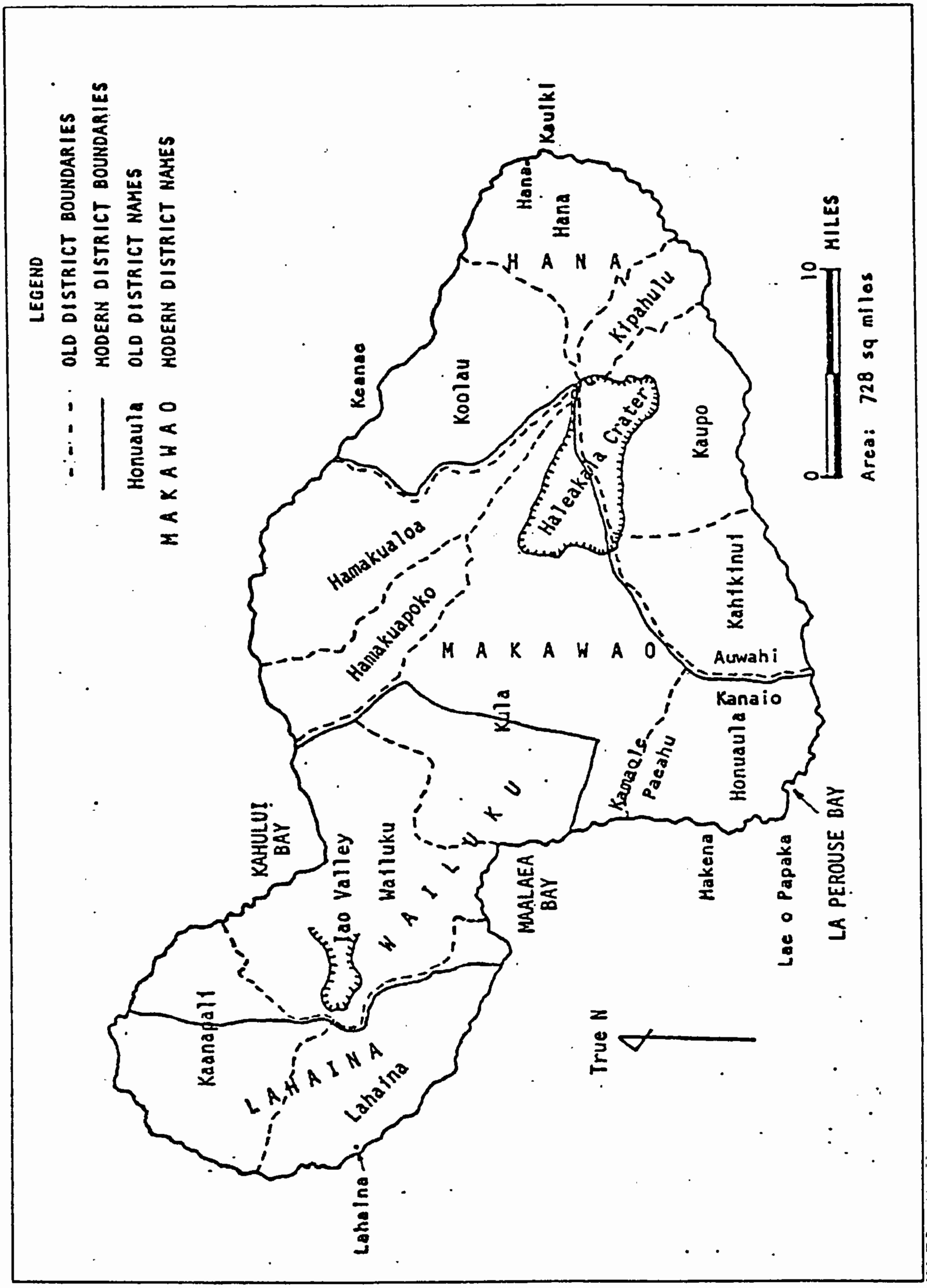


Figure B-1. Ancient and Modern Districts of Maui (from Barrere 1975)

Ancient and Modern Districts of Maui

Conclusion – Hoʻi Hope Ka ʻEhu O Ka Wai[1]

As discovered through this report, Waiehu was home to many events that happened in the Wailuku area, some traditional, some modern.

The upper regions of Waiehu, near the more mountainous areas, are filled with lore and stories of attempts and successes at ceasing control.

The matters discussed in this report are brief snippets of knowledge, for if it were the purpose of this report to delve in to the expanse of history in this area, a book, no doubt, would be the result.

Waiehu, home of the wind that hurts the skin. Perhaps there is more to the meaning of this statement than meets the eye.

I would declare at this time that, based on my personal knowledge of the Property, extensive research conducted of the Property, site visits to the Property from February thru March 2004 and interviews with several long-time residents of the area, and review of the archaeological inventory survey conducted by Scientific Consultant Services, Inc., it is my professional opinion that the proposed development will not have any significant adverse effects to native Hawaiian traditional and customary rights which would require protection under Article XII, Section 7 of the Hawaii State Constitution.

---

[1] Lit. "Receding are the sprays of water." This literal translation is a poetical interpretation of the word "conclusion." The implication of "receding" is implied as an "ending." Hence the poetical reference for "conclusion."

Maui News photo by Roy Tanaka

ON MONDAY, the John Hokoana family was at Norman's Mortuary attempting to identify the remains of one of their ancestors. Pictured here are Charles Maxwell and Bernice Hokoana.

Construction firm charged with desecrating graves

WAILUKU — A misdemeanor complaint has been filed against Fong Construction Co. for alleged desecration of gravesites at the Waiehu Heights subdivision.

Maui County Deputy Prosecutor Gerard Lee Loy acknowledged Monday he had filed the criminal complaint against the company which handled the grading work on the subdvision and dug up some 79 gravesites.

Danny Fong, owner of the company, said yesterday he had not been notified of the complaint and would not comment.

The complaint alleges that Fong Construction improperly removed some 79 gravesites from the subdivision area being developed into a residential complex.

Only one of the graves in the area had been marked, but Hawaiian leader Charles K. Maxwell had warned the developers that the Waiehu Heights site contained old Hawaiian burials.

As a result of Maxwell's warnings in early 1978, work on the project had been held up until the Bishop Museum had conducted a survey of the area. But the museum archaeologists failed to uncover any significant gravesites, and the grading work continued.

It was only after the grading had been completed that Maxwell was told of the 79 remains found buried in the sandy hills.

One Hawaiian family, who claims a mother was buried at Waiehu Heights, has filed a civil suit against the developers, Waiehu Heights Associates, as well as against Fong because of the handling of the remains.

When he discovered in February there had been 79 remains uncovered at the site, Maxwell filed a complaint with the Maui prosecutor's office. The misdemeanor charge filed in Wailuku District Court Thursday is a result of that complaint.

Lee Loy said he had not taken a tion in the case until now because h had had to conduct an investigatio on his own.

"We feel now there are sufficie grounds to bring this before court," he said.

The charge of desecration allege that the contractor had deface damaged or mistreated the burials.

HONOLULU ADVERTISER Wednesday, Feb. 21, 1979 A-13

One of 79 bodies found by developer

Kuau man, 82, says his mother was buried at Waiehu

By EDWIN TANJI
Advertiser Maui County Bureau

WAILUKU — An 82-year-old Kuau man says one of the bodies found in the area being developed into the Waiehu Heights subdivision was that of his mother, Kalauau Kapule Hokoana.

John Hokoana said he is the last surviving son of the family and can remember his brothers pointing out to him the grave of his mother.

Hokoana's identification of his mother's former grave site yesterday led to further objections to the handling of the discovery of 79 burials in the sandy dunes overlooking Waiehu.

neighbor island NEWS

The remains of the 79 persons were being held at Norman's Mortuary in Wailuku. But the workers who removed the bones simply stored them in cardboard boxes which were stuffed into a storeroom at the mortuary.

Hokoana's family and Charles K. Maxwell of Pukalani said they could not determine which of the 79 bodies is Hokoana's mother. None of the boxes, many of which were beginning to collapse, was marked except for one designated as being the body of a child, Maxwell said.

Hokoana called Maxwell over the weekend after reading about efforts led by Maxwell to identify the burials at Waiehu Heights.

Maxwell, president of the Maui ALOHA Association, has raised objections to the residential development by Waiehu Heights Associates since 1976. He said he warned the developer and contractors that they were building on Hawaiian grave sites. But he said he had no proof of the burials at the time he gave his warning.

Two weeks ago, however, Maxwell said, the developer called him and said they had discovered 79 burials at the development site.

That led to the appeal to the public through news media on Maui, by Maxwell and Maui County, for persons who could identify the remains.

Hokoana is the first and only person to have come forward with information on who may have been buried in the sand at Waiehu Heights.

His mother died when he was 2, Hokoana said yesterday. His father later moved the family to Kuau, where the family owned land. His father is now buried in Paia, but his mother wanted to be buried in Waiehu, Hokoana said.

For that reason, he said, he wants to have his mother's remains reburied where they had been originally.

"I don't know why, but she had a reason," he said.

Hokoana said he had not visited his mother's grave in recent years. He said he knew it was somewhere in the area, but the sand dunes overlooking Waiehu had been so heavily overgrown, he did not think he could have found it.

Although it appeared likely that the site was once owned by his mother's family, he said he did not know when the family owned the land or when it lost title to it.

In the recent past, the land was claimed by Wailuku Sugar Co., a subsidiary of C. Brewer. Before the closing of the Wailuku Dairy, the area was used as pasture. While the area was in pasture, there were markers indicating graves in the area, according to reports.

After the dairy closed, the land was sold to real estate agent Kay Abdul as representative of the hui known as Waiehu Heights Associates.

M-40
TMK: 3-2,
3-3

M-40

Archaeological Investigations at Waiehu
Heights Subdivision, Waiehu, Maui

Marion Kelly
Yoshihiko Sinoto, Ross Cordy

BPBM Dept. of Anthro. 1978

3, 2, 3

ARCHAEOLOGICAL INVESTIGATIONS AT
WAIEHU HEIGHTS SUBDIVISION
WAIEHU, MAUI

by

Marion Kelly
Yosihiko H. Sinoto
Ross Cordy

Department of Anthropology
Bernice P. Bishop Museum

for
Ueoka & Luna
Attorneys at Law
Wailuku, Maui

INTRODUCTION

In June 1978 the Bishop Museum was contacted by Paul Ueoka, attorney for Kay Abdul Realtors, Inc., after bulldozer operations at the Waiehu Heights Subdivision had uncovered burials and underground cracks and chambers. The Museum recommended that the area be inspected by an archaeologist, ~~and~~ Staff of the Department of Anthropology visited the construction area on four separate occasions to inspect exposed features, conduct a test excavation, and make recommendations for appropriate mitigative action. This report summarizes the results of the four days of fieldwork in subdivision Phases I, II, and III; it is anticipated that an additional field inspection of the Phase IV area will be scheduled in the near future.

BACKGROUND AND DESCRIPTION OF SURVEY AREA

Waiehu Heights Subdivision comprises four development areas (Fig. 1). Phase I, c. 35 acres, is on the eastern side of the large sand dune just south of Waiehu Stream, between the Waiehu Beach Road (formerly called Paukukalo Road) and Kahekili Highway. Phase II, c. 22 acres, is on the western side of the sand dune. In this area bulldozers had been clearing vegetation and were scraping the sand dune when the burials and underground features were uncovered. Phase III, which will be developed in the future, consists of c. 36 acres *mauka* of Phase I. Phase IV is located *makai* of the Beach Road, across Waiehu Stream.

The large sand dune that is the site of both Phases I and II is one of a series of dunes stretching along the coast of Maui from Kahului Harbor to Waihee and beyond (Fig. 2). Many of these dunes have been used in the past as burial grounds, and some contain cemeteries that are still in use. At least four separate cemeteries are located in the dunes today (see Fig. 1), two of which are directly across the Waiehu River from the sand dune described above.

In a taped interview, Charles Keau, a *kama'aina* of the area, referred to the sand dune as a *pu'uone*. Keau said that he was raised at Piihana, not far from this site, and has known the area since he was a young child. When he and his friends used to play there, many picket fences surrounded burial plots on the western side of the dune.

A report on *Endangered Hawaiian Archaeological Sites within Maui County*, by Kenneth Emory and Robert Hommon, was prepared for the County of Maui and published by the Bishop Museum in 1972. It stated that there were burial sites on Waiehu Heights Subdivision property (1972:35), and the authors recommended that

> . . . the area of the Waiehu Heights housing project be surveyed and that steps be taken to protect modern graves (early 20th century) that we found there. A quarry that produced "limestone" for adzes should be thoroughly investigated (1972:39).

While it is unfortunate that archaeologists were not contacted to inspect the sand dune site until after extensive disturbance by bulldozing, it is hoped that an archaeological survey of Phase IV, the location of the reported quarry, will be completed before construction begins.

INITIAL SITE INSPECTION

Dr. Yosihiko Sinoto and Marion Kelly visited the Waiehu sand dune site on June 3, 1978. Daniel Abdul provided transportation from the airport, and at the site Sinoto and Kelly met Warren Unemori, engineer for the development project, Able S. C. Chung, General Superintendent of Fong Construction & Trucking Co., Robert Chin, engineer for the same company, Paul Ueoka, attorney for Kay Abdul Realtors, Inc., Lesley Bruce, Charles Keau, Charles Maxwell, and Alan R. Chung, son of Able Chung. Later, after the sites had been visited, Mrs. Kay Abdul joined the group at her unfinished home.

The site visit by Bishop Museum personnel was intended to: (1) determine whether or not the burials that had be.. disturbed by bulldozer land-clearing activity were ancient Hawaiian or modern burials; (2) determine whether or not the underground cave-like chambers and cracks uncovered by bulldozer activity might contain ancient Hawaiian burials; and (3) make recommendations on the basis of the objective findings.

With the exception of one burial area, located on the highest point of the sand dune at its northernmost end, all other areas visited were located along the western side of the dune (Fig. 3).

SITE DESCRIPTIONS (Fig. 3)

Area 1. The first area visited was *mauka* of Waiehu Beach Road near its intersection with Kahekili Highway. It contained four sites, three of which had been uncovered by bulldozer activity (Fig. 4). Two of the sites were excavations that had been cut into the sandstone ceiling of a natural cave-like chamber below the surface (Fig. 5). The third site only showed evidence of an underground chamber but the sandstone had not been cut. In each of these cases sand and debris had fallen into the openings and blocked access or view into the crevices.

A modern burial (site 4) still remained undisturbed and was surrounded by a badly disintegrated wooden picket fence (Fig. 6). A low, partly buried, stone retaining wall along the lower (western) portion of the plot helped to retain the shape of the burial site within the fence. Some flowers were observed on the surface of the ground within the wall boundary. These were probably placed there several weeks ago; of an "everlasting" type, some of them still retained their blue color. Informant Charles Keau said the picket fence was similar to many others that were in the general area when he was a child.

Area 2. On the side of the dune, not far above burial site 4, is a large crack (site 5) into which a bulldozer had fallen. Debris and fallen sandstone blocked the view into and entrance of the cavity.

Area 3. The third area visited was on top of the dune at the northernmost end, just above the road connecting Waihee Beach Road with Kahekili Highway. At this site the bulldozer had disturbed a modern coffin burial (site 6). The top of the redwood coffin had been knocked off and split into several pieces and a portion of a skull had been broken. Scattered materials included a piece of shoe leather with evidence of nails around the edge, a metal button, and some dark, soft, fibrous material, possibly *pulu* (silk-like fibers from tree ferns), which was sometimes used to stuff pillows (Fig. 7).

Also at this site was another piece of wood, about 15 ft west of the other coffin lid pieces, which seemed to be in a poorer state of preservation (Fig. 8). No further evidence was found of additional burials at this area; however, Maxwell said that he remembered seeing additional bones that had been uncovered there earlier, but he could not locate them on the day of the inspection. If there were other bones that had been exposed, they may have been covered again by sand.

Numerous bulldozer tracks were in evidence in this area. About 4 or 5 ft of the top of the hill had already been removed and the sand shoved westward and down the hillside. Pieces of the dark fibrous material were found on the westward slope in the bulldozer tracks just below this area.

Area 4. The fourth area visited was on a ridge of the sand dune, about 80 meters south of Area 1 and at a slightly higher elevation. Here the bulldozer left a depression 1.8 meters long by 1.1 meters wide, exposing an underground chamber (site 7). Debris blocked any view or entrance into the cavity.

Area 5. The fifth area, on top of another knoll, contained long cracks in the ground (site 8), which indicated a possible underground cavity. Many waterworn basalt stones had been scattered in the area by bulldozer disturbance.

Area 6. The sixth area visited was the farthest inland, on the western side of the dune. This portion of the dune had not yet been touched by bulldozers. The steeply sloping ground was covered with *koa-haole*, lantana, and scrub grass. A small cave (site 9) was not far from the top of the sand dune (about 50 ft below the bulldozed road leading to the Abdul house on top of the dune). The cave entrance had been walled off with stones, and at its mouth was a low semicircular stone wall (Fig. 9). This site also appeared to be cut into sandstone on three sides and its lower edge was formed by a low stone wall. Although the pit was sealed with debris, there was a small gap that opened into a cave or cavity below. Unlike the other pits (sites 1 through 3), this pit was too small to contain a coffin. However, it was postulated that the cavity or cave might have been used for an anci··: Hawaiian type of bundle burial.

RECOMMENDED ACTION

Following the initial field inspection a draft report was submitted to Mr. Ueoka, and it was recommended that the contractor obtain a blanket permit from the Department of Health to cover the relocation of the coffin burial (site 6) and any other burials discovered during development of the project. It was also recommended that the burial plot with the picket fence (site 4) should be left undisturbed, and that an attempt should be made to find the owner(s) of this and any other located burials to make arrangements for any necessary relocations. In addition, the following recommendations were made:

1. In Area 1 debris should be removed from the sites that show cuts in the subsurface sandstone (sites 1 through 3) so that they can be examined. Any historic coffin burials found will have to be relocated and attempts should be made to locate owners.

When these sites are cleared of debris by mortuary personnel, a careful look into the natural subsurface cavities should be made by Museum staff members to determine whether or not these cavities contain ancient Hawaiian burials. Museum personnel should be contacted when the sites are clear and can be investigated.

2. A Museum survey team should put down a test pit in each of the areas on the top and on the slope of the dune where there are large cracks (sites 5, 7, and 8) just below the surface. With the help of the contractor, the heavy debris can first be cleared off the sites. Then, the survey team can continue their investigations in order to determine whether or not they may contain burials. After such determination, if burials are found and if they are modern, the contractor should proceed as described above.

3. The most important site (site 9) is the small cave with a sealed entrance. This site should be investigated by the Museum to determine contents.

4. Lastly, someone should monitor the bulldozer as it works and notify the Museum staff, and/or Department of Health when burials or underground chambers are located.

INVESTIGATION OF SITES 5, 7, AND 8

On June 7, 1978, these sites, large cracks or depressions, were analyzed by a Bishop Museum field crew of four including Elaine Jourdane, Jack Burke, and Ed Archer, and headed by Ross Cordy. Paul Ueoka and Dan Abdul accompanied the crew. The specific task was to check the depressions as possible burial sites.

All burial sites and possible burial sites were viewed for comparative purposes. Sites 5, 7, and 8 appeared to be a combination of natural features and construction equipment activity (i.e., part of the natural slope that had been cut or gouged by construction equipment). No man-made features were visible, and no cave entrances suggesting potential burial caves were apparent. On this basis, it was decided that these depressions were not sites and did not merit further investigation.

The four sites with square cuts in the stone slope (sites 1, 2, 3, and 9) were considered possible man-made cuts at this time, based on brief inspection. The location of sites 1, 2, and 3 near the picket-fence site (site 4), which was considered a highly probable burial, further suggested these could be burial sites.* The similar square-cut nature of site 9 indicated that this site also could be a burial. As instructions were received from the Museum to analyze site 9 at a later date, Mr. Ueoka and Mr. Abdul were informed that the crew would return to analyze this site sometime during June. Mr. Ueoka stated that the developers would have the Department of Health check sites 1, 2, and 3 for possible burials when the remains were exhumed from site 4. It was implied that the Museum would be notified, if necessary (e.g., if any prehistoric burials were found). This course of action accounted for treatment of the remaining sites.

In sum, on June 7 Mr. Ueoka and Mr. Abdul were told that the depression sites (sites 5, 7, and 8) did not appear to be burial sites. However, it was

---

* On June 25, Marion Kelly made a brief visit to Area 1. Pieces of several wooden coffins, apparently uncovered by bulldozer activity, were piled together, a few human bones were scattered on the sand, a cave was exposed under site 1 (see Fig. 5), and the burials within the area surrounded by the picket fence (site 4) had been removed. On July 10, Mr. Ueoka informed Mrs. Kelly that over 20 coffins in all had been uncovered by bulldozers in Phase II. About a dozen of these were in and around site 4, another ten were on top of the sand dune near site 6, and two or three others were scattered in other areas.

clearly stated that such terrain had the potential to contain caves and that such caves could contain burials. It was emphasized that burials were found in coastal areas, particularly in large sand dunes that were often unsuitable for prehistoric housing. Therefore, Mr. Ueoka and Mr. Abdul were informed that burial caverns could be uncovered, and if this should occur, they were urged to inform the Museum immediately. Both seemed agreeable to this suggestion, and this point was reiterated in Mr. Ueoka's letter of June 7, 1978, to Dr. Yosihiko Sinoto.

TEST EXCAVATION OF SITE 9

On June 19, 1978, site 9 was excavated by a Bishop Museum field crew of four people (including Elaine Jourdane, Toni Han, and Ed Archer, and headed by Ross Cordy). Paul Ueoka, Dan Abdul, Charles Maxwell, and several members of the construction company were present. The specific task was to determine if site 9 was a burial site. Our fieldcheck on June 7 had indicated: (1) that this could have been a man-made site due to the square nature of the cut in the stone slope; and (2) that it could have been a burial site due to the presence of similar sites (sites 1, 2, and 3) near a highly probable historic burial site (site 4) and due to the probable presence of a cave.

Site 9, which had been stripped of vegetation since our June 7 analysis, was cleared and photographed prior to excavation (Fig. 10). At this point the site was a small opening (about 0.3 meter high) against the slope, extending back 0.5 meter under a slight overhang. Rocks filled the front part of this opening, forming a gradual slope at the same level as the adjacent rocky slope. The opening itself was roughly equal to three sides of a square--although clearing revealed that it was not as square as it originally appeared to be. The stone of this opening was course-grained with no signs of abrasion or cuts, and the stone had horizontal bands or layers (Fig. 11).

A test pit was placed into the soil at the opening of site 9. The pit was as wide as the opening and extended 0.3 meter under the overhang. An initial layer of humus, 5 to 10 cm deep, was removed. A second layer of gray sandy soil and stone rubble was removed down to 1.0 meter below surface. At that point a thin (2 to 3 cm), grainy, hard-packed, brown soil was encountered, covering bedrock. Nothing was recovered in excavation except for fragments of one toad (*Bufo marinus* or Giant Neo-tropical Toad, an introduced species) in Layer II.

A tiny cave was found to lead off from the opening, but it was less than 0.3 by 0.3 meter, and could not have been entered by humans. Therefore, it was not investigated further.

Site 9 is interpreted as non-cultural. It was not man-made, nor was it a burial site. The only basis for the site being man-made is the square nature of the opening and perhaps the presence of stone in Layer II. However, as noted in the site description, the stone at the opening had horizontal layering with no evidence of man-made cutting such as vertical cuts, pecking, or abrasions. This suggests that the square nature of the opening was a result of natural rather than human causes. While the stones in Layer II could have been placed by man, the lack of midden, artifacts, artifact debris, or human skeletal remains, as well as the abundance of sand among the stones, makes a natural cause for stone placement more probable. The fact that the surface stones below the opening did not form a wall, but were flush with the natural slope, further supports the interpretation that site 9 was a natural feature.

RECONNAISSANCE SURVEY OF PHASE III

On July 15, 1978, Elaine Jourdane and Toni Han of Bishop Museum, assisted by Charles Keau, conducted an archaeological walk-through survey of c. 32 acres, designated Phase III of the Waiehu Heights Subdivision. The crew was accompanied by Dan Abdul.

One piece of marble, possibly a tombstone fragment, was found lying on the surface of the dirt road. Since fill was brought into this area, however, it is impossible to determine the original provenience of the marble. A portion of Phase III was used previsouly for cattle-grazing; the only surface feature in this area was a modern wooden slide for children.

No archaeological or historical sites or indications of burials were apparent on the surface in Phase III. However, it is possible that subsurface sites or burials are present, and it is recommended that an archaeologist be contacted if any such cultural remains are uncovered during bulldozing or other construction activities.

SUMMARY AND RECOMMENDATIONS

Follow-up work on possible burial sites at Waiehu indicated that three depressions (sites 5, 7, and 8) and one square opening (site 9) were not burial sites, nor man-made sites. The depressions had no man-made features, and no cave openings were visible. Site 9 had no man-made cut marks on the stone at its opening, nor did test excavation uncover any human skeletal or cultural material. On the basis of these results the developer was given clearance to proceed with work in those specific site areas.

Sites 1, 2, 3, and 4 were not analyzed by the Bishop Museum during the present investigations. These sites are to be examined by the developer (or the developer's agent) and the Department of Health. If any prehistoric burials are found during examination, these burials should not be removed and should be protected until proper historical analysis is done.

A reconnaissance survey of Phase III was conducted, with negative results. It is possible, however, that subsurface sites or burials are present in this area.

In sum, it should be emphasized that there is a high probability that prehistoric and historic burials are present in this coastal sand area at Waiehu.* If the developer does uncover any additional burials during the present construction phase, these burials should be protected until historical analysis and evaluation occur. Moreover, it is suggested that, prior to future construction in Phase IV, archaeological survey be undertaken in an attempt to determine if sites are present. A possible quarry in this area has been reported (see p. 2). If sites are found, follow-up research may be needed. There are several benefits to such an approach. One, with archaeological work done first, chances of having to halt construction work are reduced. Two, early archaeological research recovers information in a largely undisturbed context. The historical information thereby recovered, which is vital to understanding the history of Hawaii, is much more meaningful.

---

*E.g., sand dune burials have been excavated at Mokapu, Kaneohe *ahupua'a* (Oahu) (Bowen 1961; Snow 1974), at Bellows, Waimanalo *ahupua'a* (Oahu)(Pearson et al. 1971; Cordy and Tuggle 1977), and at Site H1, Ka'u District (Hawaii) (Underwood 1969).

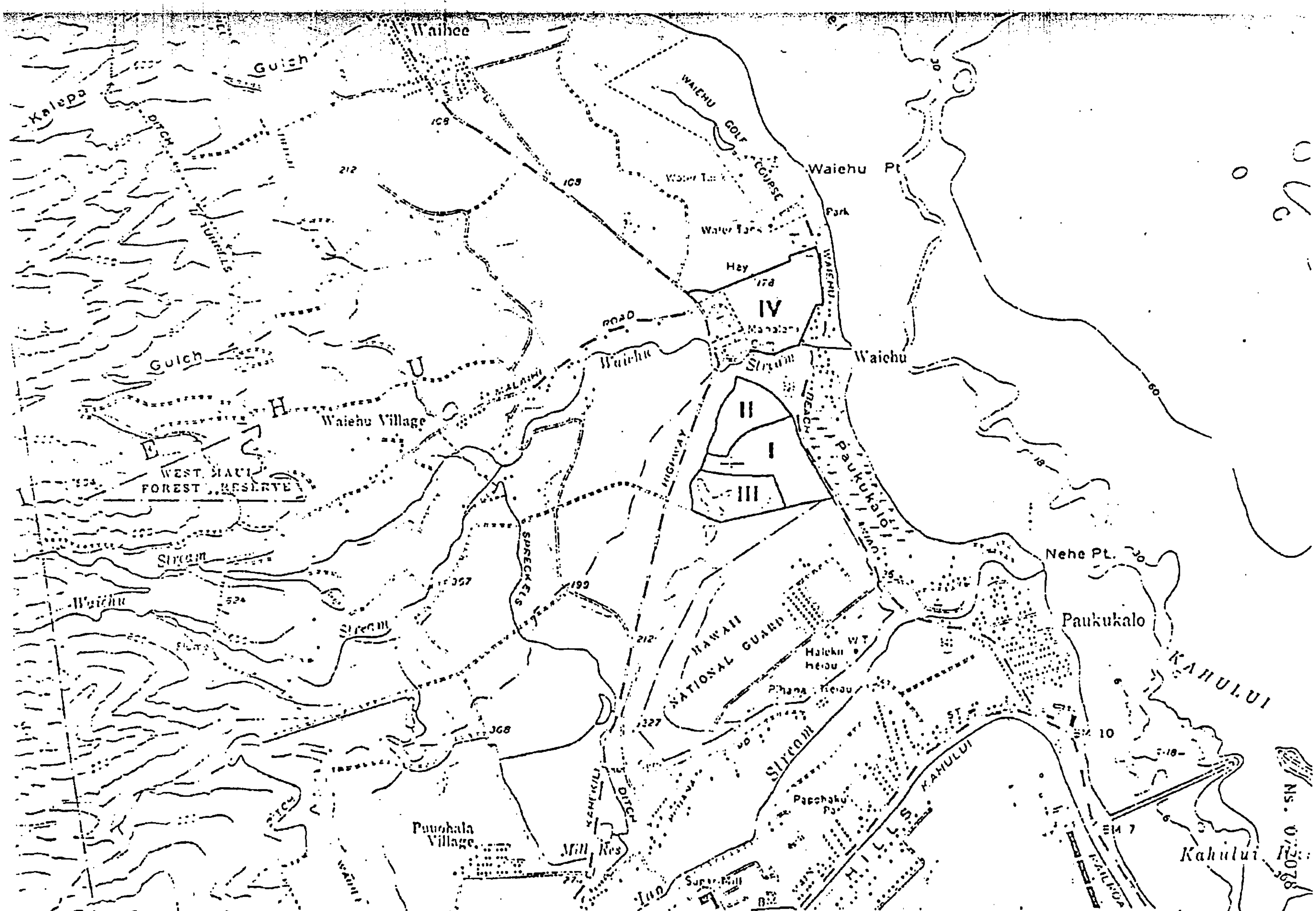


Fig. 1. Portion of U.S.G.S. map showing location of Waiehu Heights Subdivision Phases I through IV. and Mahalani Cemetery across the lower Waiehu Stream

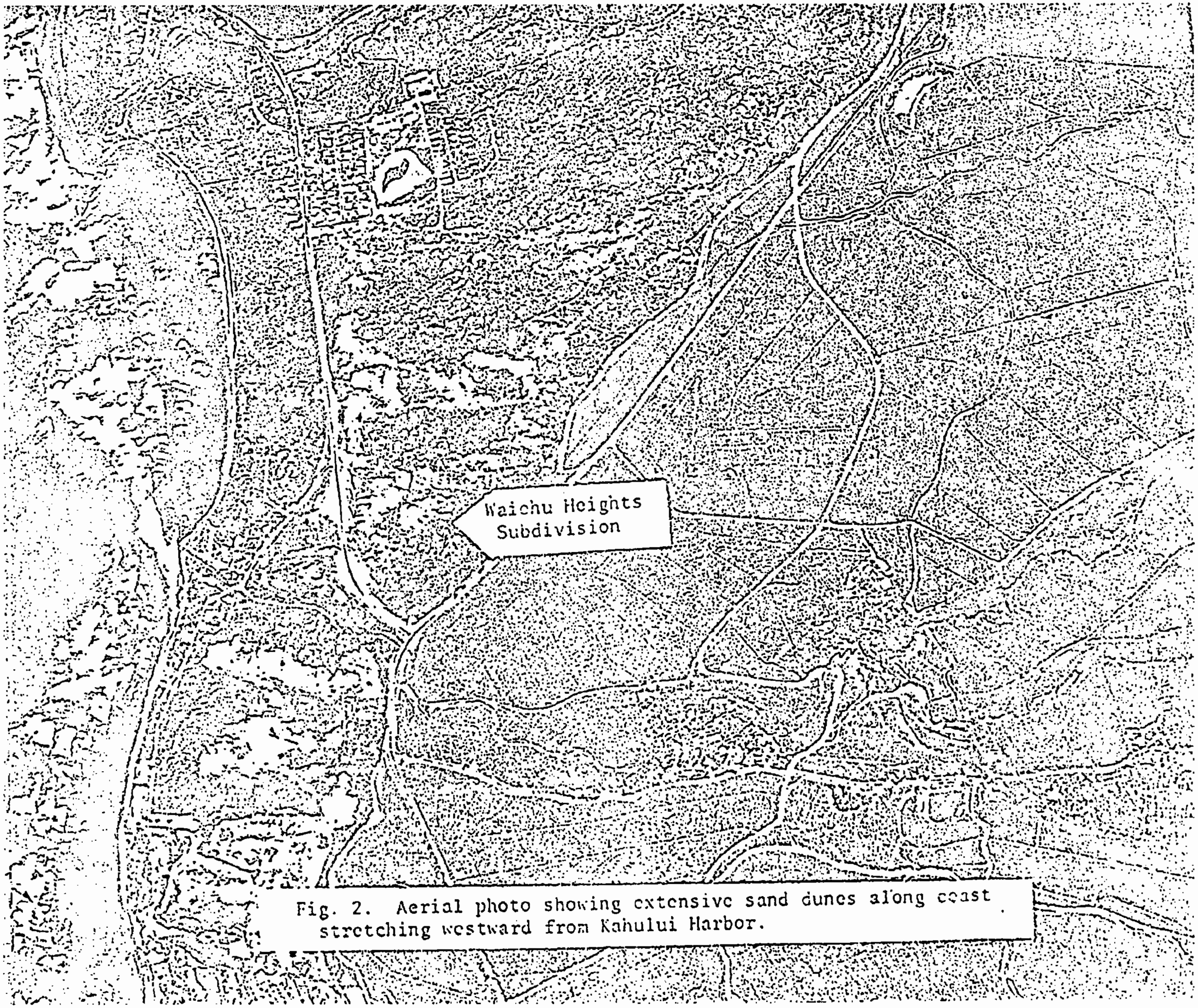
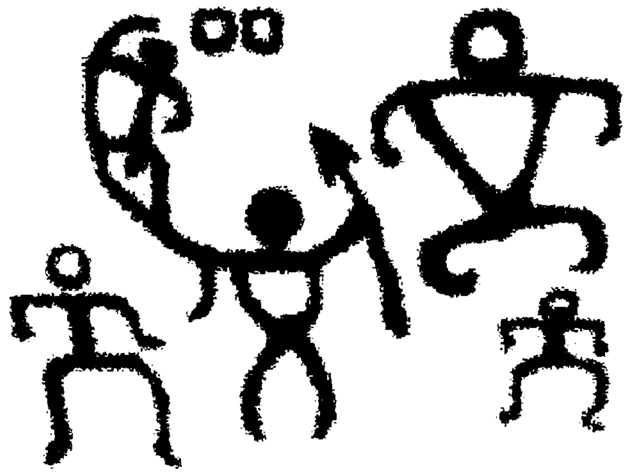


Fig. 2. Aerial photo showing extensive sand dunes along coast stretching westward from Kahului Harbor.

State Historic Preservation Division

PROTECTING NATIVE HAWAIIAN BURIALS



For at least two thousand years, native Hawaiians have placed the earthly remains and spirits of their "kupuna," or ancestors, within the landscapes of Hawai'i.

When a departing kupuna was laid to rest there was never a doubt that their remains would empower their descendants until they themselves were reduced to earth. Some kupuna were covered by stacked stones while others were buried with no surface markers at all, frequently in sand dunes.

Remains of high chiefs or those kupuna of high honor often were interred at night to conceal their location from jealous rivals who might steal and degrade or otherwise use the spiritual power of the remains for personal gain.

Because of these cultural practices, ancestral bones can be found almost anywhere in Hawai'i today. Burial sites are often accidentally disturbed either by nature (high surf or erosion) or by human activity through projects that involve excavation.

If you discover a burial site: stop activity in the immediate area; leave remains in place; contact the State Department of Land and Natural Resources, ● Historic Preservation Division and your County Police Department. Reporting a burial site disturbance is required by law (Hawai'i Revised Statutes, Chapter 6E) and severe penalties could result when SHPD is not notified of such disturbance.

Let us all continue to give these ancestors the dignity and respect they deserve. Become a partner in preserving and protecting Hawaiian burial sites.

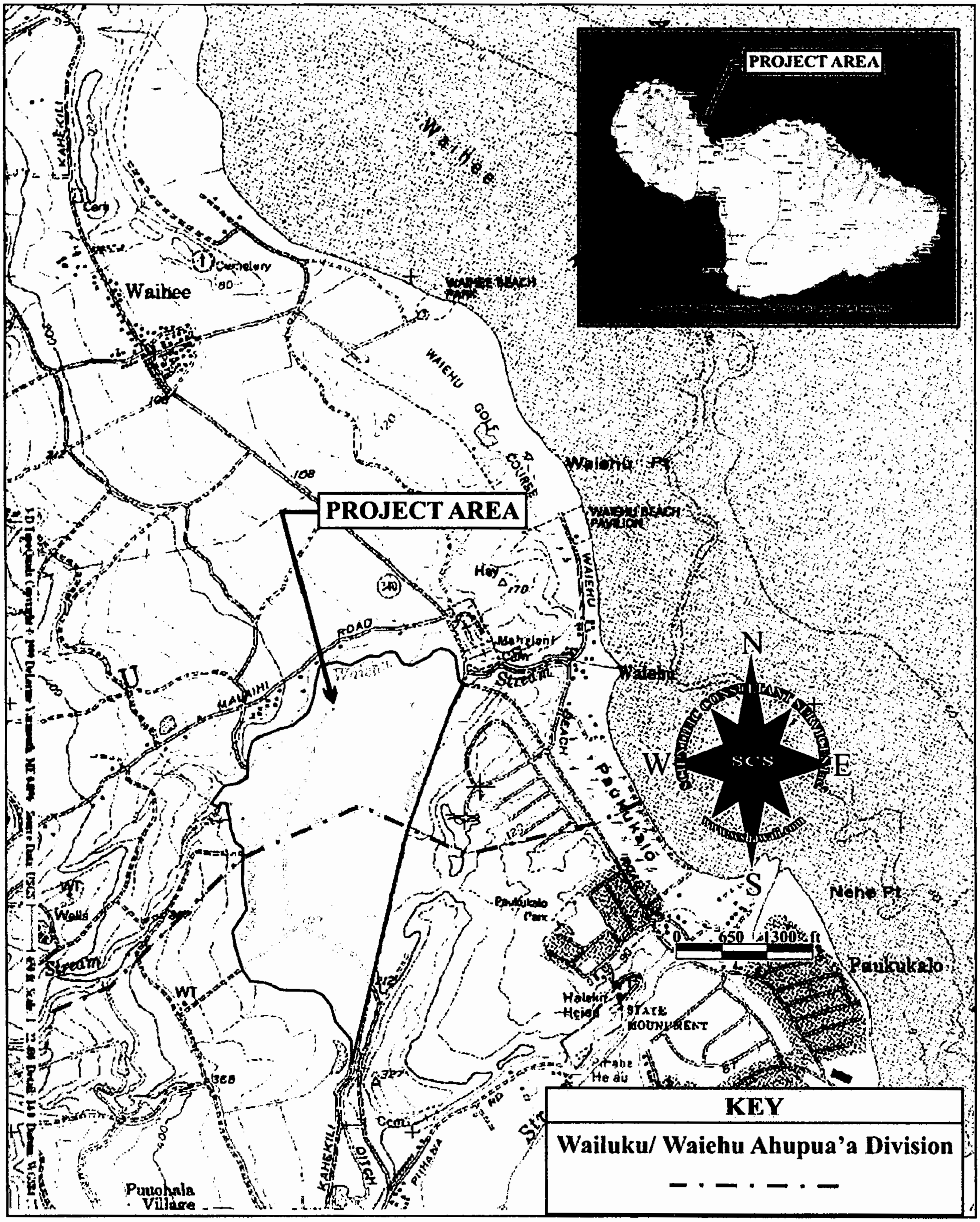


Figure 1: USGS Quadrangle Map Showing Project Area.

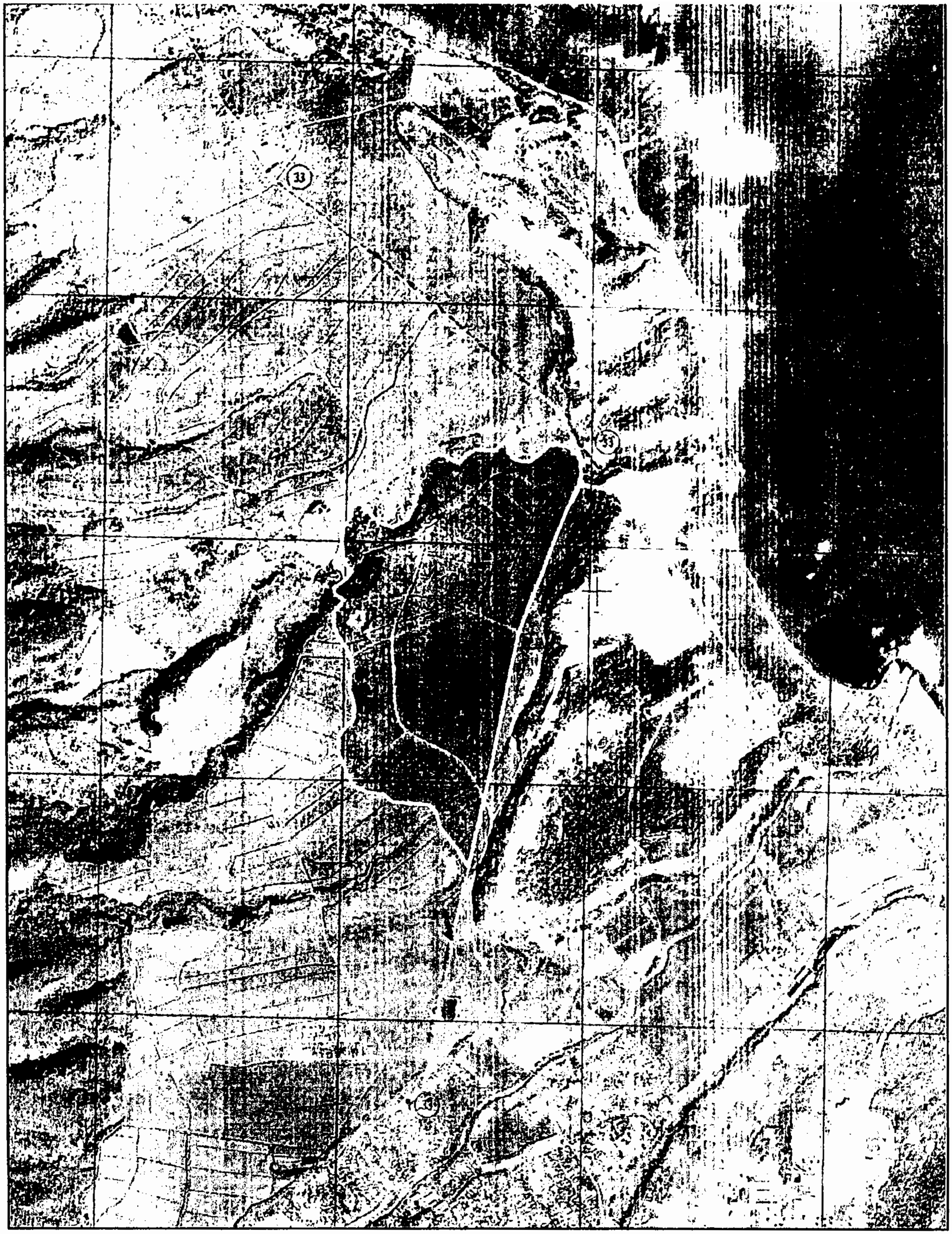
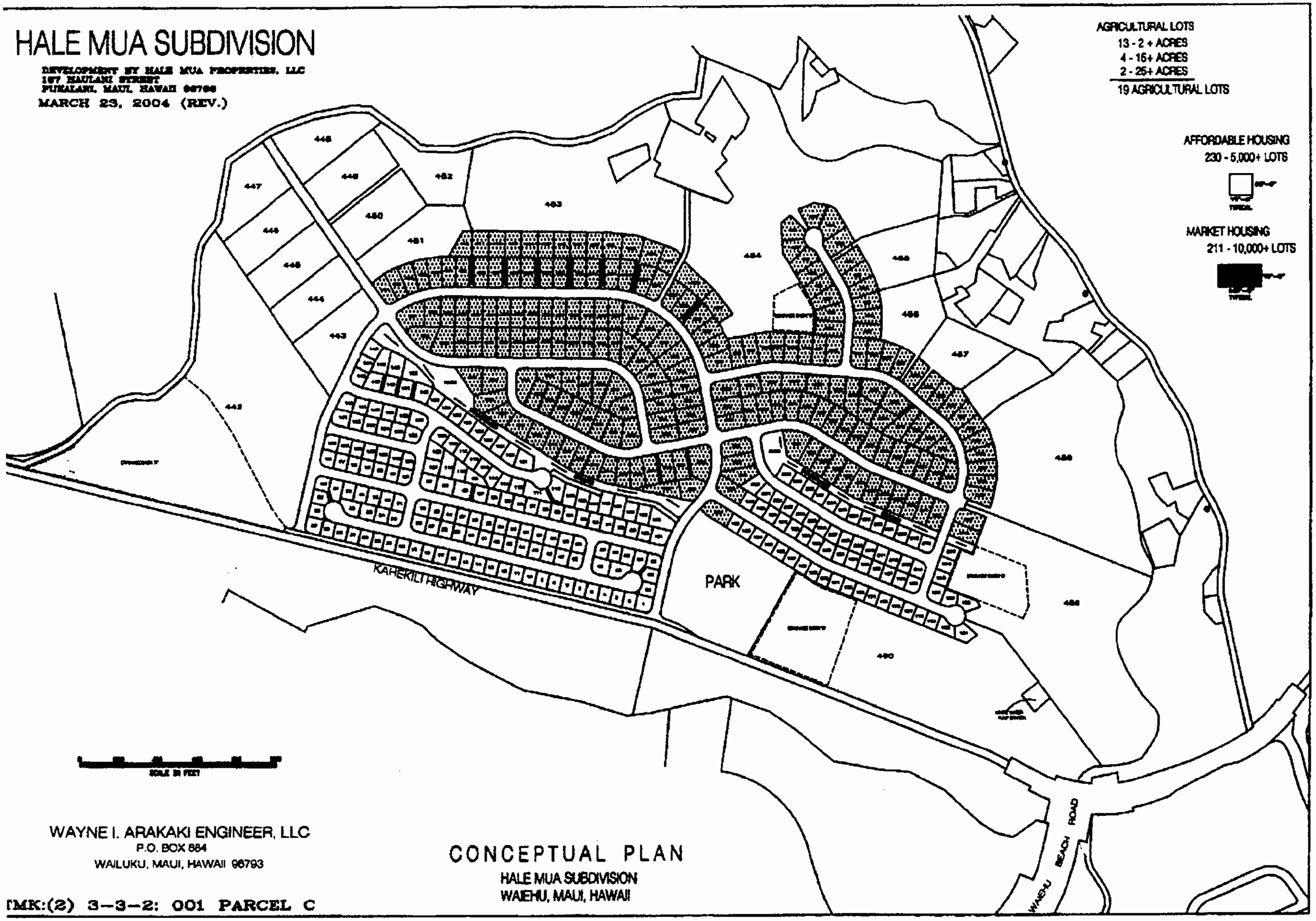


Figure 3: USGS Aerial Photography Map Showing Project Area Topography.

Note for Conceptual Plan

The light colored house lots (5,000 square feet) are the affordable housing, darker colored lots (10,000 square feet) are the market homes, and there are 13 - 2 acre agricultural lots, 4 - 16-plus acre lots, and 2 - 25 acre lots, total of 19 agricultural lots.


HALE MUA SUBDIVISION
DEVELOPMENT BY HALE MUA PROPERTIES, LLC
MARCH 23, 2004 (REV.)
AGRICULTURAL LOTS
13 - 2 + ACRES
4 - 16+ ACRES
2 - 25+ ACRES
19 AGRICULTURAL LOTS
AFFORDABLE HOUSING
230 - 5,000+ LOTS
MARKET HOUSING
211 - 10,000+ LOTS
PARK
KAHEKILI HIGHWAY
WAIEHU BEACH ROAD
WAYNE I. ARAKAKI ENGINEER, LLC
P.O. BOX 884
WAILUKU, MAUI, HAWAII 96793
CONCEPTUAL PLAN
HALE MUA SUBDIVISION
WAIEHU, MAUI, HAWAII
TMK:(2) 3-3-2: 001 PARCEL C

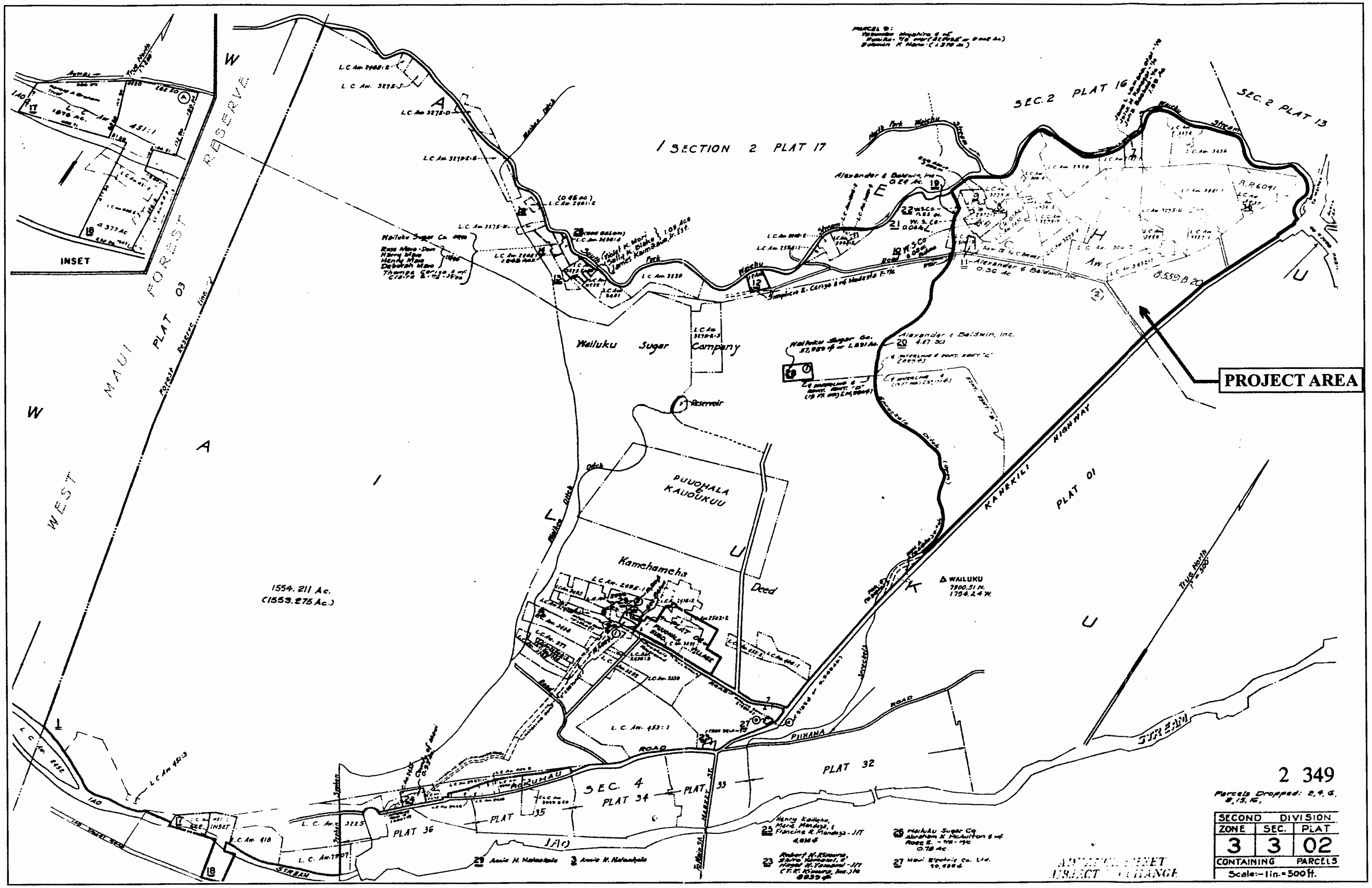


Figure 2: Tax Map Key [TMK] Showing Project Area.

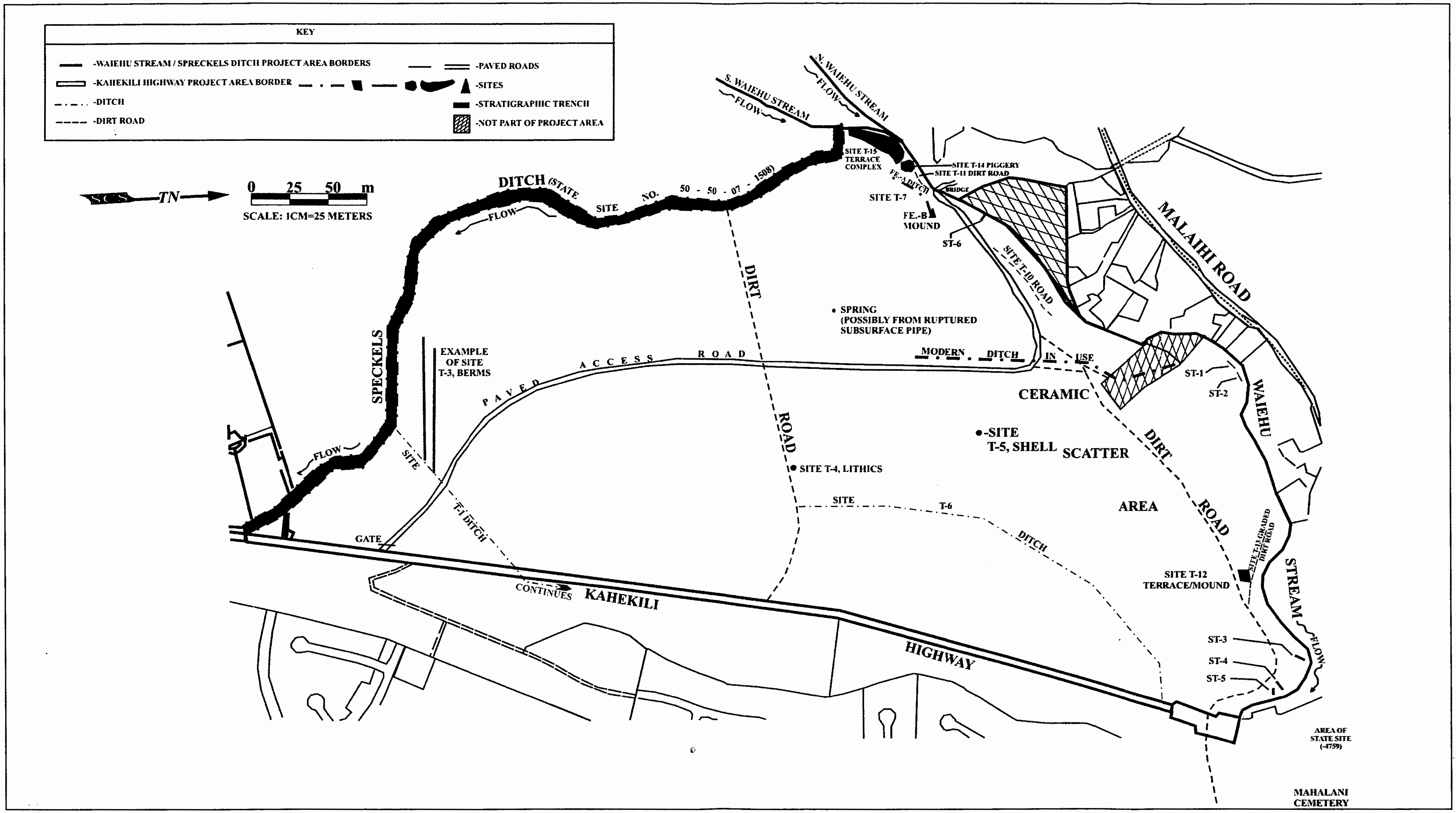


Figure 4: Project Area Map Showing Site Locations.

Intersection of Lower Waiehu Beach Road and Kahekili Highway, with the project property in foreground.

Cleared banks of Waiehu Stream, showing visible sand.

Picture of sand area on the Wailuku side of the project site, near Waiehu Stream and Kahekili Highway.

View of the project site, facing the West Maui Mountains.

Photograph of project site, taken from the Waiehu Heights side of Kahekili Highway.

Bibliography

Buck, Peter H. Arts and Crafts of Hawai'i. Honolulu: Bishop Museum Special Publication No. 45, 1957.

Cheever, Rev. Henry T. Life in the Sandwich Islands: or, The Heart of the Pacific, As it Was and Is. New York, A. S. Barnes; Cincinnati, H. W. Derby, 1851.

Emerson, Nathaniel B. Pele and Hi'iaka. A myth from Hawai'i. Rutland, VT and Japan: C.E. Tuttle, 1978.

Forander, Abraham. An Account of the Polynesian Race: Its Origins and Migrations. Rutland, Vt., Charles Tuttle 1969.

Forander, Abraham. Forander Collection of Hawaiian Antiquities and Folklore. Memoirs of the Bernice Pauahi Bishop Museum, Vols. 4, 4, 6. Honolulu, Bishop Museum Press, 1916/17.

Handy, E.S. Craighill, et al. Native Planters In Old Hawai'i: Their Life, Lore, and Environment. Honolulu, Hawai'i: 1991.

Hawai'i Supreme Court. Hawai'i Reports: Cases Decided in the Supreme Court of the Territory of Hawai'i. 43 vols. Honolulu, Honolulu Star-Bulletin, 1847-1959.

Ka Nūpepa Kū'oko'a, Oct. 1861-Dec. 1927, weekly in Hawaiian. Merged with Ke Au 'Oko'a, 1873; merged with Ko Hawai'i Pae'āina, 1891; Hawaiian legends, local, national, and international news.

Malo, David. Chs. 35-37 in Hawaiian Antiquities. 1898. Honolulu: Bishop Museum Special Publication No. 2, 1976.

Mitchell Ph.D., D. Kilolani. Resource Units in Hawaiian Culture: Revised Edition. Honolulu, Hawai'i: Kamehameha Schools Press, 2001.

Puku'i, Mary Kawena, et al. <u>Hawaiian Dictionary.</u> Honolulu, Hawai'i: University of Hawai'i Press, 1971.

Puku'i, Mary Kawena, et al. <u>Place Names of Hawai'i.</u> Honolulu, Hawai'i: University of Hawai'i Press, 1976.

Puku'i, Mary Kawena, et al. <u>'Ōlelo No'eau: Hawaiian Proverbs and Poetical Sayings.</u> Honolulu, Hawai'i: Bishop Museum Press, 1983.

Rice, William Hyde. <u>Hawaiian Legends.</u> New, illustrated ed., Honolulu, Bishop Museum Press, 1977 (orig. 1923)

United States. United States Map of Census 2000. <u>U.S. Census 2000.</u> Washington: GPO, 2000.

Wise, John H. "Food and Its Preparation." Ch. 8 in Ancient Hawaiian Civilization. A series of lectures delivered at the Kamehameha Schools by E.S. Handy et al. 1933. Rutland. VT and Japan: C.E. Tutle, 1965 (rev. ed.)

References

Scientific Consultant Services Inc., Archaeological Inventory Survey of 240.087 acres located in Wai'ehu, Wai'ehu and Wailuku Ahupua'a, Wailuku District, Maui Island, Hawai'i (TMK:(2)3-3-02:portion of 001,Lot C) Prepared by: Jon Wilson, B.A. and Michael F. Dega. Ph.D., March 2004

Archaeological Investigation at Waiehu Heights Subdivision, Waiehu, Maui. Archaeologist Marion Kelly, Yoshihiko Sinoto and Ross Cordy, 1978

Appendix F

Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS REPORT
HALE MUA SUBDIVISION

November, 2004

Prepared for:

Hale Mua Properties, LLC

Prepared by:

Julian Ng, Incorporated
P. O. Box 816
Kaneohe, Hawaii

Table of Contents

Traffic Impact Analysis Report
Hale Mua Subdivision – TMK (2) 3-3-2: 001 Parcel C (3-3-02: 20 portion)
Wailuku, Maui, Hawaii

November, 2004

Introduction

Hale Mua Properties, LLC proposes to develop a subdivision on approximately 250 acres of land between Wailuku and Waiehu on the island of Maui. The project site is located west of Kahekili Highway (see Figure 1). The subdivision will include 19 large lots ranging in size from 2 acres to larger than 25 acres, 209 lots at least 10,000 square feet each for market housing, and 238 lots (5,000 square feet minimum) for affordable housing. Vehicular access to the lots will be provided by dedicated streets with two connections to Kahekili Highway.

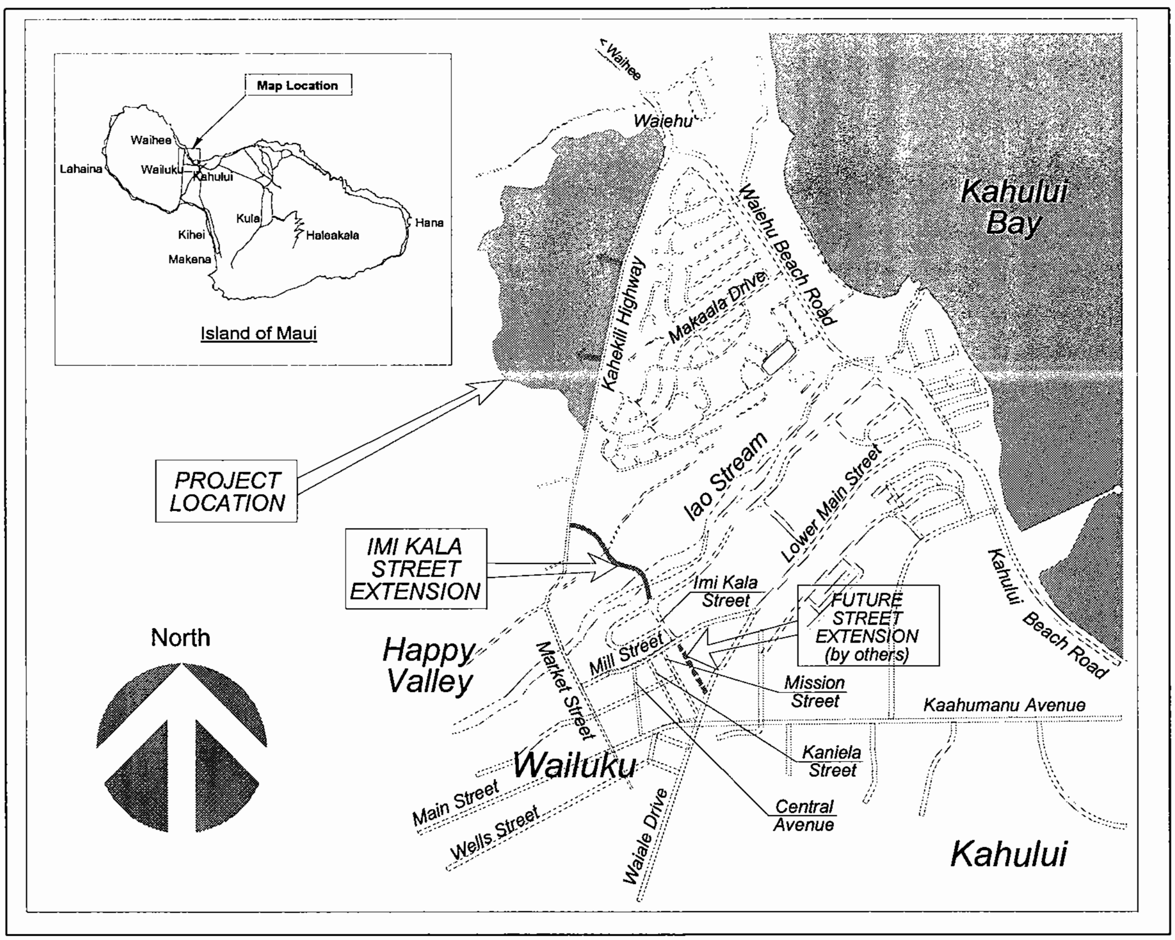


Figure 1 – Project Location

The limits of this traffic study were determined by evaluating the potential impact of the project to peak hour traffic volumes and comparing these impacts to growth in traffic that is already expected to occur. Because there is no locally established criterion, the threshold suggested by the Institute of Transportation Engineers "that a traffic access/impact study be conducted whenever a proposed development will generate 100 or more *added* (new) peak direction trips to or from the site" was used to establish the limits of this study (Institute of Transportation Engineers, *Traffic Access and Impact Studies for Site Development, A Recommended Practice*, 1991). The project's impact was determined to be less than 100 vehicles per hour in the peak direction north of the proposed north access road to the site and south of Mill Street in Wailuku.

Hale Mua Properties, LLC is in negotiations with the County of Maui to participate on a fair share basis in the improvement of a new roadway and bridge over Iao Stream to connect Kahekili Highway to Imi Kala Street in Wailuku. While this traffic report includes estimates of the project's contribution to traffic between the project site and Wailuku, it is not intended to be a traffic report for the new roadway and bridge. The main purpose of this report is to identify future peak hour conditions at the proposed connections to Kahekili Highway and recommend improvements at these intersections. Additional evaluation of future conditions at the intersection of Imi Kala Street and Eha Street and along Mill Street are discussed in later sections.

The analyses used traffic count data and estimates from the State of Hawaii, Department of Transportation, Highways Division. Counts taken in May 2003 and the latest available estimates of average daily traffic for 2001 from the State Highways Division were used. These data were supplemented by field counts taken in 2004 at the intersection of Kahekili Highway and Makaala Drive, along Imi Kala Street, and at several Mill Street intersections. Field count data are summarized in the appendix.

The description of peak hour conditions at intersections use the "Levels of Service" concept. Levels of service are determined from delays due to stop controls or the need to yield to conflicting traffic at unsignalized intersections. Level of Service C is considered acceptable for rural conditions and Level of Service D is considered acceptable for urban conditions. Criteria for levels of service are:

Delay (per vehicle) at Unsignalized Intersections	Level of Service
up to 10 seconds	Level of Service A
> 10 and < 15 seconds	Level of Service B
> 15 and < 25 seconds	Level of Service C
> 25 and < 35 seconds	Level of Service D
> 35 and < 50 seconds	Level of Service E
> 50 seconds	Level of Service F

Reference: *Highway Capacity Manual 2000*

Existing Traffic

Kahekili Highway is a two-lane roadway between Market Street in the Happy Valley area of Wailuku and Waiehu Beach Road, a two-lane coastal roadway that connects to Lower Main Street and Kahului Beach Road. Kahekili Highway continues north to provide access to Waihee and other communities to the north. At the "T"-intersection of Waiehu Beach Road and Kahekili Highway, Waiehu Beach Road forms the stem of the "T" to the east. The north leg of Kahekili Highway and the east leg (Waiehu Beach Road) are under the jurisdiction of the State Highways Division; Kahekili Highway to the south is a County roadway. In the vicinity of the project site, Makaala Drive intersects the highway at an unsignalized "T"-intersection from the east.

The State Highways Division has estimated that the average daily traffic volumes in 2001 were 8,549 vehicles per day on the segment of Waiehu Beach Road nearest Kahekili Highway, and 4,445 vehicle per day on Kahekili Highway north of its intersection with Waiehu Beach Road. These volumes compare to average daily volumes of 5,956 and 2,988 in 1993, reflecting an average growth of approximately 5% per year. A traffic count in 2001 of the approaches to and departures from the intersection of Kahekili Highway and Waiehu Beach Road showed a two-way volume of 4,303 vehicles over a 24-hour period on the south leg, which passes in front of the project.

The State Highways Division also conducted traffic counts at the intersection of Kahekili Highway and Waiehu Beach Road in May 2003. The morning peak hour occurred between

6:45 AM and 7:45 AM, and the afternoon peak hour was 4:30 PM to 5:30 PM. The count data from recent years indicate that traffic volumes on Kahekili Highway are increasing at a rate of approximately 3% per year. Table 1 summarizes the 24-hour totals and the peak hour volumes at the intersection.

Table 1 – Traffic Count Data (2003)

	Kahekili Highway (north leg)		Kahekili Highway (south leg)		Waiehu Beach Road (east leg)	
	Southbound	Northbound	Southbound	Northbound	Westbound	Eastbound
24-hour total	4,436	4,073	2,206	2,230	3,467	3,707
AM Peak Hour	645	511	348	251	401	439
PM Peak Hour	320	382	139	235	305	321

Source: State of Hawaii, Department of Transportation, Highway Planning Branch

Makaala Drive, a two-lane collector street serving a residential subdivision, runs from Waiehu Beach Road to Kahekili Highway. The connection to Waiehu Beach Road is the "front" door to the subdivision, while the connection to Kahekili Highway is a shortcut to the Happy Valley part of Wailuku. Counts were taken during the morning and afternoon peak periods on two weekdays in March 2004. Peak conditions occurred for only a portion (about 40 minutes) of the peak hour. Peak hour turning volumes at the intersection of Makaala Drive and Kahekili Highway based on the field counts are shown in Figure 2 and the results of intersection analyses using the procedure for unsignalized intersections from the *Highway Capacity Manual 2000* are shown in Table 2.

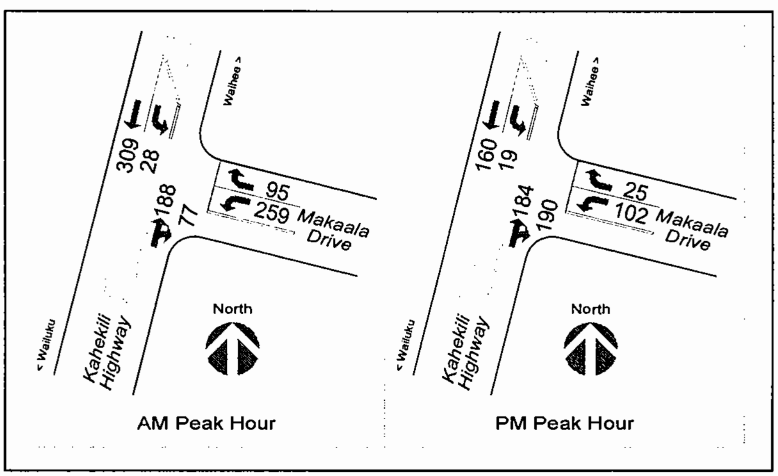


Figure 2 – Existing Traffic Volumes – Kahekili Highway and Makaala Drive

Table 2 – Existing Intersection Peak Hour Conditions

Kahekili Highway and Makaala Drive (unsignalized)	AM Peak Hour		PM Peak Hour	
	Approach delay (sec.)	Level of Service	Approach delay (sec.)	Level of Service
Left turn to Makaala Drive	8.0	A	8.3	A
Right turn from Makaala Drive	10.5	B	10.3	B
Left turn from Makaala Drive	22.9	C	13.3	B

Future Conditions Without Proposed Project

Future peak hour traffic volumes at the intersection without the proposed Hale Mua project were estimated for year 2020, using a growth rate of 2 percent per year, based on the growth rate for traffic volumes in the area indicated by the long-range transportation plan, for through movements at the intersection. The duration of peak conditions is expected to extend to the entire peak hour as increases in traffic volumes are accommodated over a longer peak period. Figure 3 shows the future peak hour volumes; the results of the intersection analyses, shown in Table 3, indicate only minor change from existing conditions.

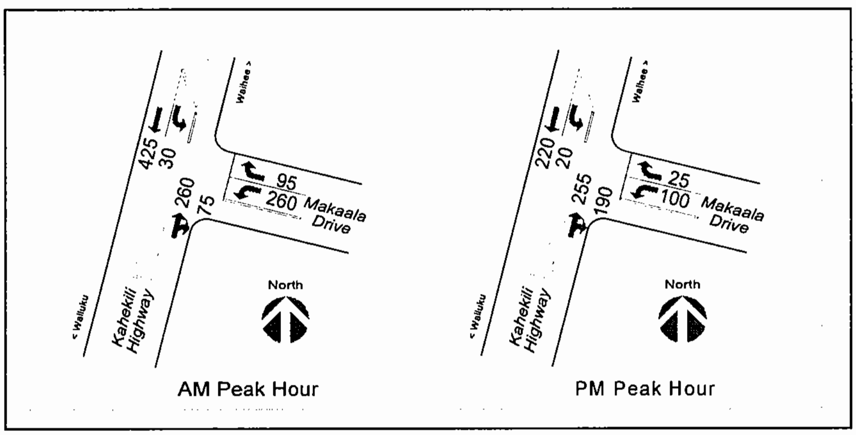


Figure 3 – Future (2020) Traffic Volumes – Kahekili Highway and Makaala Drive

Table 3 – Future (2020) Intersection Peak Hour Conditions (without project)

Kahekili Highway and Makaala Drive (unsignalized)	AM Peak Hour		PM Peak Hour	
	Approach delay (sec.)	Level of Service	Approach delay (sec.)	Level of Service
Left turn to Makaala Drive	8.1	A	8.5	A
Right turn from Makaala Drive	10.7	B	10.7	B
Left turn from Makaala Drive	24.9	C	14.0	B

Impact of Proposed Project – Proposed Connections to Kahekili Highway

The proposed project is a subdivision that will include 19 large lots (two are 25 acres or larger, four are 15-25 acres in size, and thirteen are 2 to 15 acres in size), 209 residential lots larger than 10,000 square feet, and 238 affordable housing lots between 5,000 and 10,000 square feet. The large lots were assumed to have traffic generating characteristics similar to those of the residential lots.

Trip rates from the widely-used reference published by the Institute of Transportation Engineers, *Trip Generation (7th Edition)*, were used to estimate the number of trips generated by the subdivision. Because all of the lots except the affordable lots could have two dwellings (primary house and an "ohana" unit), the traffic impact of the 466-lot subdivision was evaluated for full build-out, or a maximum of 694 detached dwelling units. Table 4 shows the trip generation rates and the trip estimates for the project at full build-out.

Table 4 – Project Trip Generation (691 dwelling units)

	Trip Rates		Trips generated	
	Trips per dwelling unit	% entering	Entering project site	Leaving project site
Average weekday	9.57	50%	3,320	3,320
AM Peak Hour	0.75	25%	130	390
PM Peak Hour	1.01	63%	442	259

Project traffic would approach or leave the site using Kahekili Highway. Considering possible origins and destinations and routing on the existing roadways, 20% of the traffic is estimated to arrive from or depart to the north, with the remainder arriving from or departing to the south. Project traffic was assigned onto the project roadways based on the subdivision layout and the desired direction of travel on Kahekili Highway. Figure 4 shows the traffic assignments at the project's intersections with Kahekili Highway and at the Makaala Drive intersection with the highway.

Table 5 shows the results of the unsignalized intersection analyses of the intersections of the highway with the project access roadways, with the following assumptions about the layout of each intersection:

- vehicles on the project road stop before turning onto the highway
- the project access road approach has separate lanes for left turns and right turns onto the highway
- a separate left turn lane is provided on the highway for left turns onto the side street
- right turns from the highway are made from the through lane

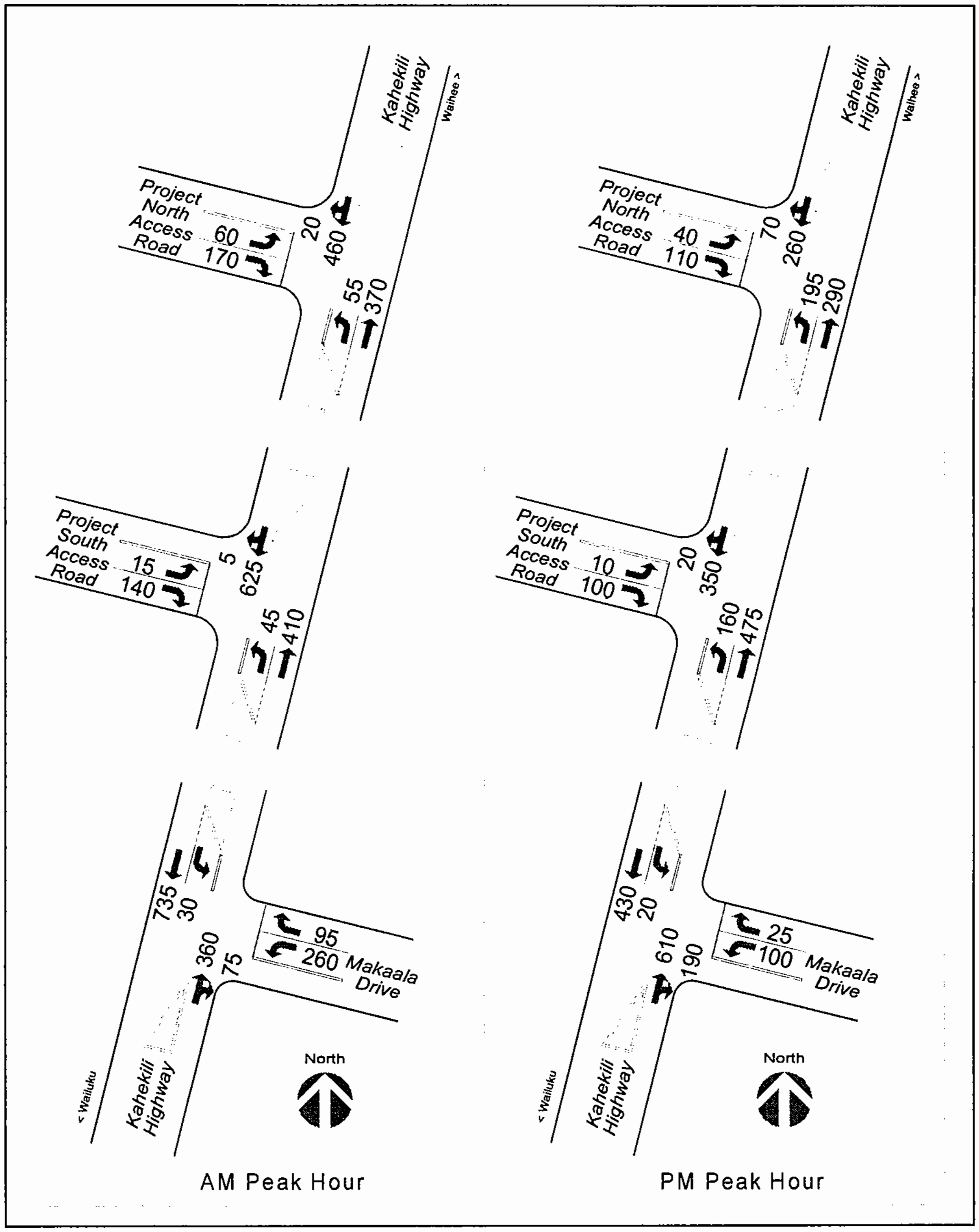


Figure 4 – Future (2020) Traffic Assignments (Kahekili Highway) With Project

Table 5 – Future (2020) Intersection Peak Hour Conditions (with Project)

Kahekili Highway and:	Movement (stopped) or yielding	AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
North Access Road ("T"-intersection)	Left turn, access road to highway	0.16	16.0	C	0.14	18.6	C
	Right turn, access road to highway	0.31	14.0	B	0.17	11.0	B
	Left turn, highway to project road	0.05	8.6	A	0.18	8.6	A
South Access Road ("T"-intersection)	Left turn, access road to highway	0.04	16.1	C	0.04	18.9	C
	Right turn, access road to highway	0.31	16.2	C	0.17	11.6	B
	Left turn, highway to project road	0.05	9.0	A	0.15	8.7	A

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

Storage Lengths for Left Turn Lanes – Left turn lanes should be provided for traffic turning from Kahekili Highway into the project. In the PM Peak Hour, over 25% of the 635 vehicles northbound at the south intersection will make a left turn, against a southbound volume of 350 vehicles per hour. At the "T"-intersection to the north, left turn volume is 40% of the 485 vehicles per hour northbound turning across a southbound volume of 260 vehicles per hour. In both cases, volumes exceed the guide for considering left-turn lanes on two-lane highways (from American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets 2001*, Exhibit 9-75).

The required storage lengths of the left turn lanes are based on the expected peak traffic volumes. The length of storage in a left turn lane at an unsignalized intersection should be sufficient to store the average number of arrivals during a 2-minute period in the peak hour. For the peak turning volumes of 195 vehicles per hour and 160 vehicles per hour at the north and south access roads, respectively, minimum storage lengths are seven vehicles at the north intersection and six vehicles at the south intersection. For storage lengths of 25 feet for each car and 50 feet for each truck, and a minimum allowance for one truck, the minimum storage lengths are 200 feet (north intersection) and 175 feet (south intersection). Adequate tapers should be provided in addition to the storage lengths.

Impact of Proposed Project – Intersection of Kahekili Highway and Makaala Drive

Table 6 summarizes the results of the analyses of existing, future without project, and future with project traffic assignments at the intersection of Kahekili Highway and Makaala Drive.

Table 6 – Peak Hour Conditions at Kahekili Highway and Makaala Drive

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Left turn, highway to Makaala Dr.	Existing (March, 2004 counts)	0.03	8.0	A	0.02	8.3	A
	Future (2020) without Hale Mua	0.03	8.1	A	0.02	8.5	A
	Future (2020) with Hale Mua	0.03	8.4	A	0.03	9.9	A
Right turn, Makaala Dr. to highway	Existing (March, 2004 counts)	0.14	10.5	B	0.04	10.3	B
	Future (2020) without Hale Mua	0.14	10.7	B	0.04	10.7	B
	Future (2020) with Hale Mua	0.16	11.7	B	0.07	14.8	B
Left turn, Makaala Dr. to highway	Existing (March, 2004 counts)	0.61	22.9	C	0.22	13.3	B
	Future (2020) without Hale Mua	0.61	24.9	C	0.22	14.0	B
	Future (2020) with Hale Mua	0.88	63.4	F	0.36	23.2	C

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

The analyses show that left turns from Makaala Drive to Kahekili Highway will have very long delays in the AM Peak Hour for the assigned traffic. Traffic signals, however, may not be warranted. The high volume of left turns occurs only during the AM Peak Hour and would not be a condition that would be expected in the near future, as the traffic assignments are for year 2020 with full build-out of the Hale Mua project (assuming also that all lots that are ohana-eligible will have two dwelling units). For the 2020 volumes on the highway, the available capacity for left turns will still exceed the volume of left turns in the peak hour.

If only one-third of the ohana-eligible lots in Hale Mua have a second dwelling unit, there will be a reduction in highway traffic, and a reduction in the delays for left turns from Makaala Drive to the highway. Results of the analysis of the unsignalized intersection with the lower highway volumes show that left turns would be 0.81 of capacity with an average delay per vehicle of 49.4 seconds (Level of Service E) in the AM Peak Hour.

Impacts to Kahekili Highway

To the north, traffic on Kahekili Highway would increase from the daily volume of 4,440 vehicles per day counted in 2003. At an average rate of 2% per year for seventeen years, this increase would be 1,650 vehicles per day. Project traffic, i.e. trips with an origin or destination in the project, has been estimated to be 1,330 per day. Project traffic would be part of this expected increase. However, if the project traffic were added to the expected increase in traffic volumes, the daily volume on the highway north of the project would be 7,420 vehicles per day.

Peak hour traffic to the north due to full build-out the project is less than 100 vehicles per hour in the peak direction, the threshold suggested by the Institute of Transportation Engineers for significant traffic impacts and the need to conduct a traffic study. The addition of the traffic with an origin or destination in the project site would increase highway volumes in the AM Peak Hour from 455 vehicles per hour (vph) southbound and 355 vph northbound to 480 vph southbound (an increase of 25 vph) and 430 vph northbound (+75 vph), Traffic would increase from 240 vph southbound and 280 vph northbound to 330 vph southbound (+90 vph) and 330 vph northbound (+50 vph) in the PM Peak Hour. At the intersection of Kahekili Highway and Waiehu Beach Road, project impact would be smaller; for an estimated 50% of the project-related traffic turning onto Waiehu Beach Road, the impacts to Kahekili Highway north of the intersection and the impacts to Waiehu Beach Road would each be less than 50 vph in the peak direction.

South of Makaala Drive, existing traffic volumes on Kahekili Highway are about 65 per cent higher than south of Waiehu Beach Road. Daily volume, estimated to be 7,300 vehicles per day (vpd) in 2004, would increase to 10,000 vpd; the addition of project traffic (assuming that the project is in addition to growth already expected) would bring the total daily volume on the highway to 15,300 vpd. The existing two-lane highway should be adequate for these volumes. Examples of other existing two-lane highways on Maui already carrying similar daily volumes are shown in Table 7.

Table 7 – Examples of Existing Two-Lane Highways with 15,000 ± ADT

	Average Daily Traffic, 2001
Honoapiilani Highway, Main Street to Keanu Street	15,718
Honoapiilani Highway, Keanu Street to Kuihelani Highway	14,376
Piilani Highway, Kilohana Drive to Wailea Ike Drive	14,368
Hana Highway, Baldwin Avenue to Holomua Avenue	14,002
Haleakala Highway, Pukalani Bypass segment	12,949
Kula Highway, Haleakala Highway to Omaopio Road	12,617
North Kihei Road, Maui Electric to Mokulele Highway	12,802
Kuihelani Highway, Puunene Avenue to Honoapiilani Highway	13,835

Source: State of Hawaii, Department of Transportation, Highways Division. *Traffic Summary, Islands of Maui, Molokai, and Lanai – 2001.*

The traffic impacts to the south would be greatest at the intersections. Analyses of intersections to the south were done to determine peak hour conditions with full build-out of the proposed project. The improvement of Imi Kala Street and its connection to Kahekili Highway would provide alternative routes for traffic between the project site and Wailuku. At the intersection of Imi Kala Street and Kahekili Highway, minimal impacts are expected, as southbound traffic would be turning left from the highway to Imi Kala Street, and northbound traffic would be turning right onto the highway.

Imi Kala Street and Eha Street

The addition of a new bridge over Iao Stream and the extension of Imi Kala Street north to Kahekili Highway would increase traffic on Imi Kala Street. Figure 5 shows existing traffic volumes at the intersection of Imi Kala Street and Eha Street/ Wili Pa Loop, based on field counts taken in May, 2004. Imi Kala Street is the major street, i.e., traffic has the right-of-way in using the intersection. Westbound traffic on Eha Street and eastbound traffic on Wili Pa Loop stop before entering the intersection. Northbound right turns from Imi Kala Street to Eha Street occur away from the main intersection; northbound left turns to Wili Pa Loop has a separate lane. Capacity analyses of the intersection show acceptable conditions during peak hours.

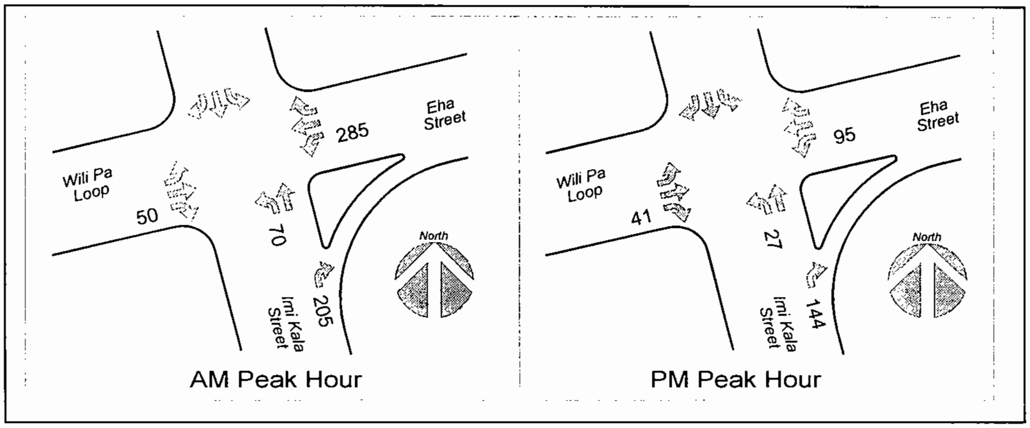


Figure 5 – Existing (2004) Traffic Volumes at Imi Kala Street and Eha Street

Future conditions without the Hale Mua project, based on the annual 2 percent increase in traffic volumes, are shown in Figure 6.

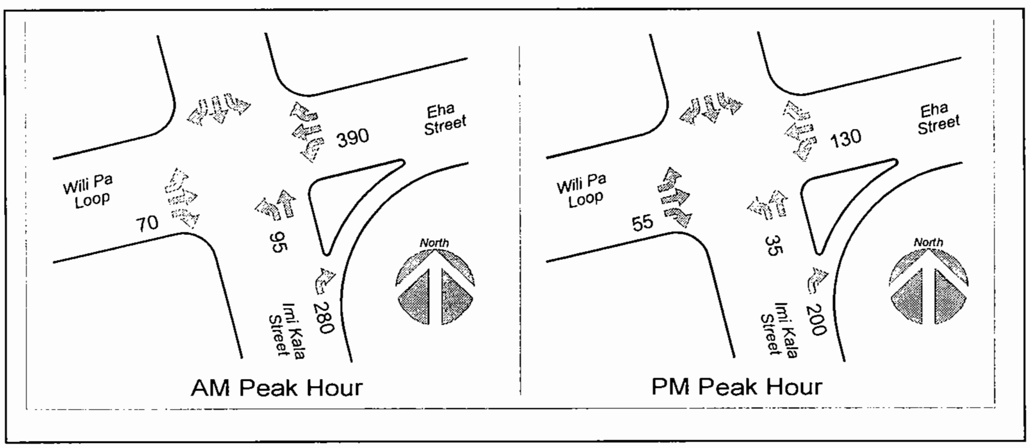


Figure 6 – Future (2020) Traffic Volumes at Imi Kala Street and Eha Street (without Hale Mua)

Future volumes with the Hale Mua project, which include other traffic diverted from Market Street onto Imi Kala Street as a result of the extension of Imi Kala Street to Kahekili Highway, are shown in Figure 7. These volumes include estimates for future traffic for year 2020 if non-project traffic volumes were to increase at an average rate of 2% per year, and 50% of the traffic that now uses Kahekili Highway, Market Street through Happy Valley, and Mill Street were to divert to Imi Kala Street.

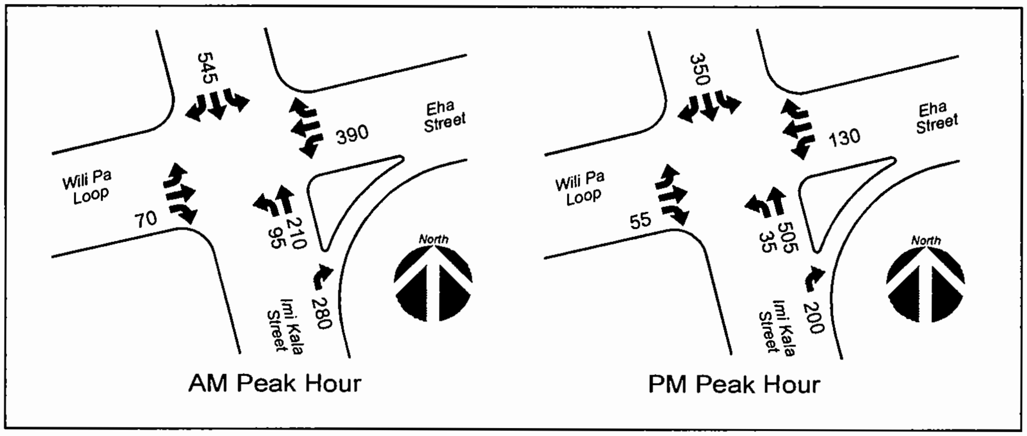


Figure 7 – Future (2020) Traffic Volumes at Imi Kala Street and Eha Street (with Hale Mua)

Table 8 shows the results of analyses of the existing, future conditions without, and future conditions with the Hale Mua project at the existing unsignalized intersection.

Table 8 – Peak Hour Conditions at Imi Kala Street and Eha Street

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Westbound approach (Eha Street)	Existing (May, 2004 counts)	0.49	15.3	C	0.13	10.1	B
	Future (2020) without Hale Mua	0.76	26.8	D	0.19	10.7	B
	Future (2020) with Hale Mua	1.80	>300	F	0.45	25.6	D
Eastbound approach (Wili Pa Loop)	Existing (May, 2004 counts)	0.05	8.5	A	0.04	8.5	A
	Future (2020) without Hale Mua	0.08	8.6	A	0.06	8.5	A
	Future (2020) with Hale Mua	0.15	13.4	B	0.09	10.9	B
Northbound left turn, Imi Kala to Wili Pa Loop	Existing (May, 2004 counts)	0.05	7.3	A	0.02	7.3	A
	Future (2020) without Hale Mua	0.07	7.4	A	0.02	7.3	A
	Future (2020) with Hale Mua	0.11	9.1	A	0.03	8.2	A

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

With the additional traffic on Imi Kala Street, traffic turning left from Eha Street to Imi Kala Street in the AM Peak Hour would exceed available capacity and drivers would have very long delays, with increased traffic on Imi Kala Street. If the intersection were signalized, conditions were found to be "under" capacity (conditions were estimated by computing the sum of conflicting movements at the intersection, and comparing the sum with the criteria that sums of 1,200 of less indicate desirable "under" capacity conditions, sums of 1,201 to 1,400 indicate "near" capacity conditions, and sums greater than 1,400 indicate "over" capacity conditions). The sum of conflicting movements would be 1,100 in the AM Peak Hour and 690 in the PM Peak Hour, in both cases, the intersection will operate at desirable under capacity conditions.

The extension of Imi Kala Street north to Kahekili Highway would be just one of several projects to improve traffic circulation in the Wailuku area. The extension of Imi Kala Street to the south, between Mill Street and Waiale Drive, along with the extension to the north, would provide a new continuous north-south route through Wailuku. The extension to the south will be programmed for future construction by the County of Maui, but the timetable is uncertain at this time. Analyses of impacts along Mill Street, therefore, were done to evaluate project impacts assuming the extension to the south is not done before 2020.

Impacts Along Mill Street

Figure 8 shows existing traffic volumes at the intersections of Mill Street and Market Street, Central Avenue, Kaniela Street, and Mission Street, based on field counts taken in May, 2004 and October, 2004. The highest volume in the AM peak period at the intersection of Mill Street and Imi Kala Street was counted during the hour 7:15 AM to 8:15 AM; peak hours for all the other intersections occurred between 7:00 AM and 8:00 AM. In the afternoon peak period, the peak hour at the Market Street and Mill Street intersection occurred from 4:15 PM to 5:15 PM. At the Central Avenue and Mill Street intersection, the peak hour occurred between 3:45 PM and 4:45 PM; at the other intersections, the afternoon peak hour occurred between 4:00 PM and 5:00 PM.

At the intersection of Market Street and Mill Street, Market Street is a two-lane roadway with single lanes shared by through and turning traffic in each direction (northbound and southbound). Traffic approaching on westbound Mill Street is controlled by a stop sign and the approach, while striped as a single lane, is wide enough that right turns can pass to the right of cars waiting to turn left onto Market Street. With this intersection control, normal use would give first priority to through movements on Market Street, second priority to southbound left turns from Market Street to Mill Street, and third priority to left turns from westbound Mill Street to Market Street. Site observations, however, indicate that the normal practice is that many southbound drivers turning left from Market Street to Mill Street will yield to westbound drivers making the left turn from Mill Street.

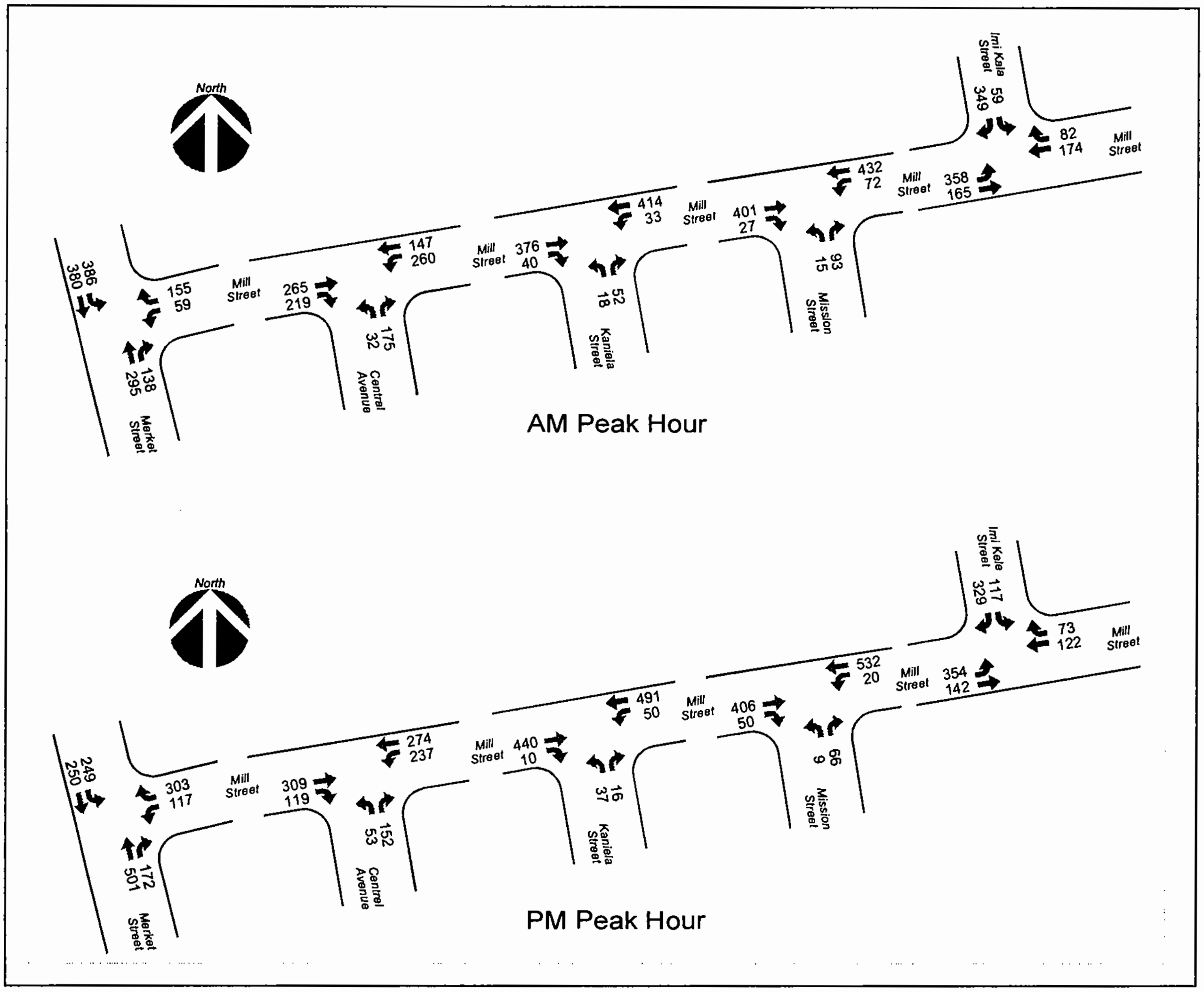


Figure 8 – Existing (2004) Traffic Volumes along Mill Street

At the other intersections, Mill Street is the major street, i.e., traffic has the right-of-way in using the intersection. Mill Street is a two-lane roadway with a single lane for traffic in each direction. At Central Avenue, Kaniela Street, and Mission Street, northbound vehicles are controlled by stop signs; each approach is a single lane shared by vehicles turning right or left onto Mill Street. At Imi Kala Street, southbound traffic stop before entering the intersection; separate lanes are provided for right turns and for left turns. Tables 9 through 13 show the results of the capacity analyses of the unsignalized intersections.

Future peak hour volumes at these intersections without the Hale Mua project were estimated by factoring existing volumes by 137% (average annual increase of 2%) and are shown in Figure 9.

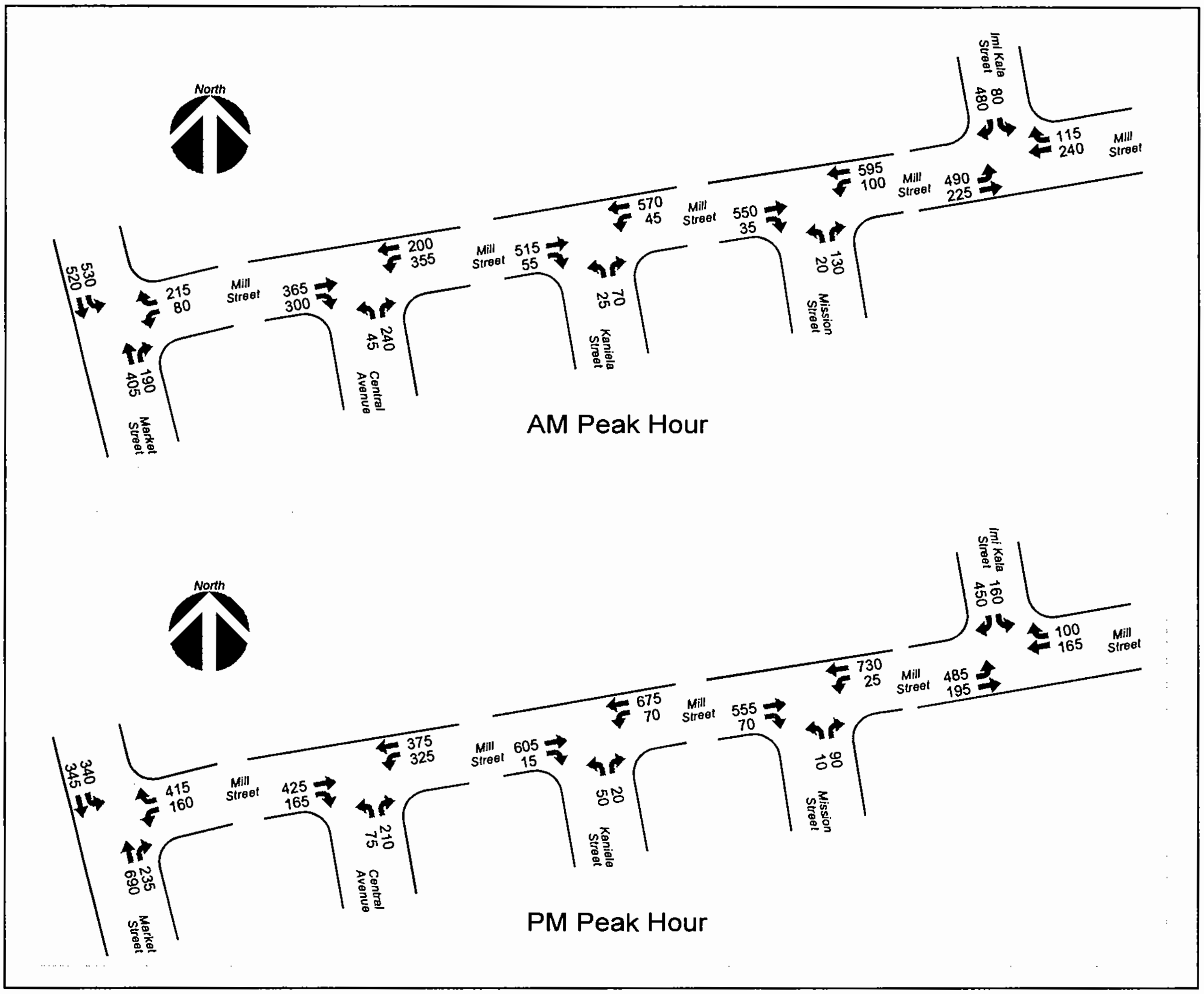


Figure 9 – Future (2020) Traffic Volumes along Mill Street (without Hale Mua)

For future conditions with the Hale Mua project, traffic volumes on Mill Street were estimated with traffic between Kahekili Highway and Mill Street divided between Market Street and the new Imi Kala Street extension to the highway. The diversion of traffic to Imi Kala Street will affect turning movements at the intersections of Mill Street with Market Street, Central Avenue, Kaniela Street, and Mission Street. Figure 10 shows the traffic assignments for future conditions with the Hale Mua project.

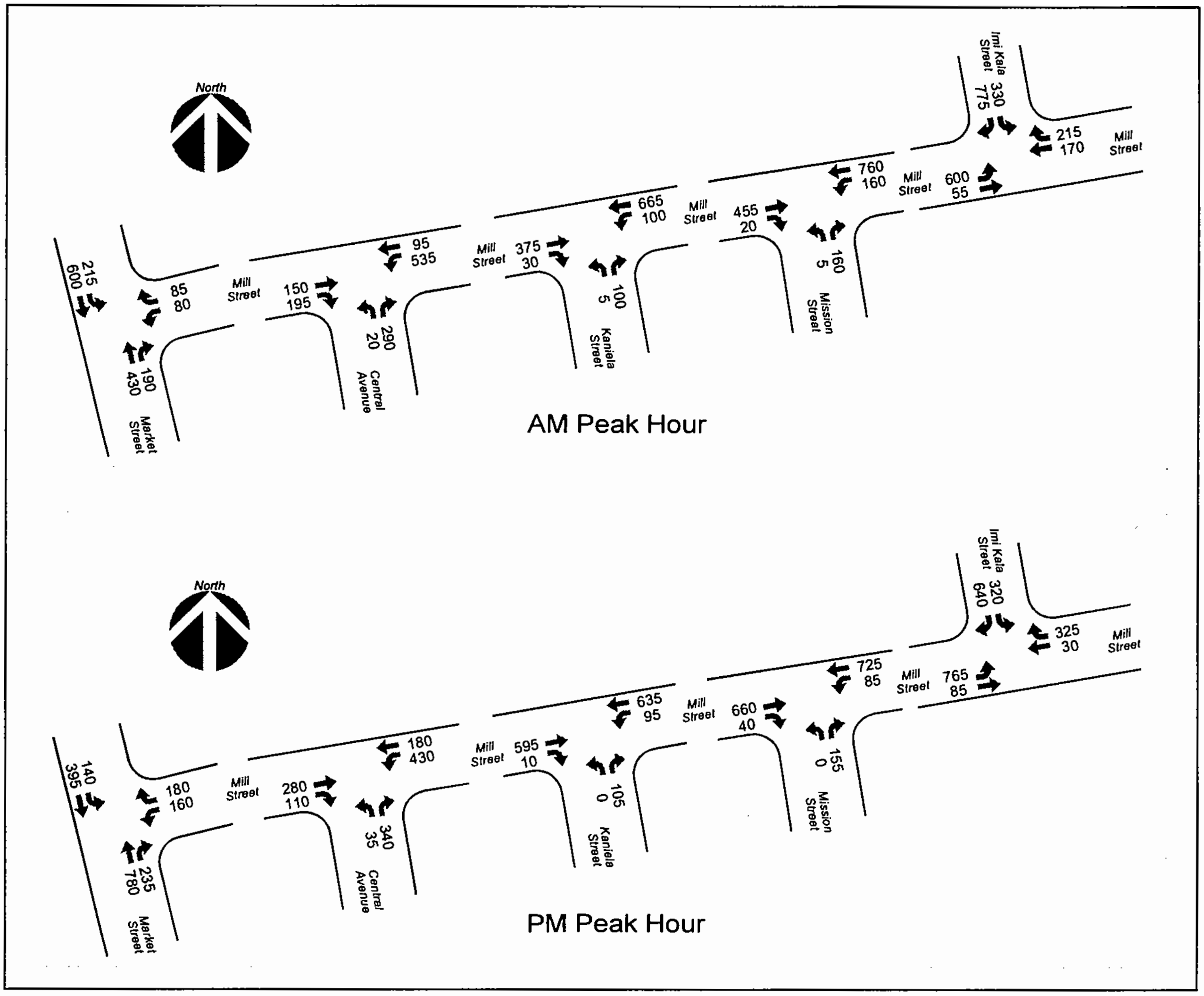


Figure 10 – Future (2020) Traffic Volumes along Mill Street (with Hale Mua)

Each intersection was analyzed as an unsignalized intersection with the existing number of lanes. In general, the delays will increase as volumes increase and levels of service will worsen; however, the addition of the connection on Imi Kala Street will change traffic patterns and improve conditions at each intersection, resulting in conditions not much different than existing.

Table 9 – Peak Hour Conditions at Market Street and Mill Street

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Southbound left turns Market to Mill	Existing (May, 2004 counts)	0.39	10.5	**B**	0.34	11.5	**B**
	Future (2020) without Hale Mua	0.63	15.1	**C**	0.60	18.4	**C**
	Future (2020) with Hale Mua	0.24	10.1	**B**	0.25	12.8	**B**
Westbound left turns Mill to Market	Existing (May, 2004 counts)	1.02	225.1	**F**	1.57	392.8	**F**
	Future (2020) without Hale Mua	5.44	>999	**F**	7.96	>999	**F**
	Future (2020) with Hale Mua	1.01	191.7	**F**	2.49	803.6	**F**
Westbound right turns Mill to Market	Existing (May, 2004 counts)	0.26	12.5	**B**	0.77	34.9	**D**
	Future (2020) without Hale Mua	0.44	17.0	**C**	1.48	261.0	**F**
	Future (2020) with Hale Mua	0.13	12.8	**B**	0.68	39.5	**E**

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

The analysis of existing conditions at the intersection of Market Street and Mill Street show that the volume of left turns from westbound Mill Street to Market Street are higher than the computed capacity. The existing practice of many of the southbound drivers of yielding to the westbound left turn traffic was approximated by assuming that a two-way left turn lane exists on Market Street, thereby allowing the westbound left turn traffic to first cross northbound traffic, then merge with southbound traffic. The results of this modified analysis for existing and future with project peak hour volumes are shown in Table 10. Conditions in the AM Peak Hour would be improved over existing conditions. In the PM Peak Hour, volume would be very near capacity and delays would be nearly two minutes per vehicle.

Table 10 – Peak Hour Conditions at Market Street and Mill Street (median assumed to simulate driver actions)

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Westbound left turns Mill to Market	Existing (May, 2004 counts)	0.59	75.5	**F**	0.73	64.3	**F**
	Future (2020) without Hale Mua	*	*	**F**	2.02	580.3	**F**
	Future (2020) with Hale Mua	0.52	49.5	**E**	0.97	110.1	**F**

* = computed capacity = 0, V/C and ADPV not calculated
V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

The analyses indicate that changes to the intersection of Market Street and Mill Street will be needed to accommodate future traffic demand, with or without the proposed Hale Mua project. The changes could include the addition of turning lanes, traffic signals, or conversion from the existing two-way stop control to a roundabout or other control. Future conditions will be improved with the Hale Mua project due to the diversion of some of the total traffic demand to Imi Kala Street.

At the intersection of Mill Street and Central Avenue, the addition of the traffic from the Hale Mua project and the effect of expected traffic diversion to Imi Kala Street are shown in Table 11. Future conditions with Hale Mua would be improved over future conditions without the project. The addition of a median two-way left turn lane on Mill Street to act as a refuge lane for left turns could further improve conditions.

Table 11 – Peak Hour Conditions at Mill Street and Central Avenue

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Westbound left turns Mill to Central	Existing (May, 2004 counts)	0.30	10.1	**B**	0.23	9.3	**A**
	Future (2020) without Hale Mua	0.43	12.1	**B**	0.37	11.0	**B**
	Future (2020) with Hale Mua	0.49	11.0	**B**	0.41	10.3	**B**
Northbound shared lane, left and right turns, Central to Mill	Existing (May, 2004 counts)	0.56	24.0	**C**	0.62	30.0	**D**
	Future (2020) without Hale Mua	1.13	134.5	**F**	1.56	317.4	**F**
	Future (2020) with Hale Mua	0.81	41.7	**E**	1.11	112.2	**F**
	Future (2020) with Hale Mua *	0.65	23.4	**C**	0.86	43.2	**E**

* with a refuge lane for left turns
V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

The results of the analyses shown in Table 11 for future conditions assume that an extension of Imi Kala Street to Main Street (Waiale Road) has not been done. As noted earlier, this extension, as part of a long-range plan to improve circulation in the Wailuku area, would improve conditions as some of the traffic that now use Central Avenue would be diverted to the new roadway.

At the unsignalized Mill Street intersections with Kaniela Street and with Mission Street, future conditions will improve with the Hale Mua project, due to the diversion of traffic to

Imi Kala Street. With-project traffic volumes could be handled by the existing intersections at acceptable levels of service, as shown in Tables 12 and 13.

Table 12 – Peak Hour Conditions at Mill Street and Kaniela Street

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Westbound left turns Mill to Kaniela	Existing (May, 2004 counts)	0.04	8.5	**A**	0.05	8.5	**A**
	Future (2020) without Hale Mua	0.06	9.1	**A**	0.08	9.3	**A**
	Future (2020) with Hale Mua	0.11	8.7	**A**	0.11	9.4	**A**
Northbound shared lane, left and right turns, Kaniela to Mill	Existing (May, 2004 counts)	0.19	15.2	**C**	0.20	21.8	**C**
	Future (2020) without Hale Mua	0.36	23.5	**C**	0.51	52.6	**F**
	Future (2020) with Hale Mua	0.23	13.8	**B**	0.24	15.0	**C**

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

Table 13 – Peak Hour Conditions at Mill Street and Mission Street

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Westbound left turns Mill to Mission	Existing (May, 2004 counts)	0.07	8.6	**A**	0.02	8.4	**A**
	Future (2020) without Hale Mua	0.12	9.5	**A**	0.03	9.0	**A**
	Future (2020) with Hale Mua	0.18	9.3	**A**	0.10	9.6	**A**
Northbound shared lane, left and right turns, Mission to Mill	Existing (May, 2004 counts)	0.26	15.1	**C**	0.15	13.2	**B**
	Future (2020) without Hale Mua	0.51	26.4	**D**	0.26	17.2	**C**
	Future (2020) with Hale Mua	0.39	17.3	**C**	0.38	18.2	**C**

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

The existing unsignalized intersection of Mill Street and Imi Kala Street will not be able to serve the increased traffic expected at that intersection, with or without the proposed Hale Mua project and the extension of Imi Kala Street to the north. Southbound left turns from Imi Kala Street to Mill Street will exceed available capacity. Results of the unsignalized intersection analyses are shown in Table 14.

Table 14 – Peak Hour Conditions at Imi Kala Street and Mill Street

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Southbound right turns Imi Kala to Mill	Existing (May, 2004 counts)	0.48	13.7	B	0.45	12.5	B
	Future (2020) without Hale Mua	0.77	23.8	C	0.66	18.1	C
	Future (2020) with Hale Mua	1.18	114.8	F	0.91	36.7	E
Southbound left turns Imi Kala to Mill	Existing (May, 2004 counts)	0.49	53.0	F	0.93	115.0	F
	Future (2020) without Hale Mua	1.57	>999	F	2.97	997.6	F
	Future (2020) with Hale Mua	8.71	>999	F	>10	>999	F
Eastbound left turns Mill to Imi Kala	Existing (May, 2004 counts)	0.31	9.1	A	0.31	8.9	A
	Future (2020) without Hale Mua	0.47	10.8	B	0.45	10.2	B
	Future (2020) with Hale Mua	0.59	12.6	B	0.77	18.0	C

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

Traffic signals at the intersection of Imi Kala Street and Mill Street would be one way to improve conditions. In order to serve traffic efficiently, separate lanes for turns from Mill Street would be added along with signals. Table 15 shows the results of the capacity analyses for a signalized intersection with the added turn lanes.

Table 15 – Future Peak Hour Conditions at Signalized Imi Kala Street and Mill Street

	AM Peak Hour		PM Peak Hour	
	Sum	Condition	Sum	Condition
Future (2020) without Hale Mua	810	Under	810	Under
Future (2020) with Hale Mua	1,100	Under	1,120	Under

Regional Impact of Project

The proposed project will increase traffic demand into Wailuku from the north. In the most critical condition during the morning peak hour, full development of the project will increase the volume entering Wailuku from the north by about 20% of existing volumes. The project's effect on peak hour traffic volumes north of Wailuku would be as much as 28% of existing volumes, as shown in Table 16.

Table 16 – Project Traffic Compared with Existing Volumes Across Iao Stream north of Wailuku

		Southbound	Northbound
AM Peak Hour	Existing (2001) on Waiehu Beach Road *	1,103	490
	Existing (2004) on Kahekili Highway **	568	265
	Existing Total	1,671	755
	Project Traffic at Full development	335	95
	Project traffic as % of existing traffic	20%	13%
PM Peak Hour	Existing (2001) on Waiehu Beach Road *	681	991
	Existing (2004) on Kahekili Highway **	262	374
	Existing Total	943	1,365
	Project Traffic at full development	200	385
	Project traffic as % of existing traffic	21%	28%

Sources:

* State of Hawaii, Department of Transportation, Highways Division, *Traffic Survey Data – Island of Maui 2001*, Station C-3-D, Waiehu Beach Road at Iao Stream Bridge (May 29-30, 2001).

** Manual traffic counts taken in March, 2004 (see appendix)

The long-range plan for land transportation on Maui has estimated that traffic volumes on roadways north of Wailuku will increase at an average rate of 2 percent per year, or about 37 percent in 16 years. A range of interpretations of this comparison could be made – at one end of the spectrum, the proposed Hale Mua project would be within this growth and would be a significant part of this growth, possibly replacing other growth that had previously been identified. The other end of this range, for which the analyses contained herein were based, would be that the Hale Mua project would be in addition to the growth already identified, thereby resulting in a more rapid growth in traffic demand.

In comparison, the new connection will provide a third route into Wailuku from the north, increasing capacity by about 50% over existing.

Conclusions and Recommendations

The proposed project will connect to the existing Kahekili Highway at two new "T"-intersections. With appropriate improvements, each intersection would have adequate capacity to accommodate the expected peak hourly volumes at acceptable levels of service. The project will increase traffic volumes on Kahekili Highway, resulting in increased delays for left turns from Makaala Drive to Kahekili Highway during the morning peak traffic hours; however, the capacity of the intersection for these left turns is expected to continue to exceed peak hourly demand to the year 2020.

The Hale Mua project will include an off-site project to improve traffic flow in Wailuku. The construction of a new bridge over Iao Stream and the extension of Imi Kala Street to Kahekili Highway will increase roadway capacity in and out of Wailuku from the north. This improvement is expected to divert traffic from Market Street and increase traffic volumes on Imi Kala Street. Traffic signals on Imi Kala Street may be necessary at major intersections such as Eha Street and Mill Street.

This improvement would be a partial implementation of a new continuous north-south roadway that has been proposed between Kahekili Highway and Waiale Drive. If the extension of Imi Kala Street to the south of Mill Street is not done, turning movements at the Mill Street intersections with Central Avenue, Kaniela Street, and Mission Street are expected to be affected. Analyses of conditions at these intersections without and with the project indicate that peak hour conditions will generally be better with the Hale Mua project than without the project.

At the new connections to the highway, left turn lanes should be provided for northbound left turns into the project site at both intersections. Minimum storage lengths were computed to be 200 feet at the north intersection and 175 feet at the south intersection.

APPENDIX A – FIELD COUNTS @ Kahekili Highway and Makaala Drive

	Southbound Kahekili Highway		Northbound Kahekili Highway		Westbound Makaala Drive	
	TH	LT	TH	RT	LT	RT
Monday, March 15, 2004						
06:30 AM - 06:45 AM	56	6	36	8	26	11
06:45 AM - 07:00 AM	71	6	41	6	38	21
07:00 AM - 07:15 AM	76	4	42	18	76	17
07:15 AM - 07:30 AM	82	7	59	22	80	31
07:30 AM - 07:45 AM	80	11	46	31	65	26
07:45 AM - 08:00 AM	45	6	36	16	35	4
08:00 AM - 08:15 AM	43	3	31	16	16	3
08:15 AM - 08:30 AM	27	2	16	27	12	1
03:30 PM - 03:45 PM	50	7	51	57	30	9
03:45 PM - 04:00 PM	42	3	51	43	25	4
04:00 PM - 04:15 PM	40	4	31	44	24	6
04:15 PM - 04:30 PM	28	5	51	46	23	6
04:30 PM - 04:45 PM	26	5	44	45	15	11
04:45 PM - 05:00 PM	39	5	58	55	32	6
05:00 PM - 05:15 PM	28	4	49	49	15	3
05:15 PM - 05:30 PM	18	3	41	37	17	3
Friday, March 19, 2004						
06:30 AM - 06:45 AM	48	9	31	11	31	13
06:45 AM - 07:00 AM	63	6	32	19	47	7
07:00 AM - 07:15 AM	63	4	36	18	66	16
07:15 AM - 07:30 AM	75	7	41	16	63	25
07:30 AM - 07:45 AM	86	20	46	25	56	16
07:45 AM - 08:00 AM	50	8	20	27	36	3
08:00 AM - 08:15 AM	21	3	25	11	23	3
08:15 AM - 08:30 AM	17	2	22	16	21	1
03:30 PM - 03:45 PM	45	5	55	36	23	3
03:45 PM - 04:00 PM	19	2	38	28	30	2
04:00 PM - 04:15 PM	32	5	37	49	26	8
04:15 PM - 04:30 PM	30	3	48	40	27	3
04:30 PM - 04:45 PM	16	3	46	36	16	1
04:45 PM - 05:00 PM	33	3	40	46	21	3
05:00 PM - 05:15 PM	21	2	46	37	11	3
05:15 PM - 05:30 PM	28	4	34	41	21	6

TH = through movement LT = left turn RT = right turn

APPENDIX B – FIELD COUNTS @ Imi Kala Street, Wili Pa Drive, and Eha Street

	Northbound Imi Kala Street		Eastbound Wili Pa Drive	Westbound Eha Street
	RT	LT	RT	LT
Wednesday, May 5, 2004				
05:30 AM - 05:45 AM	4	2	1	11
05:45 AM - 06:00 AM	7	5	0	18
06:00 AM - 06:15 AM	15	2	4	19
06:15 AM - 06:30 AM	16	6	0	26
06:30 AM - 06:45 AM	23	9	6	41
06:45 AM - 07:00 AM	57	22	11	50
07:00 AM - 07:15 AM	53	16	16	57
07:15 AM - 07:30 AM	48	8	13	77
07:30 AM - 07:45 AM	47	24	10	101
07:45 AM - 08:00 AM	45	6	8	63
08:00 AM - 08:15 AM	40	4	6	56
08:15 AM - 08:30 AM	49	6	5	46
03:30 PM - 03:45 PM	28	6	8	18
03:45 PM - 04:00 PM	38	9	13	28
04:00 PM - 04:15 PM	41	6	11	23
04:15 PM - 04:30 PM	37	6	9	26
04:30 PM - 04:45 PM	29	5	2	22
04:45 PM - 05:00 PM	31	3	4	27
05:00 PM - 05:15 PM	33	4	5	39
05:15 PM - 05:30 PM	34	6	4	31
05:30 PM - 05:45 PM	34	6	2	26
05:45 PM - 06:00 PM	24	4	2	21
06:00 PM - 06:15 PM	19	2	2	18
06:15 PM - 06:30 PM	16	2	1	14

TH = through movement LT = left turn RT = right turn

APPENDIX C – FIELD COUNTS @ Market Street and Mill Street

	Southbound Market Street		Northbound Market Street		Westbound Mill Street	
	TH	LT	TH	RT	LT	RT
Friday, October 8, 2004						
06:00 AM - 06:15 AM	48	29	22	3	6	11
06:15 AM - 06:30 AM	70	55	39	10	7	15
06:30 AM - 06:45 AM	89	70	42	14	5	28
06:45 AM - 07:00 AM	77	67	58	15	10	22
07:00 AM - 07:15 AM	116	80	49	22	9	15
07:15 AM - 07:30 AM	121	122	62	33	8	41
07:30 AM - 07:45 AM	78	103	92	47	23	45
07:45 AM - 08:00 AM	65	81	92	36	19	54
08:00 AM - 08:15 AM	53	60	84	29	25	36
Tuesday, October 12, 2004						
03:00 PM - 03:15 PM	56	62	91	40	31	56
03:15 PM - 03:30 PM	65	36	73	43	19	52
03:30 PM - 03:45 PM	83	41	95	48	26	61
03:45 PM - 04:00 PM	58	51	101	53	30	52
04:00 PM - 04:15 PM	64	43	109	40	28	47
04:15 PM - 04:30 PM	55	64	114	30	37	71
04:30 PM - 04:45 PM	72	70	146	54	30	86
04:45 PM - 05:00 PM	54	61	116	29	25	81
05:00 PM - 05:15 PM	69	54	125	59	25	65
05:15 PM - 05:30 PM	58	71	116	33	11	68

TH = through movement LT = left turn RT = right turn

APPENDIX D – FIELD COUNTS @ Mill Street and Central Avenue

	Eastbound Mill Street		Northbound Central Avenue		Westbound Mill Street	
	TH	RT	LT	RT	TH	LT
Thursday, October 7, 2004						
05:30 AM - 05:45 AM	22	14	1	5	14	12
05:45 AM - 06:00 AM	26	8	2	10	18	15
06:00 AM - 06:15 AM	26	17	2	11	22	13
06:15 AM - 06:30 AM	33	20	3	13	17	26
06:30 AM - 06:45 AM	49	31	4	19	21	24
06:45 AM - 07:00 AM	56	51	4	27	42	38
07:00 AM - 07:15 AM	51	58	6	38	35	53
07:15 AM - 07:30 AM	74	77	5	40	23	66
07:30 AM - 07:45 AM	75	54	12	52	47	78
07:45 AM - 08:00 AM	65	30	9	45	42	63
08:00 AM - 08:15 AM	59	31	8	33	40	52
08:15 AM - 08:30 AM	50	20	4	35	55	45
03:00 PM - 03:15 PM	78	27	10	47	82	66
03:15 PM - 03:30 PM	74	25	8	54	56	57
03:30 PM - 03:45 PM	68	23	20	30	71	65
03:45 PM - 04:00 PM	74	23	12	46	54	57
04:00 PM - 04:15 PM	79	37	15	39	66	55
04:15 PM - 04:30 PM	67	31	6	28	80	66
04:30 PM - 04:45 PM	89	28	20	39	74	59
04:45 PM - 05:00 PM	57	23	12	34	65	46
05:00 PM - 05:15 PM	75	23	14	55	64	49
05:15 PM - 05:30 PM	62	26	24	40	58	62

TH = through movement LT = left turn RT = right turn

APPENDIX E – FIELD COUNTS @ Mill Street and Kaniela Street

	Eastbound Mill Street		Northbound Kaniela Street		Westbound Mill Street	
	TH	RT	LT	RT	TH	LT
Tuesday, October 5, 2004						
06:00 AM - 06:15 AM	32	0	2	0	34	1
06:15 AM - 06:30 AM	43	0	1	4	39	1
06:30 AM - 06:45 AM	58	3	0	6	57	1
06:45 AM - 07:00 AM	76	3	7	1	60	3
07:00 AM - 07:15 AM	91	7	5	3	85	8
07:15 AM - 07:30 AM	103	11	4	7	110	8
07:30 AM - 07:45 AM	78	9	5	17	104	8
07:45 AM - 08:00 AM	104	13	4	25	115	9
08:00 AM - 08:15 AM	80	2	2	9	93	4
Tuesday, October 19, 2004						
03:30 PM - 03:45 PM	106	5	11	13	115	10
03:45 PM - 04:00 PM	99	1	8	3	90	19
04:00 PM - 04:15 PM	121	0	4	1	129	12
04:15 PM - 04:30 PM	107	4	12	2	107	11
04:30 PM - 04:45 PM	94	1	9	9	118	18
04:45 PM - 05:00 PM	118	5	12	4	137	9
05:00 PM - 05:15 PM	122	1	4	2	119	5
05:15 PM - 05:30 PM	96	2	4	3	90	9

TH = through movement LT = left turn RT = right turn

APPENDIX F – FIELD COUNTS @ Mill Street and Mission Street

	Eastbound Mill Street		Northbound Mission Street		Westbound Mill Street	
	TH	RT	LT	RT	TH	LT
Tuesday, October 5, 2004						
06:00 AM - 06:15 AM	32	0	0	2	35	1
06:15 AM - 06:30 AM	46	1	0	2	40	7
06:30 AM - 06:45 AM	62	2	4	6	54	8
06:45 AM - 07:00 AM	71	6	4	10	59	7
07:00 AM - 07:15 AM	89	5	0	16	93	19
07:15 AM - 07:30 AM	103	7	6	23	112	20
07:30 AM - 07:45 AM	86	9	6	24	106	20
07:45 AM - 08:00 AM	123	6	3	30	121	13
08:00 AM - 08:15 AM	89	0	4	13	93	9
Tuesday, October 19, 2004						
03:30 PM - 03:45 PM	111	8	2	11	123	6
03:45 PM - 04:00 PM	90	12	1	21	108	6
04:00 PM - 04:15 PM	112	10	2	13	139	4
04:15 PM - 04:30 PM	95	14	3	17	115	7
04:30 PM - 04:45 PM	90	13	4	23	132	4
04:45 PM - 05:00 PM	109	13	0	13	146	5
05:00 PM - 05:15 PM	114	10	1	15	123	2
05:15 PM - 05:30 PM	93	6	3	11	96	1

TH = through movement LT = left turn RT = right turn

APPENDIX G – FIELD COUNTS @ Imi Kala Street and Mill Street

	Eastbound Mill Street		Southbound Imi Kala Street		Westbound Mill Street	
	TH	LT	RT	LT	TH	RT
Tuesday, May 4, 2004						
05:30 AM - 05:45 AM	6	9	6	4	6	3
05:45 AM - 06:00 AM	8	13	8	5	7	4
06:00 AM - 06:15 AM	9	11	22	3	13	4
06:15 AM - 06:30 AM	10	22	21	2	16	3
06:30 AM - 06:45 AM	20	26	35	1	30	2
06:45 AM - 07:00 AM	30	58	47	6	33	25
07:00 AM - 07:15 AM	27	61	73	8	22	23
07:15 AM - 07:30 AM	40	97	103	13	51	25
07:30 AM - 07:45 AM	33	82	85	13	44	22
07:45 AM - 08:00 AM	48	98	69	16	47	14
08:00 AM - 08:15 AM	44	81	92	17	32	21
08:15 AM - 08:30 AM	20	75	51	22	32	23
03:30 PM - 03:45 PM	11	42	36	7	13	22
03:45 PM - 04:00 PM	39	84	87	22	32	23
04:00 PM - 04:15 PM	35	105	101	40	31	17
04:15 PM - 04:30 PM	34	75	64	23	33	22
04:30 PM - 04:45 PM	36	80	71	26	29	19
04:45 PM - 05:00 PM	37	94	93	28	29	15
05:00 PM - 05:15 PM	37	76	87	29	47	12
05:15 PM - 05:30 PM	34	76	79	14	40	11
05:30 PM - 05:45 PM	39	59	60	7	35	15
05:45 PM - 06:00 PM	48	54	46	11	46	8
06:00 PM - 06:15 PM	42	47	37	13	37	3
06:15 PM - 06:30 PM	40	37	26	7	31	6

TH = through movement LT = left turn RT = right turn

Appendix F-1

Supplemental Traffic Analysis

Julian Ng, Incorporated
Transportation Engineering Consultant
P. O. Box 816
Kaneohe, Hawaii 96744-0816
phone: (808) 236-4325
fax: (808) 235-8869
email: jnghi@hawaii.rr.com

April 19, 2005

Mr. Sterling J. Kim
Hale Mua Properties, LLC
385 Hukilike Street, Suite 210
Kahului, HI 96732

Subject: Hale Mua Subdivision
Addendum to November 2004 *Traffic Impact Analysis Report*

Dear Mr. Kim:

This addendum to the November 2004 *Traffic Impact Analysis Report* for the subject project has been prepared to address future conditions with the Hale Mua project and Imi Kala Street extended from Mill Street to Lower Main Street. This has been done in response to a comment from the County of Maui Department of Public Works and Environmental Management contained in their March 7, 2005 letter commenting on the Draft Environmental Assessment for the project. This addendum includes revised estimates of future year (2020) peak hour traffic volumes at the Mill Street intersections with Central Avenue, Kaniela Street, Mission Street, and Imi Kala Street.

The information provided herein is intended to supplement the traffic report, specifically traffic assignments shown in Figure 10 and Tables 10, 11, 12, 13, and 15 of the report. Traffic conditions at other locations that were evaluated are not expected to be affected by this addendum. Exhibit A below and Exhibit B on the next page show the revised traffic assignments.

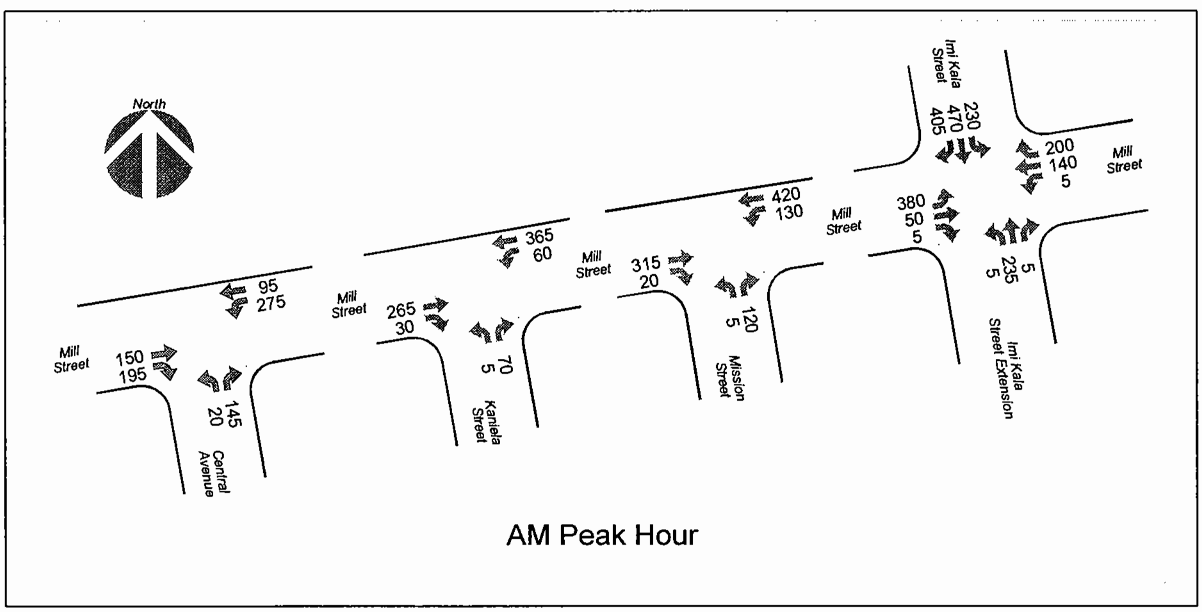


Exhibit A –2020 AM Peak Hour Traffic Assignments along Mill Street (with Hale Mua)

Mr. Sterling J. Kim
April 19, 2005
Page 2 of 3

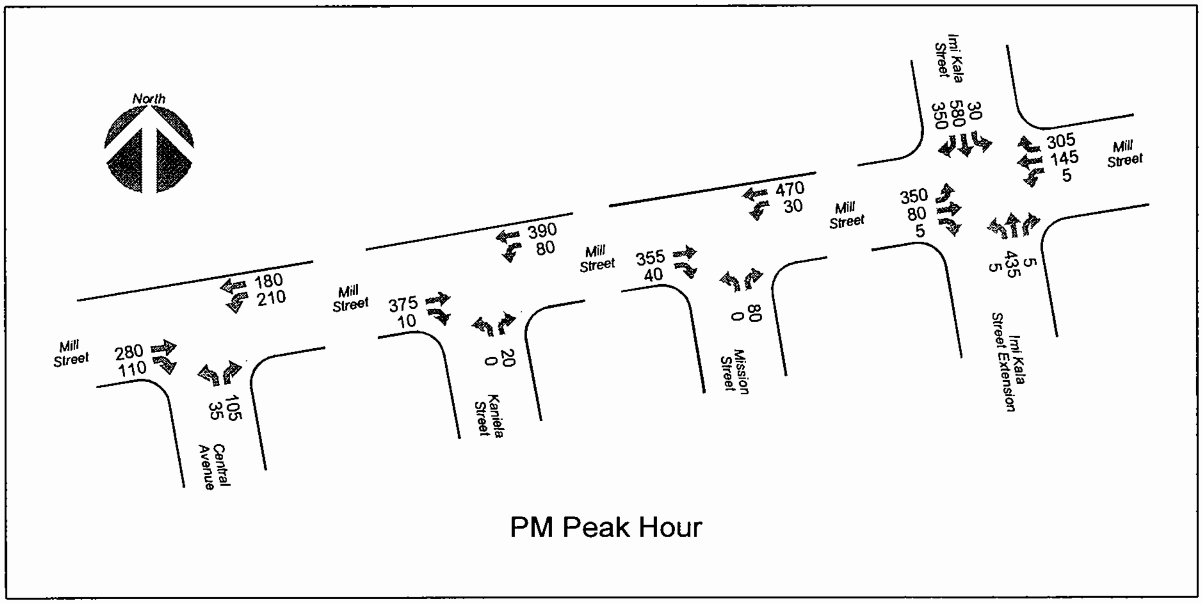


Exhibit B – 2020 PM Peak Hour Traffic Assignments along Mill Street (with Hale Mua)

The three "T"-intersections were analyzed as unsignalized intersections with the existing number of lanes. As indicated in Table 1 below, conditions are acceptable (Level of Service D or better) for all controlled movements at these intersections.

Table 1 – Peak Hour Conditions along Mill Street

		AM Peak Hour			PM Peak Hour		
		V/C	ADPV	LOS	V/C	ADPV	LOS
Mill Street & Central Avenue	Westbound left turn from Mill St.	0.25	9.1	**A**	0.20	9.0	**A**
	Northbound shared lane (stopped)	0.27	12.5	**B**	0.28	14.2	**B**
Mill Street and Kaniela Street	Westbound left turn from Mill St.	0.06	8.2	**A**	0.08	8.4	**A**
	Northbound shared lane (stopped)	0.13	11.2	**B**	0.03	10.8	**B**
Mill Street and Mission Street	Westbound left turn from Mill St.	0.13	8.5	**A**	0.03	8.2	**A**
	Northbound shared lane (stopped)	0.22	12.4	**B**	0.13	11.3	**B**

V/C = volume-to-capacity ratio
ADPV = average delay per vehicle, seconds
LOS = Level of Service

The analyses show over capacity conditions at an unsignalized intersection of Mill Street and Imi Kala Street. Traffic signals at the intersection of Imi Kala Street and Mill Street would be one way to improve conditions. In order to serve traffic efficiently, separate left turn lanes at each approach should be provided along with signals. In addition, separate right turn lanes should be included on the southbound and the westbound approaches to provide added capacity for the high volumes of right turns expected on those approaches. Table 2 below shows the results of the capacity analyses for a signalized intersection with the added turn lanes.

Table 2 – Future Peak Hour Conditions at Signalized Imi Kala Street and Mill Street

	AM Peak Hour		PM Peak Hour	
	Sum	Condition	Sum	Condition
Future (2020) with Hale Mua	995	Under	1,190	Under

Should you have any questions, please contact me.

Sincerely,

JULIAN NG, INCORPORATED

Julian Ng, P.E., P.T.O.E.
President

Appendix G

Preliminary Engineering Report

PRELIMINARY ENGINEERING REPORT

FOR

HALE MUA SUBDIVISION PROJECT

Waihee, Wailuku, Maui, Hawaii

T.M.K. : (2) 3-3-02: 01

Prepared For:

Hale Mua Properties, LLC
187 Haulani Place
Pukalani, Maui, Hawaii

Prepared By:

Wayne I. Arakaki
P.O. Box 884
Wailuku, Maui, Hawaii 96793

September 20, 2004
April 26, 2005 (Revised)

A. INTRODUCTION

B. EXISTING INFRASTRUCTURE

1. ROADWAYS
2. DRAINAGE
3. WASTEWATER
4. WATER
5. ELECTRIC, TELEPHONE & CABLE TV

C. PROPOSED INFRASTRUCTURE IMPROVEMENTS

1. ROADWAYS
2. DRAINAGE
3. WASTEWATER
4. WATER
5. ELECTRIC, TELEPHONE & CABLE TV

Preliminary Engineering Report
Hale Mua Subdivision Project
TMK:(2) 3-3-02: 01

A. INTRODUCTION

This report is to provide information on the existing and proposed infrastructure which will provide service for the "Hale Mua Subdivision Project". The existing infrastructure is limited for agricultural use of the property.

The project site is located in Wailuku, along Kahekili Highway. It is also near the intersection of Waiehu Beach Road and Kahekili Highway. The site encompass an area of approximately 238 acres. It is currently an abandon macadamia nut orchard. There are no houses on the property and presently not in use. Wailuku Country Town Estates is located along the South side of the project site. Waiehu Heights and Waiehu Terrace is located across the East side along Kahekili Highway. Waiehu Stream is located on the North side of the property. The area is currently rural in nature.

The project will contain various lot size for residential use. There will be 238 affordable parcels with a minimum lot size of 5,000 sq.ft.. The market housing will consist of 209 lots, with a minimum size of 10,000 sq.ft.. There will also be 19 large lots ranging from two acres to twenty five acres. There will also be a park and two smaller parks located in the proposed subdivision.

The proposed improvements will consist of paved roadways, concrete curb, gutters and sidewalks. All utilities will be underground for electrical, telephone and cable TV. The water and wastewater system will be designed and constructed to the County of Maui requirements. A drainage system will also be constructed with three detention ponds and connecting grassed swales.

B. EXISTING INFRASTRUCTURE

1. ROADWAYS

Kahekili Highway is along the East boundary of the project site. It is a two lane undivided County road, which runs in the North to South direction into Wailuku Town. The speed limit is at 30 miles per hour (mph) fronting the project site. There are no other access to the project site other than Kahekili Highway.

Kahekili Highway is connected to Waiehu Beach Road, which is located at the North side of the project site. It is a two lane undivided road which goes in a

East to West direction and connects to Lower Main Street and Kahului Beach Road. There is no signal light at the intersection of Kahekili Highway and Waiehu Beach Road, because of the light traffic. Kahekili Highway at the South direction connects to Market Street which goes to Wailuku Town. There are no traffic signals until you reach the intersection of either Central Avenue and Main or Main and High Street.

2. DRAINAGE

The project site which is higher than Kahekili Highway, does not get any runoff from the paved road. On the South and Western boundary, is "Spreckels Ditch". The Makua offsite runoff flows into the ditch which, and eventually to a reservoir for irrigation use. The "Spreckels Ditch" blocks all of the offsite runoff to the project site. There is an existing drainage way that follows the North boundary of the Wailuku Country Estates subdivision. This drainage way crosses under the "Spreckels Ditch", across the project site and into a four feet culvert under Kahekili Highway then into Waiehu Stream. The North boundary follows the Waiehu Stream. The 100 year flow computes to 7,400 cfs. This information was taken from the "Flood Insurance Study", dated September 6, 1989. The flow was measured at Kahekili Highway. The basin encompassed an area of 4.5 square miles. We have plotted the 100 year flood limits on the attached map. The project is higher than Kahekili Highway, which fronts the project site. There are no drainage systems along Kahekili Highway. Presently runoff sheet flows cross the Highway on to the downstream properties, then into Waeihu Stream.

The project site is presently being used to cultivate macadamia nuts. The existing ground slopes in a easterly to westerly direction from an elevation of (+) 250 +\-feet M.S.L. to (+) 40 +\-feet M.S.L. with an average slope of approxiately 8 to 10%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, (August 1972)", Wailuku Silty Clay (WvC, 7 to 15 percent slopes), Iao Silty Clay (IaA, 0 to 3 percent slopes).

The project will include a new road from Kahekili Highway and a new bridge at Iao Stream, to connect to Imi Kala Street at the Mill yard.

One of the requirements for the off site improvements is replace an existing bridge at the end of Imi Kala Street. The existing runoff for the 100 year flood, is 13,800 cfs. This information was taken from the "Flood Insurance Study", dated September 6, 1989. The flow was measured at the mouth of Iao Stream, which encompassed an area of 10.1 square miles. A field survey was completed to evaluate the required height for the new bridge. The existing bridge which is over 50 years has not encountered any flood damage over the years.

The Imi Kala Road Extension will connect to Kahekili Highway, to improve existing traffic conditions. Iml Kala Road ends at Iao Stream, next to the existing bridge. As stated above a new bridge will be built, and the road will be extend first to

Piihana Road then to Kahekili Highway. The area where the proposed road will be constructed in vacant sugar and macadamia nut fields. The new road will not cross over any existing drainage ways, except for the "Spreckels Ditch", which is an irrigation ditch.

The project site runoff sheet flows onto Kahekili Highway then down to Waiehu Stream. There are no drainage problems associated with the project site.

The estimated onsite runoff for a 50 year, 1 hour storm from the entire project site is 203 cfs.

3. WASTEWATER

There are no sewer lines located near the project site. The surrounding parcels with the exception of Wailuku Country Town Estates is on "Individual Waste Water System" or septic systems. There is a force sewer main at the intersection of Kahekili Highway and Lower Waiehu Beach Road. This is sewer line is at capacity and will not be available for the project. Also, along Kahekili Highway there are no sewer lines. The existing point of connection that is available for use, is at Imi Kala Road in the Mill yard. All other sewer lines are to capacity and will not be available to service the proposed Hale Mua Subdivision. The connection points will either be at the County Pump Station located near the intersection of Waiehu Beach Road and Lower Main Street (old Y. Hata Warehouse) or the existing sewer line located at Imi Kala Street. Wastewater collected from the Wailuku area is transported to the Kahului Wastewater Treatment Plant in Naska.

4. WATER

The existing water system will be used for domestic use and fire protection. There are several water tanks located above the project site. The Waiehu Heights water tank has a capacity of 300,000 gallons at an elevation of 347' M.S.L.. There is another 1.0 M.G. concrete tank further above at an elevation of 490' and a 100,000 gallon steel tank at an elevation of 546' M.S.L.. A series of 8", 12" and 16" waterlines are located around the project site, along Kahekili Highway, Spreckels Ditch and at the intersection of Waiehu Beach Road and Kahekili Highway.

The Department of Water Supply (DWS), the existing water tanks and source will provide the necessary water service for the project site. The source for this project is the water wells that are located next to the existing storage water tanks. (Waiehu Water Wells). We proposing additional storage to the existing water system.

5. ELECTRIC, TELEPHONE & CABLE TV

There is existing overhead telephone transmission system lines located along Kahekili Highway, fronting the project site. There is no electrical power overhead or underground servicing the project site. Overhead electrical power is located near the intersection of Waiehu Beach Road and Kahekili Highway. Also, overhead electrical power is located along at the intersection of Kahekili Highway and Piihana Road, near Happy Valley (Wailuku). Cable TV service is located similar location to the overhead electrical power lines.

The telephone lines that are fronting the project site will be relocated since it is in the road widening portion of the highway improvements.

An electrical easement has been granted to Maui Electric at the South side of the project site. This electrical service is to provide power (water well pumps) for the existing Water Well located above the project site.

C. PROPOSED INFRASTRUCTURE IMPROVEMENTS

1. ROADWAYS

There will be two access roads for this subdivision along Kahekili Highway. Both intersecting subdivision roads will be 48 feet in right-of-way widths. Kahekili Highway has an existing right-of-way of 40 feet. The future right-of-way for Kahekili Highway is 60 feet. We will be dedicating a portion of this road for road widening purposes. The road widening will be 10 feet from the new property line. Improvements to the Kahekili Highway, will include concrete curbs and gutters. There will also be a concrete sidewalk and grass swale for drainage purposes.

All of the onsite subdivision roadways, will be constructed to County of Maui standards. Concrete wheel chair ramps will be constructed at appropriate locations to comply with ADA standards. The required striping and sign age will be installed in accordance with the Department of Public Works and Environmental Management standards. The interior subdivision streets will have 48 foot right-of-ways and will be to County Standards. The cul-de-sacs will have an edge of pavement radius of 40 feet a right-of-way radius of 50 feet. The larger traffic lanes and cul-de-sac pavement radius are to accommodate the larger fire trucks that are stationed in the Central Maui area.

A "Traffic Impact Assessment Report for Hale Mua Project" was prepared for the project dated July 2004, Julian Ng, Incorporated, which stated the following: "*The proposed project will connect to the existing Kahekili Highway at two new "T" intersections. Each intersection would have adequate capacity to accommodate expected peak hourly volumes at acceptable levels of service. Increased traffic volume on Kahekili Highway will increase delays for left turns from Makaala Drive to Kahekili Highway during the morning peak traffic hours; however, the capacity of the left turn will continue to exceed peak hourly demand.*

At the new connections to the highway, left turn lanes should be provided for Northbound left turns into the project site at both intersections. Minimum storage lengths were computed to be 200 feet at the North intersection and 175 feet at the South intersection (Makaala Drive)."

In accordance with the recommendations in the Traffic Impact Report, the Development will include the construction of the left turn lanes and road widening along Kahekili Highway. Also, there will additional road improvements to help mitigate any future and existing traffic conditions.

There will be a new road extending Imi Kala Street which presently dead ends at the Mill Yard Industrial Subdivision. A new bridge will be constructed replacing the existing bridge over Iao Stream. The Imi Kala Street roadway extension will continue and intersect Piihana Road. The road will then travel over an abandon Macadamia Nut farm (Piihana Project District) then connect to Kahekili Highway. The new intersection is located midway between Puuohala Road and the North access road of the Wailuku Country Town Estates. The proposed Imi Kala Street extension will be also be used for the Piihana Project District development. The proposed road will have a right-of-way of 60 feet. Presently the existing right-of-way for Imi Kala Street is 60 feet wide.

The new route will encourage traffic to pass through the Imi Kala Street road extension. This will lessen traffic at Market Street and Waiehu Beach Road. The impact to minimize traffic may not justify the cost of the improvements, based on the generated traffic. But, this improvements was needed, in order to service future projects located along Kahekili Highway.

2. DRAINAGE

Hale Mua Subdivision: There will be several major drainage improvements for the project site. We will be constructing a broad grass overflow swale along the "Spreckels Ditch". This is a safety measure should the ditch overflow from excess runoff, the grass swale will convey the runoff to a detention pond located on the project site.

As shown earlier there are four major drainage areas which is label as "Basin A, B, C, and D". There are also four detention ponds, which similar labeled "Drainage Basin A, B, C, and D". The runoff from the four areas will flow into the four detention ponds to eliminate increase of runoff due to development. The runoff from each drainage basin will be collected by a series of catch basins, drainage pipes, culverts, or grassed swales into the detention ponds. Please see drainage plans.
There will also be a grass swale along Kahekili Highway to collect runoff from the road improvements that will be fronting the project site. This runoff as indicated will flow into Detention Pond "B". We have computed the required storage runoff or a 50 year one hour storm, for each drainage basin. Please see the drainage and soil erosion control reports

The runoff from the Drainage Basins will be collected by curb inlet catch basins located at the appropriate intervals along the subdivision roads and convey the runoff to the various detention pond. We will incorporate drainage pipes, grassed swales, culverts and to transmit the runoff to the detention ponds.

The existing 48 inch culvert which is located at Kahekili Highway, along the South boundary, will be reconstructed with triple 60 inch culverts. The existing 48 inch is under size and a 50 year one hour storm would be a problem if storm runoff should over flow the banks and on to Kahekili Highway.

Iao Bridge Replacement: Currently the existing flow from Iao Stream will remain the same. The new bridge will be built higher than the existing one. The capacity of Iao Stream at this intersection will remain the same, there is no construction being proposed with in the stream. Also, runoff from the bridge and existing connecting roads will remain unchanged. They are no other drainage improvements planned for the "Iao Bridge Replacement".

Imi Kala Road Extension: Based on the proposed new road there will be grassed swales on both sides of the "Imi Kala Road Extension". The increase runoff from the new paved road will flow onto these grassed swales then into several catch basins. The catch basins will be connected with 24" drainage pipes. The runoff will then flow into two detention ponds. There will be no increase of run off with the construction of the proposed Imi Kala Street road extension, to adjacent and downstream properties.

It is estimated that the post development runoff sheet flowing from the project site will be 468 cfs, with a net increase of 265 cfs.

There will be no increase in runoff from the project site, after construction of the development is completed. This is in accordance with Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui.

3. WASTEWATER

The proposed project will have 8 inch sewer lines traversing through the subdivision. This will all be on a gravity system. The sewer lines will connect to a pump station and to a new force main, that is located at the lower section of the project site. The force main will then convey waste water from the pump station to the existing sewer manhole and line located along Imi Kala Street. The proposed force main will follow Kahekili Highway towards Wailuku Town, then follow the Imi Kala Street roadway extension, across Iao Stream then into an existing sewer manhole, along Imi Kala Street.

The Developer has requested for an exemption for any sewer fees, for the "affordable lots". They will contribute any normal fees currently being assessed by the County for the "market lots". This contribution should be used to increase the size of the proposed waster water system. This will allow future developments to tie into this wastewater system at minimal cost.

4. WATER

The Department of Water Supply has indicated that the total storage requirement for the subdivision will be approximately 500,000 gallons. Construction of two storage tanks and a booster pump is required, by the Department.

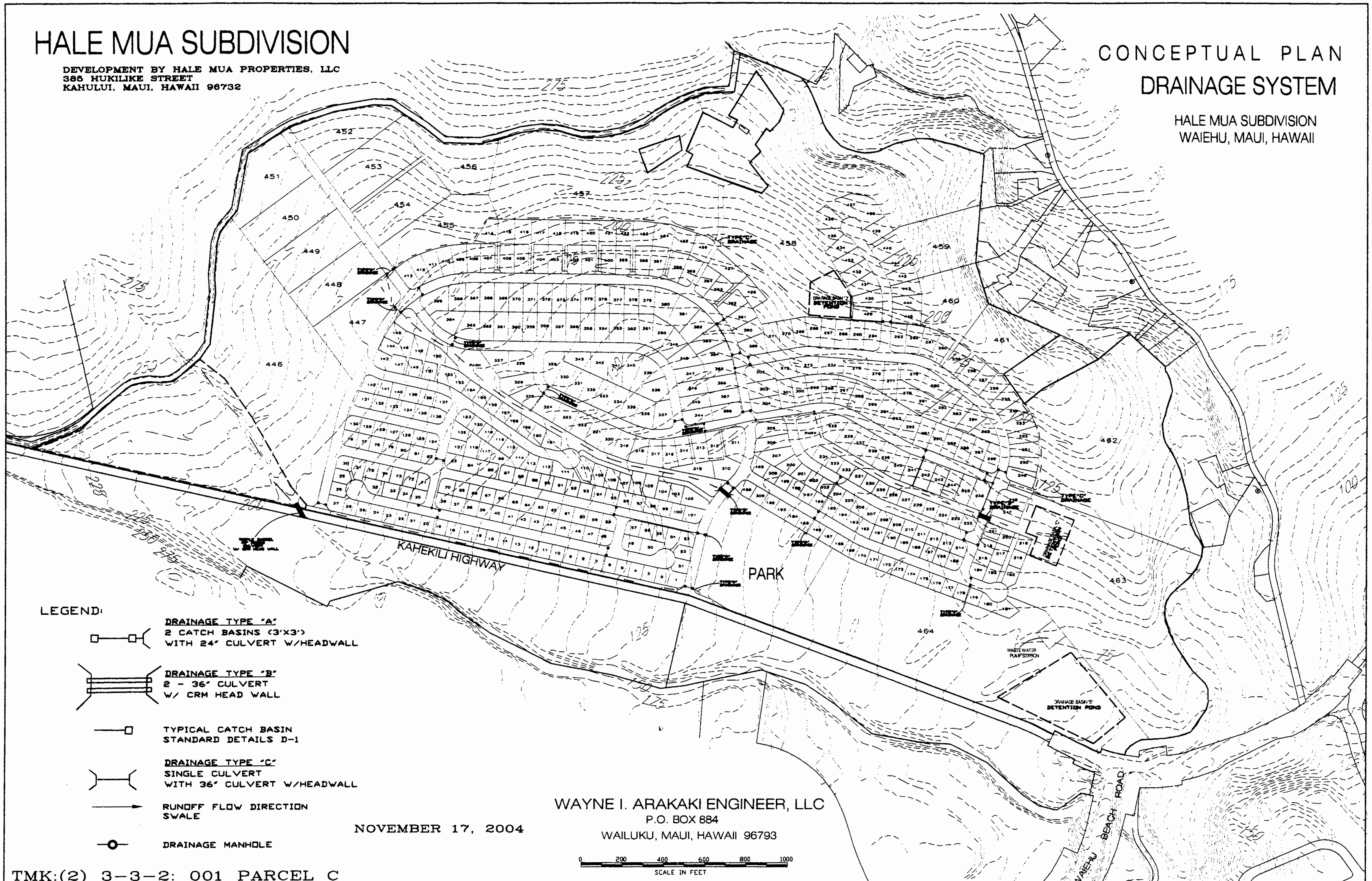
The domestic water demand for the project is anticipated to be approximately 415,000 gallons per day. It is assumed that the "Market Lots and Large Lots" will all have a main house and cottage, after fully developed. The affordable housing will be limited to a single dwelling. Each dwelling will consume approximately 600 gallons per day. In accordance with the Department of Water Supply standards, the fire flow demand for a residential development is 1,000 gallons per minute for a 2 hour duration. All new fire hydrants will be installed with a maximum spacing of 350 feet. This would meet the Fire Department's present requirements.

The waterline within the project site will all be 8 and 12 inch ductile iron. All water service laterals will follow the 2002 DWS standards. Utility service easements that is required by DWS, for future use, will be provided by the land owner.

5. ELECTRIC, TELEPHONE, & CABLE TV

The proposed electrical, telephone, and cable TV distribution systems will be installed underground. The main electrical line will be connected from over head lines, which is located, along the North side of the property.

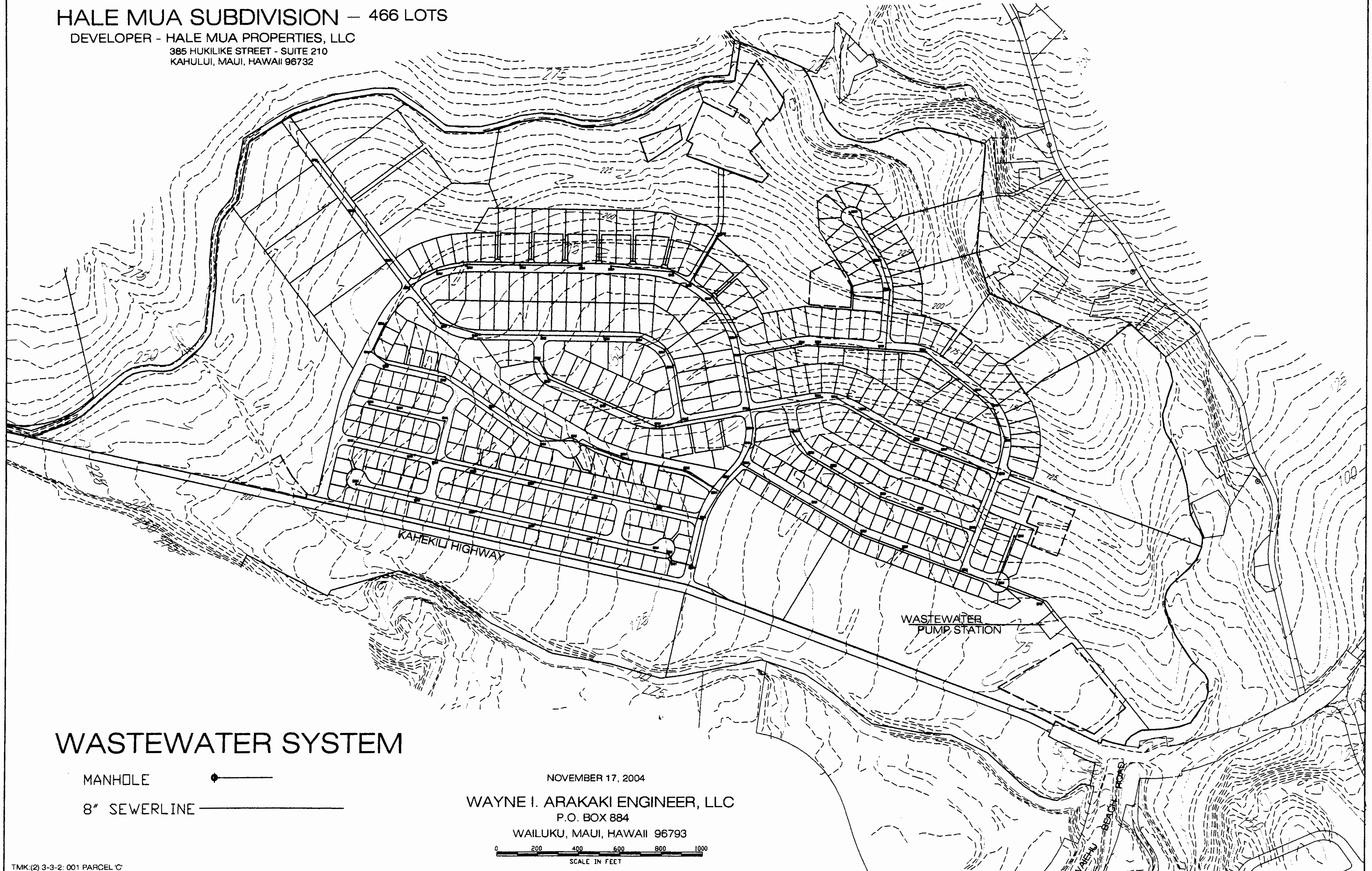
Street lights will be installed along the subdivision streets at intervals to be determine by a private Electrical Engineer. Electrical construction plans will be reviewed by Maui Electric Company, Verizon and Oceanic Cable for approval.



HALE MUA SUBDIVISION
DEVELOPMENT BY HALE MUA PROPERTIES, LLC
385 HUKILIKE STREET
KAHULUI, MAUI, HAWAII 96732
CONCEPTUAL PLAN
DRAINAGE SYSTEM
HALE MUA SUBDIVISION
WAIEHU, MAUI, HAWAII
KAHEKILI HIGHWAY
PARK
WASTEWATER PUMP STATION
DRAINAGE BASIN 'E' DETENTION POND
WAIEHU BEACH ROAD
LEGEND:
DRAINAGE TYPE "A"
2 CATCH BASINS (3'X3')
WITH 24" CULVERT W/HEADWALL
DRAINAGE TYPE "B"
2 - 36" CULVERT
W/ CRM HEAD WALL
TYPICAL CATCH BASIN
STANDARD DETAILS D-1
DRAINAGE TYPE "C"
SINGLE CULVERT
WITH 36" CULVERT W/HEADWALL
RUNOFF FLOW DIRECTION
SWALE
DRAINAGE MANHOLE
NOVEMBER 17, 2004
WAYNE I. ARAKAKI ENGINEER, LLC
P.O. BOX 884
WAILUKU, MAUI, HAWAII 96793
0 200 400 600 800 1000
SCALE IN FEET
TMK:(2) 3-3-2: 001 PARCEL C

HALE MUA SUBDIVISION – 466 LOTS

DEVELOPER - HALE MUA PROPERTIES, LLC
385 HUKILIKE STREET - SUITE 210
KAHULUI, MAUI, HAWAII 96732



WASTEWATER SYSTEM

MANHOLE

8" SEWERLINE

NOVEMBER 17, 2004

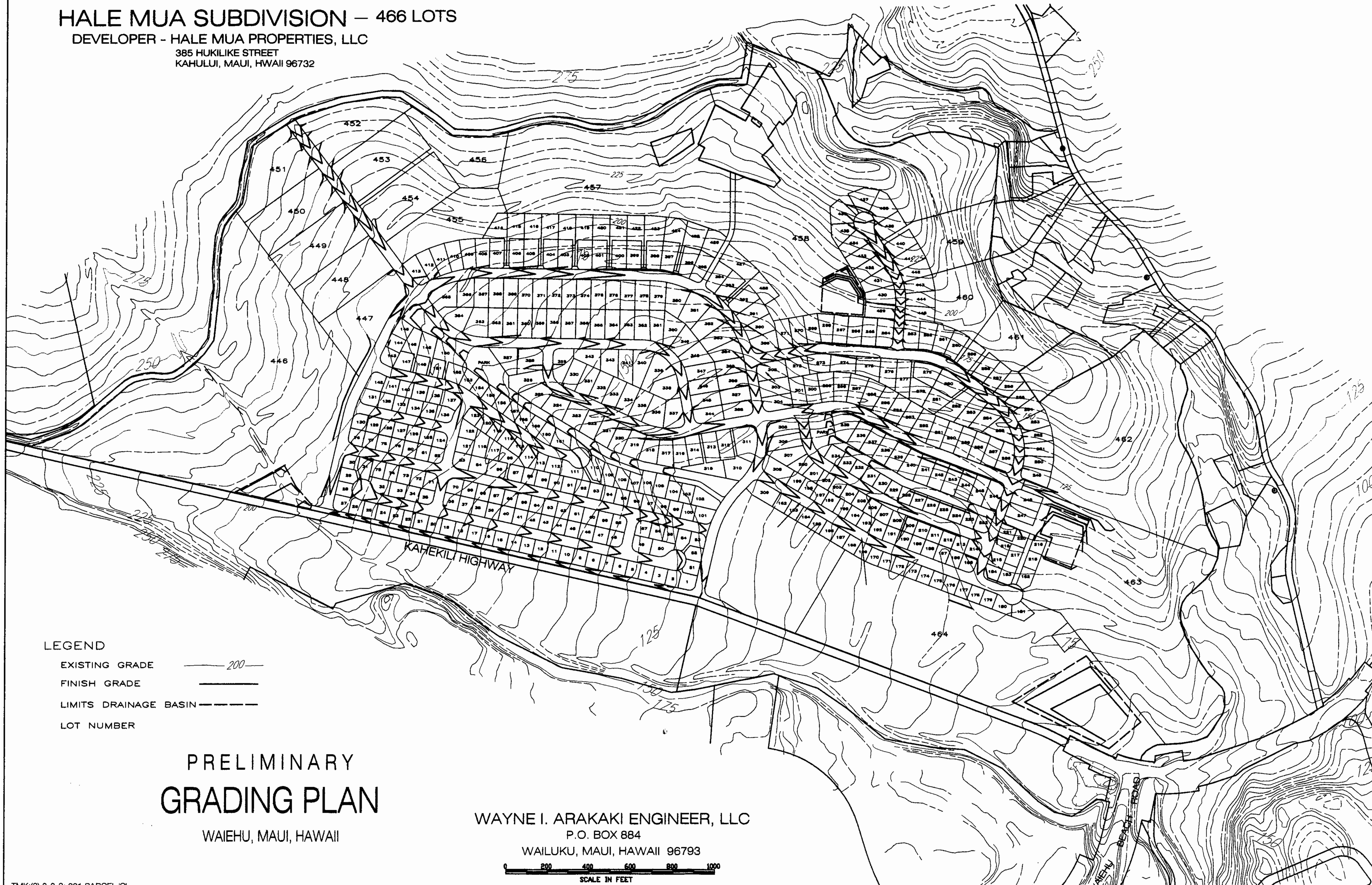
WAYNE I. ARAKAKI ENGINEER, LLC
P.O. BOX 884
WAILUKU, MAUI, HAWAII 96793

0 200 400 600 800 1000
SCALE IN FEET

TMK:(2) 3-3-2: 001 PARCEL 'C'

HALE MUA SUBDIVISION – 466 LOTS

DEVELOPER - HALE MUA PROPERTIES, LLC
385 HUKILIKE STREET
KAHULUI, MAUI, HWAII 96732



LEGEND

EXISTING GRADE —200—

FINISH GRADE

LIMITS DRAINAGE BASIN

LOT NUMBER

PRELIMINARY

GRADING PLAN

WAIEHU, MAUI, HAWAII

WAYNE I. ARAKAKI ENGINEER, LLC
P.O. BOX 884
WAILUKU, MAUI, HAWAII 96793

0 200 400 600 800 1000
SCALE IN FEET

TMK:(2) 3-3-2: 001 PARCEL 'C'

Appendix H

Drainage and Soil Erosion Report

DRAINAGE REPORT

and

SOIL EROSION CONTROL

for

HALE MUA SUBDIVISION

TMK: (2) 3-3-02: 001 (Parcel C)

PREPARED FOR:

Hale Mua Properties
385 Hukilike Street
Suite 210
Kahului, Maui, Hawaii 96732

PREPARED BY:

WAYNE I. ARAKAKI ENGINEER, LLC
P.O. BOX 884
WAILUKU, HAWAII 96793

February 8, 2004
April 25, 2005 (revised)

INTRODUCTION

This report has been prepared to evaluate the onsite and offsite runoff for the subject parcel. The proposed drainage improvements are as follows per report.

PROPOSED PROJECT

A. Location

The project site is located in Wailuku, Waiehu, on the Island of Maui, Hawaii. The project site bordered by Kahekili Highway on the East, Waiheu Stream, and a existing drainage way along the West and South. The project site encompass an area of approximately 238 acres.

B. Project Description

The proposed plan for the Hale Mua Subdivision is to develop the project site into 466 residential lots ranging from 5,000 square feet to 20 acres. Site improvements will include asphalt paved roadways with curb, gutters and sidewalks. Underground utility improvements will consist of drainage, sewer, water, electrical, telephone, and TV cable systems. Offsite improvements will include road extensions, a bridge, sewer, water and highway improvements.

C. Topography and Soil Conditions

The project site is presently being used to cultivate macadamia nuts. The existing ground slopes in a easterly to westerly direction from an elevation of (+) 250 +\- feet M.S.L. to (+) 40 +\-feet M.S.L. with an average slope of approxiately 8 to 10%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, (August 1972)", Wailuku Silty Clay (WvC, 7 to 15 percent slopes), Iao Silty Clay (IaA, 0 to 3 percent slopes). Please see the "Soil Erosion Control Plan".

D. Climate and Rainfall

The project site is generally warm and sunny throughout most of the year. The average annual rainfall amounts to approximately 25 to 40 inches, with most of the rainfall occurring in the winter months. The average temperature is about 70 F.

E. Drainage (Existing Conditions)

1. **Iao Bridge Replacement**: One of the requirements of the off site improvements is replace an existing bridge at the end of Imi Kala Street. The existing runoff for the 100 year flood, is 13,800 cfs. This information was taken from the "Flood Insurance Study", dated September 6, 1989. The flow was measured at the mouth of Iao Stream, which encompassed an area of 10.1 square miles. A field survey was completed to evaluate the required height for the new bridge. The existing bridge which is over 50 years has not encountered any flood damage over the years.

2. **Imi Kala Road Extension**: The Imi Kala Road Extension will connect to Kahekili Highway, to improve existing traffic conditions. Iml Kala Road ends at Iao Stream, next to the existing bridge. As stated above a new bridge will be built, and the road will be extend first to Piihana Road then to Kahekili Highway. The area where the proposed road will be constructed in vacant sugar and macadamia nut fields. The new road will not cross over any existing drainage ways, except for the "Spreckels Ditch", which is an irrigation ditch.

3. **Hale Mua Subdivision**: The project site is located along Kahekili Highway. On the South and Western boundary, is "Spreckels Ditch". The Makua offsite runoff flows into the ditch which, and eventually to a reservoir for irrigation use. The "Spreckels Ditch" blocks all of the offsite runoff to the project site. There is an existing drainage way that follows the North boundary of the Wailuku Country Estates subdivision. This drainage way crosses under the "Spreckels Ditch", across the project site and Kahekili Highway to Waiehu Stream.

The North boundary follows the Waiehu Stream. The 100 year flow computes to 7,400 cfs. This information was taken from the "Flood Insurance Study", dated September 6, 1989. The flow was measured at Kahekili Highway. The basin encompassed an area of 4.5 square miles. We have plotted the 100 year flood limits on the attached map.

The project is higher than Kahekili Highway, which fronts the project site. There are no drainage systems along Kahekili Highway. Presently runoff sheet flows cross the Highway on to the downstream properties, then into Waeihu Stream.

F. Flood and Tsunami Zone

According to data from the Flood Insurance Rate Map (FIRM), effective June 1, 1981, prepared by the Federal Emergency Management Agency, Federal Insurance Administration, the subject parcel is located in an area minimal flooding. Flood zone hazard 'C'. We have computed the 100 year flood limits on the Flood map.

HYDROLOGY CALCULATIONS

The hydrologic calculations are based on the "Drainage Master Plan for the County of Maui", and the "Rainfall Frequency Atlas of the Hawaiian Islands", Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau.

Rational Formula Used: $Q = CIA$

Where

Q	=	rate of flow
A	=	area (acres)
I	=	rainfall intensity for a duration equal to time of concentration (in./hr.)
C	=	runoff coefficient

DETERMINATION OF RUNOFF

Existing conditions/ Offsite runoff above the subdivision/ Determination of **100 year flood limits**

<u>Area of Drainage Basin</u>

Subject Parcel

Basin "A"	**31 acres**
Basin "B"	**128 acres**
Basin "C"	**24 acres**
Basin "D"	**30 acres**

The rest of area will not be disturbed. The open space will be used for landscaping or agricultural purposes.

G. Proposed Drainage Improvement (Developed Conditions)

1. **Iao Bridge Replacement**: Currently the existing flow from Iao Stream will remain the same. The new bridge will be built higher than the existing one. The capacity of Iao Stream at this intersection will remain the same. Also, runoff from the bridge and existing connecting roads will remain unchanged. They are no other drainage improvements planned for the "Iao Bridge Replacement".

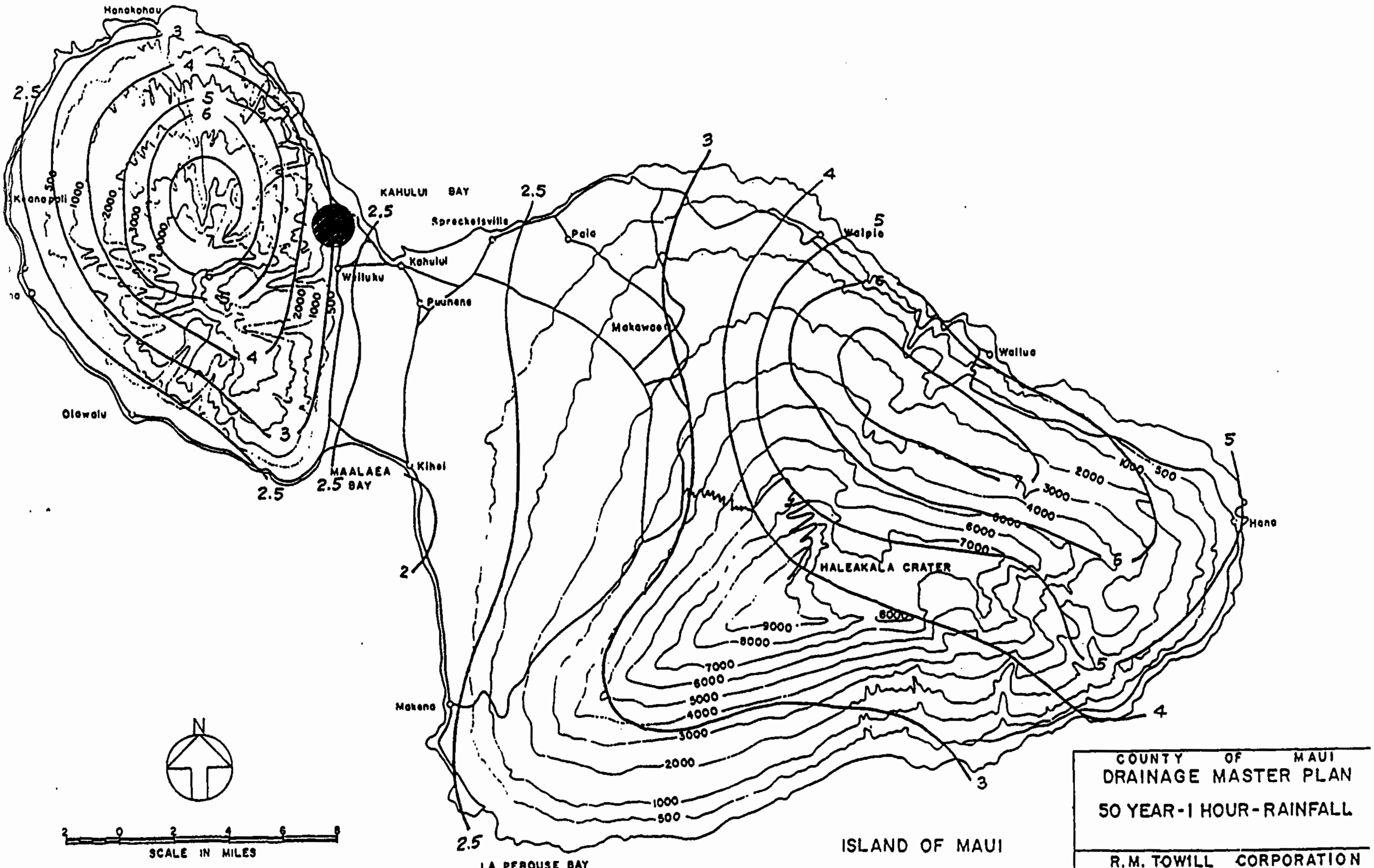
2. **Imi Kala Road Extension**: Based on the cross section there will be grassed swales on both sides of the "Imi Kala Road Extension". The increase runoff from the new paved road will flow onto these grassed swales. Any excess runoff will sheet flow on to the existing vacant agricultural fields. Dry wells will be placed with in the road shoulders to absorb the runoff that is generated from the

paved roads.

3. **Hale Mua Subdivision**: There will be several major drainage improvements for the project site. We will be constructing a broad grass overflow swale along the "Spreckels Ditch". This is a safety measure should the ditch overflow from excess runoff. As shown earlier there are four major drainage areas which is label as "Basin A, B, C, and D". There are also four detention ponds, which similar labeled "Drainage Basin A, B, C, and D". The runoff from the four areas will flow into the four detention ponds to eliminate increase of runoff due to development. The runoff from each drainage basin will be collected by a series of catch basins, drainage pipes, culverts, or grassed swales into the detention ponds. Please see drainage plans.
There will also be a grass swale along Kahekili Highway to collect runoff from the road improvements that will be fronting the project site. This runoff as indicated will flow into Detention Pond "B". We have computed the required storage runoff or a 50 year one hour storm, for each drainage basin. Please see the attached computation section.

CONCLUSION

The proposed subdivision will construct a drainage system that will capture the increase of runoff due to development. There will be several detention ponds constructed to detain runoff that would be generated from the subdivision. There will be no adverse impact on adjacent or downstream properties.



COUNTY OF MAUI
DRAINAGE MASTER PLAN

50 YEAR - 1 HOUR - RAINFALL

R. M. TOWILL CORPORATION
CIVIL ENGINEERS - SURVEYORS

PLATE 7

Table 1

GUIDE FOR THE DETERMINATION OF RUNOFF COEFFICIENTS FOR BUILT-UP AREAS*

WATERSHED CHARACTERISTICS	EXTREME	HIGH	MODERATE	LOW
INFILTRATION	NEGLIGIBLE 0.20	SLOW 0.14	MEDIUM 0.07	HIGH 0.0
RELIEF	STEEP (> 25%) 0.08	HILLY (15-25%) 0.06	ROLLING (5-15%) 0.03	FLAT (0-5%) 0.0
VEGETAL COVER	NONE 0.07	POOR (< 10%) 0.05	GOOD (10-50%) 0.03	HIGH (50-90%) 0.0
DEVELOPMENT TYPE	INDUSTRIAL & BUSINESS 0.55	HOTEL-APARTMENT 0.45	RESIDENTIAL 0.40	AGRICULTURAL 0.15

**NOTE*: *The design coefficient "c" must result from a total of the values for all four watershed characteristics of the site.*

Table 2

RUNOFF COEFFICIENTS

Type of Drainage Area	Runoff Coefficient C
Parks, cemeteries	0.25
Playgrounds	0.35
Railroad yard areas	0.40
Unimproved areas	0.30
Streets:	
Asphaltic	0.95
Concrete	0.95
Brick	0.85
Driveway and walks	0.85
Roofs	0.95
Lawns:	
Sandy soil, flat, 2%	0.10
Sandy soil, avg., 2-7%	0.15
Sandy soil, steep, 7%	0.20
Heavy soil, flat, 2%	0.17
Heavy soil, avg., 2-7%	0.22
Heavy soil, steep, 7%	0.35

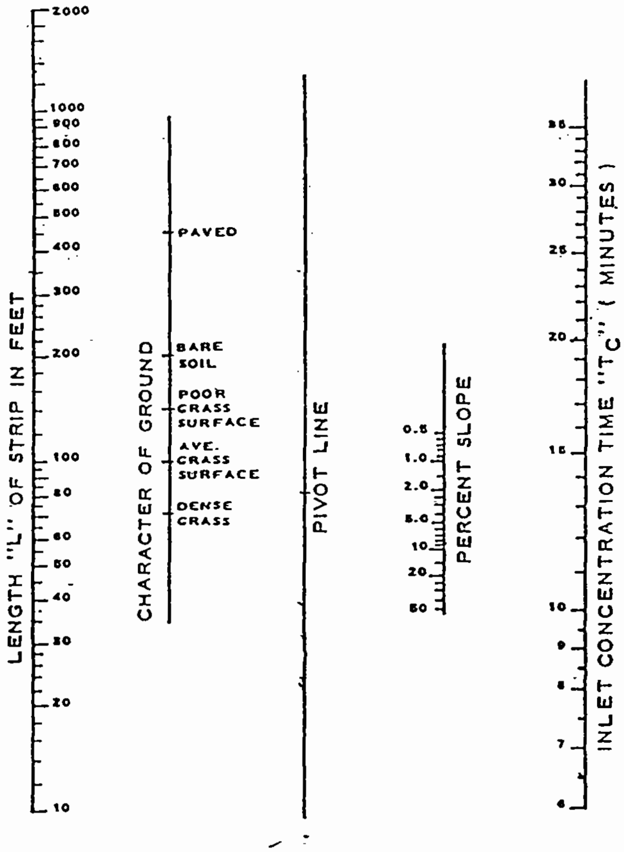
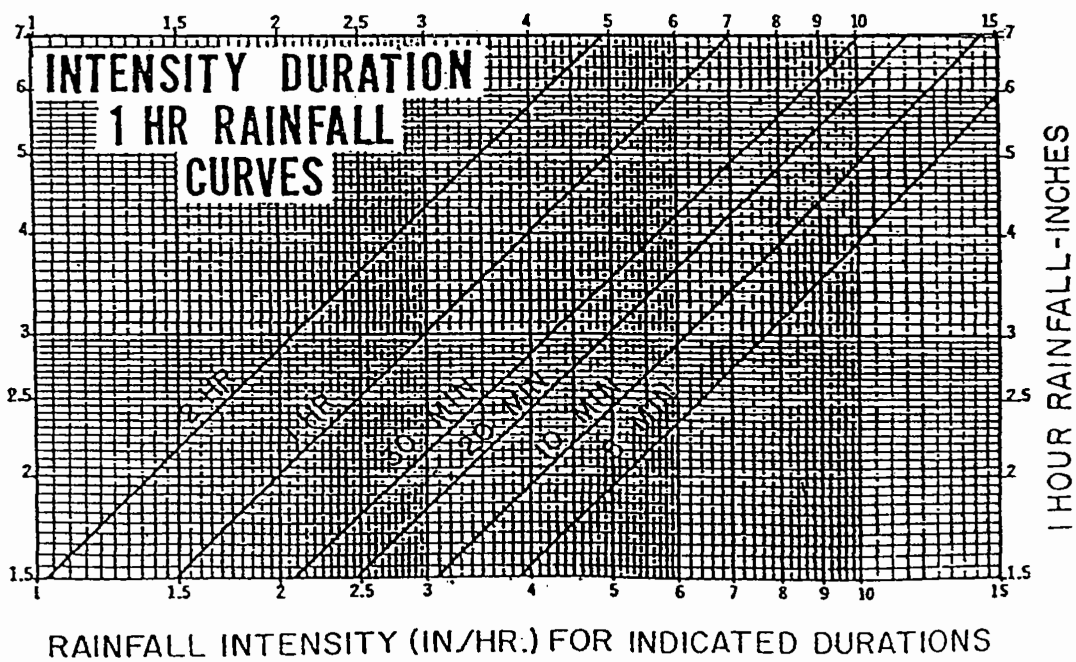


Plate 1

Overland Flow Chart

Plate 2



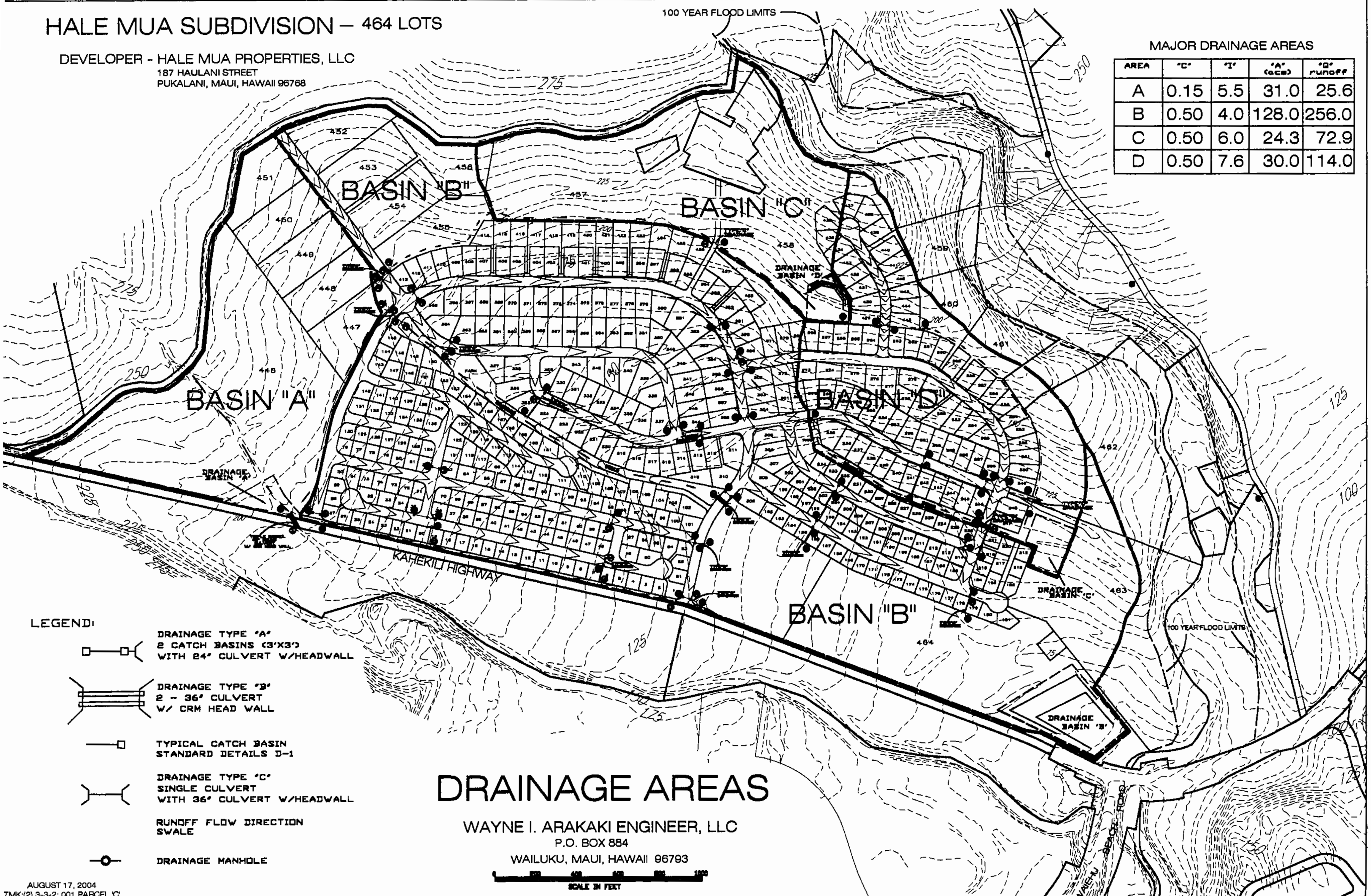
OFFSITE DRAINAGE BASINS
AND COMPUTATIONS OF RUNOFF

HALE MUA SUBDIVISION – 464 LOTS

DEVELOPER - HALE MUA PROPERTIES, LLC
187 HAULANI STREET
PUKALANI, MAUI, HAWAII 96768

MAJOR DRAINAGE AREAS

AREA	"C"	"I"	"A" (acs)	"Q" runoff
A	0.15	5.5	31.0	25.6
B	0.50	4.0	128.0	256.0
C	0.50	6.0	24.3	72.9
D	0.50	7.6	30.0	114.0



LEGEND:

DRAINAGE TYPE "A"
2 CATCH BASINS (3'X3')
WITH 24" CULVERT W/HEADWALL

DRAINAGE TYPE "B"
2 – 36" CULVERT
W/ CRM HEAD WALL

TYPICAL CATCH BASIN
STANDARD DETAILS D-1

DRAINAGE TYPE "C"
SINGLE CULVERT
WITH 36" CULVERT W/HEADWALL

RUNOFF FLOW DIRECTION
SWALE

DRAINAGE MANHOLE

DRAINAGE AREAS

WAYNE I. ARAKAKI ENGINEER, LLC
P.O. BOX 884
WAILUKU, MAUI, HAWAII 96793

SCALE IN FEET

AUGUST 17, 2004
TMK:(2) 3-3-2: 001 PARCEL 'C'

HALE MUA SUBDIVISION

Drainage Basin “A”

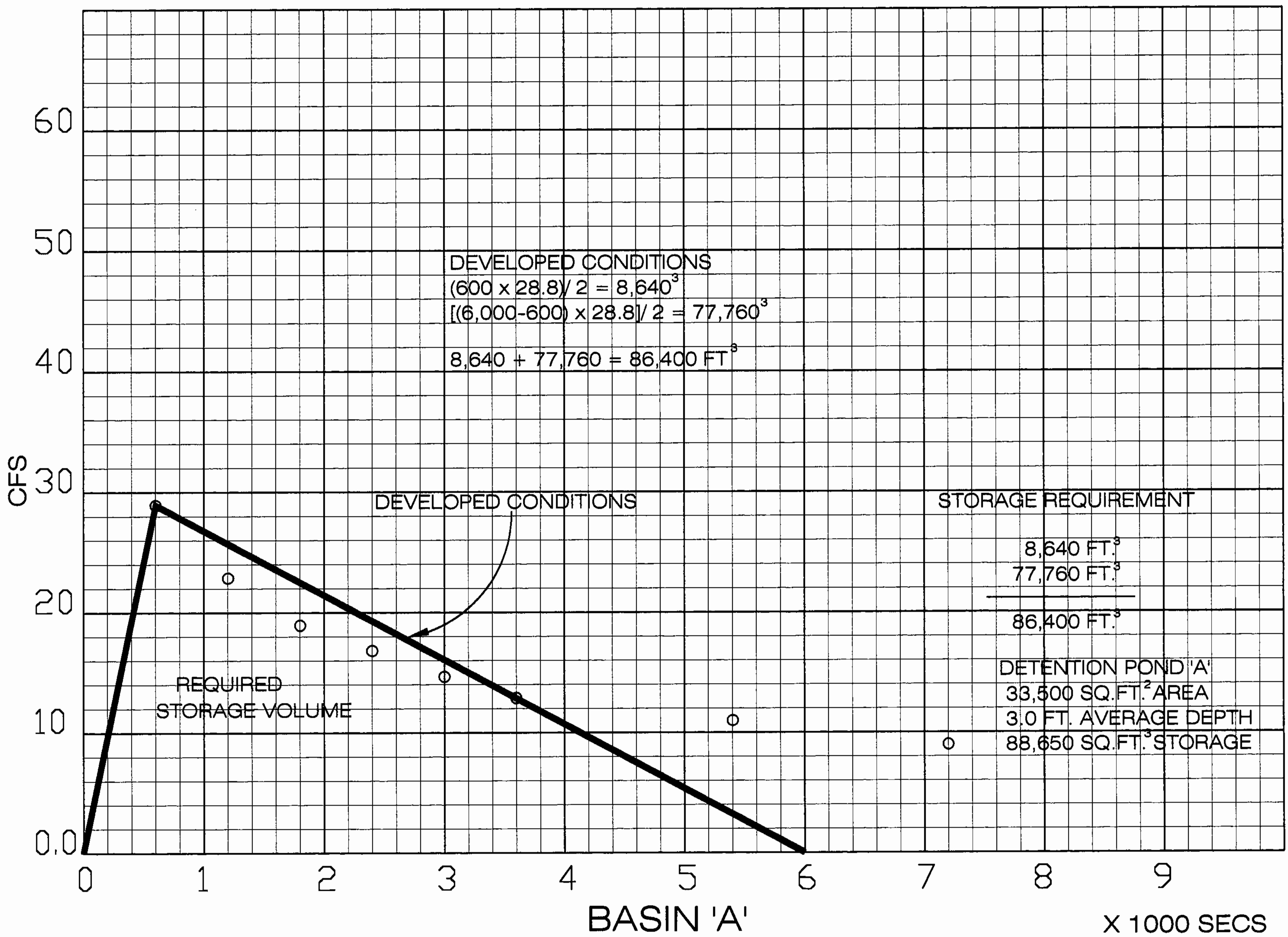
Computation of Drainage Storage Volumes for 50 year one hour storm

Tabulation Runoff Volumes Developed Conditions

Values C=0.15 A=31.0 acres

Times (T) Minutes		Intensity (I)	Runoff (Q)
10 minutes	600 seconds	6.2	28.8
20 minutes	1,200 seconds	4.9	22.8
30 minutes	1,800 seconds	4.2	19.5
40 minutes	2,400 seconds	3.6	16.7
50 minutes	3,000 seconds	3.2	14.9
60 minutes	3,600 seconds	2.9	13.5
90 minutes	5,400 seconds	2.5	11.6
120 minutes	7,200 seconds	2.1	9.7

STORAGE VOLUME CALCS HALE MUA SUBDIVISION



HALE MUA SUBDIVISION

Drainage Basin “B”

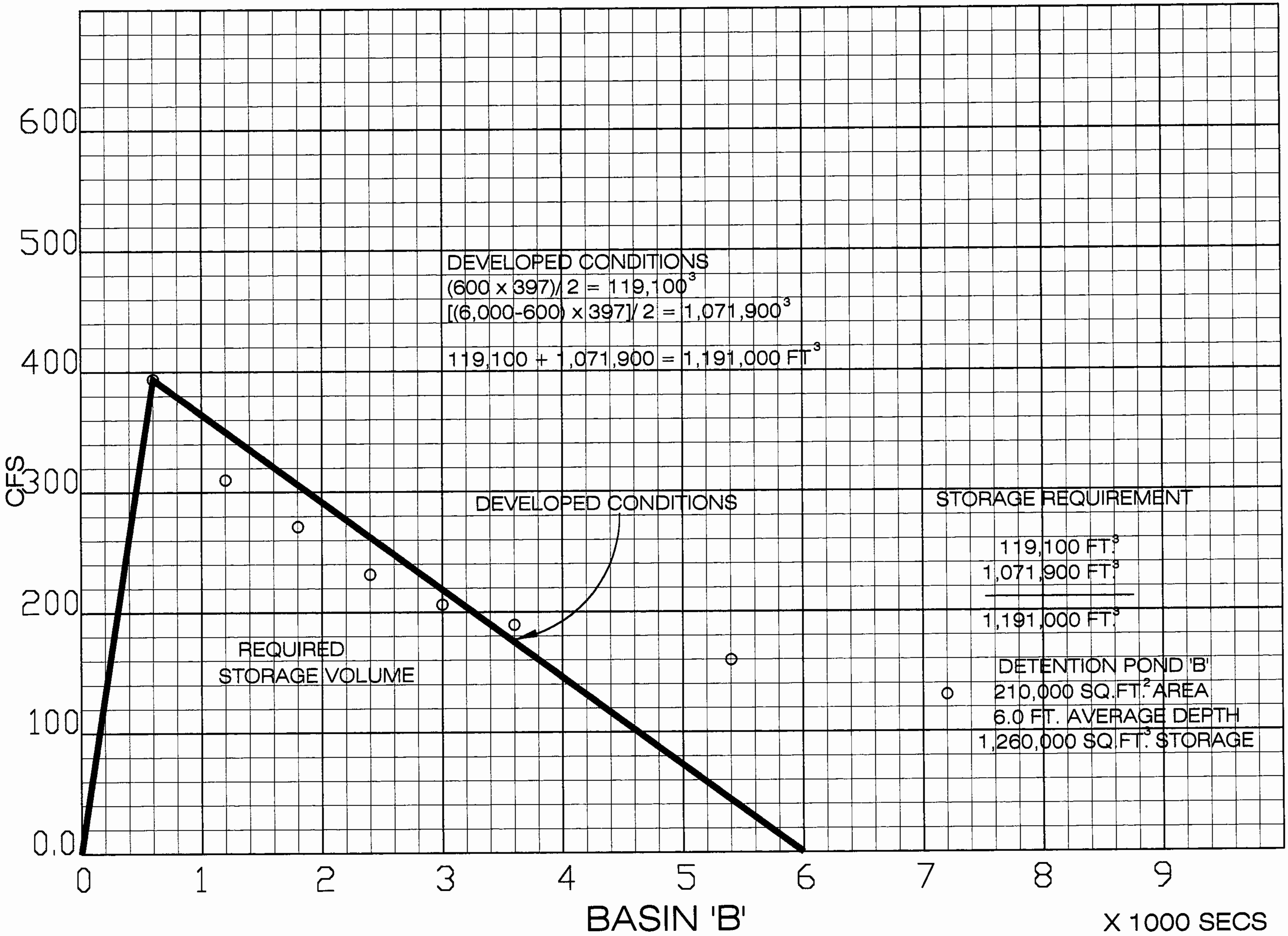
Computation of Drainage Storage Volumes for 50 year one hour storm

Tabulation Runoff Volumes Developed Conditions

Values C=0.50 A=128.0 acres

Times (T) Minutes		Intensity (I)	Runoff (Q)
10 minutes	600 seconds	6.2	397
20 minutes	1,200 seconds	4.9	314
30 minutes	1,800 seconds	4.2	269
40 minutes	2,400 seconds	3.6	230
50 minutes	3,000 seconds	3.2	205
60 minutes	3,600 seconds	2.9	186
90 minutes	5,400 seconds	2.5	160
120 minutes	7,200 seconds	2.1	134

STORAGE VOLUME CALCS HALE MUA SUBDIVISION



HALE MUA SUBDIVISION

Drainage Basin “C”

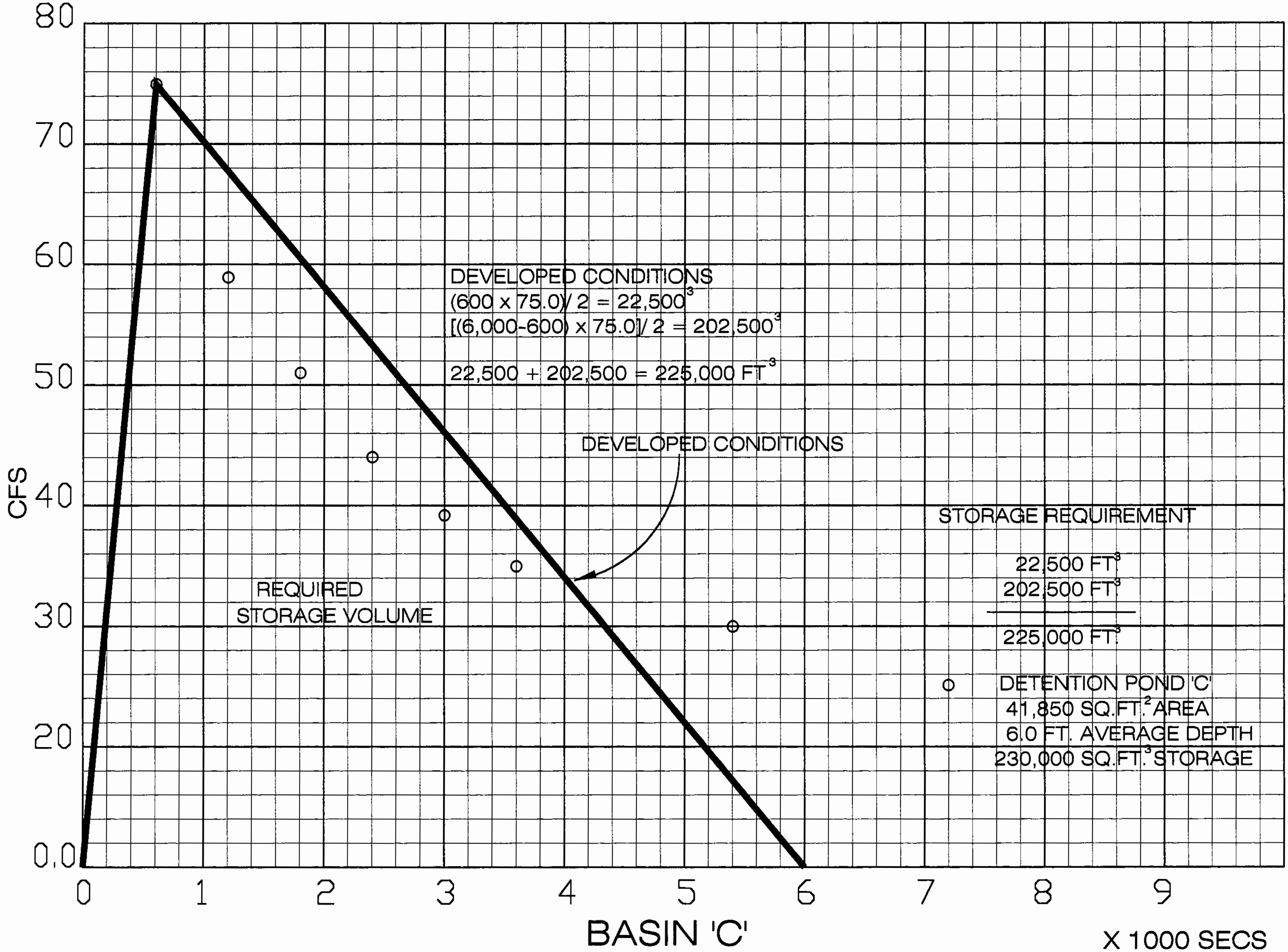
Computation of Drainage Storage Volumes for 50 year one hour storm

Tabulation Runoff Volumes — Developed Conditions

Values — C=0.50 — A= 24.3 acres

Times (T) Minutes		Intensity (I)	Runoff (Q)
10 minutes	600 seconds	6.2	75
20 minutes	1,200 seconds	4.9	59
30 minutes	1,800 seconds	4.2	51
40 minutes	2,400 seconds	3.6	44
50 minutes	3,000 seconds	3.2	39
60 minutes	3,600 seconds	2.9	35
90 minutes	5,400 seconds	2.5	30
120 minutes	7,200 seconds	2.1	25

STORAGE VOLUME CALCS — HALE MUA SUBDIVISION



HALE MUA SUBDIVISION

Drainage Basin “D”

Computation of Drainage Storage Volumes for 50 year one hour storm

Tabulation Runoff Volumes	Developed Conditions

Values	C=0.50	A= 30.0 acres

Times (T) Minutes		Intensity (I)	Runoff (Q)
10 minutes	600 seconds	6.2	93
20 minutes	1,200 seconds	4.9	73
30 minutes	1,800 seconds	4.2	63
40 minutes	2,400 seconds	3.6	54
50 minutes	3,000 seconds	3.2	48
60 minutes	3,600 seconds	2.9	44
90 minutes	5,400 seconds	2.5	37
120 minutes	7,200 seconds	2.1	31

STORAGE VOLUME CALCS

HALE MUA SUBDIVISION