

LINDA CROCKETT LINGLE
MAYOR



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COUNTY OF MAUI
DEPARTMENT OF FIRE CONTROL
200 DAIRY ROAD
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January 25, 1994

Mr. Brian J.J. Choy, Director
Office of Environmental Quality Control
220 South King Street
Central Pacific Plaza, Suite 400
Honolulu, HI 96813

OFFICE OF
ENVIRONMENTAL
QUALITY CONTROL

'94 JAN 27 19:32

RECEIVED

Re: Proposed Hana Fire Station, TMK 1-4-06:2
Final Environmental Assessment

Dear Mr. Choy:

The Maui County Fire Department has determined that the proposed Hana Fire Station will not have significant environmental effects and has issued a negative declaration. No comments were received during the 30-day public comment period which began on November 23, 1993. Please publish this notice in the February 8, 1994 OEQC Bulletin.

Transmitted herewith are four (4) copies of the Final Environmental Assessment prepared for the Hana Fire Station, and a completed OEQC Bulletin Publication form.

We thank you for your assistance in handling this matter. Please contact Mr. Rory Frampton of Chris Hart & Partners at 871-5726 if you have any questions.

Yours truly,


Ronald P. Davis
Fire Chief

cc: Nolan Perreira
Greg Bayless
Chris Hart



1994-02-08-MA-FEA-Hana Fire Station

FEB 8 1994

FINAL ENVIRONMENTAL ASSESSMENT

HANA FIRE STATION



Prepared for:

Department of Fire Control
County of Maui
200 Dairy Road
Kahului, Maui, Hawaii 96732

Phone: 243-7561

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Chris Hart and Partners
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JANUARY, 1994

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JANUARY, 1994

TABLE OF CONTENTS

I. PROJECT OVERVIEW	1
A. PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP	1
B. PROJECT NEED	1
C. PROPOSED IMPROVEMENTS	2
II. DESCRIPTION OF THE EXISTING ENVIRONMENT	3
A. PHYSICAL SETTING	3
1. Surrounding Land Use	3
2. Climate	3
3. Topography and Soil Characteristics	4
4. Flood Hazard	4
5. Flora and Fauna	5
6. Archaeological Resources	5
7. Air Quality	5
8. Noise Characteristics	5
9. Visual Resources	6
B. SOCIO-ECONOMIC ENVIRONMENT	6
1. Population	6
2. Economy	6
C. PUBLIC SERVICES	7
1. Police and Fire Protection	7
2. Solid Waste	7
3. Schools	7
4. Recreational Facilities	8
D. INFRASTRUCTURE	8
1. Roadways	8
2. Wastewater	8
3. Water	8
4. Drainage	9
5. Electrical	9
III. POTENTIAL IMPACTS AND MITIGATION MEASURES	9
A. PHYSICAL ENVIRONMENT	9
1. Surrounding Uses	9
2. Topography/Landform	10
3. Flora and Fauna	10
4. Archaeological Resources	10
5. Air Quality	10
6. Noise	11
7. Visual Resources	11
B. SOCIO-ECONOMIC ENVIRONMENT	12
1. Population and Local Economy	12
2. Public Services	12

**TABLE OF CONTENTS
(con't)**

C. INFRASTRUCTURE12
 1. Roadways12
 2. Water.....13
 3. Drainage13
 4. Wastewater.....13
 5. Other Infrastructure Systems.....14
IV. RELATIONSHIP TO GOVERNMENT PLANS, POLICIES AND
CONTROLS14
 A. STATE LAND USE DISTRICTS.....14
 B. GENERAL PLAN OF THE COUNTY OF MAUI.....14
 C. HANA COMMUNITY PLAN.....15
V. FINDINGS AND CONCLUSIONS.....16
VI. AGENCIES CONTACTED IN THE PREPARATION OF THE DRAFT
ENVIRONMENTAL ASSESSMENT.....16

LIST OF FIGURES

- FIGURE 1 - REGIONAL LOCATION MAP
- FIGURE 2 - LOCATION MAP
- FIGURE 3 - PRELIMINARY SITE PLAN
- FIGURE 4 - PRELIMINARY FLOOR PLAN
- FIGURE 5 - PRELIMINARY BUILDING ELEVATIONS
- FIGURE 6 - PRELIMINARY BUILDING ELEVATIONS

APPENDICES

- APPENDIX A - ARCHAEOLOGICAL AND BOTANICAL SURVEY REPORT
- APPENDIX B - PRELIMINARY DRAINAGE AND SOIL EROSION CONTROL
REPORT

Preface

The County of Maui, Department of Fire Control, proposes to construct a new Hana Fire Station in Hana, Maui, Hawaii (TMK 1-4--06:2). Pursuant to Chapter 343, Hawaii Revised Statutes, Chapter 200 of Title 11, Administrative Rules, Environmental Impact Statement Rules, and in connection with the Special Management Area (SMA) application, this Environmental Assessment (EA) documents the Project's technical characteristics and environmental impacts, and advances findings and conclusions relative to the significance of the project.

I. PROJECT OVERVIEW

A. PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP

The applicant, County of Maui, Department of Fire Control, proposes to construct a new Hana Fire Station located in Hana, Maui, Hawaii (TMK 1-4-:06:2) The subject property is located south of the intersection of Hana Highway and Uakea Road, adjacent to the County's Hana District Police Station and Equipment Baseyard. The proposed site is approximately one (1) mile from the center of Hana Town. See Figures 1 & 2.

The subject property is located between Hana Highway and Uakea Road with frontage along both roadways. The property is approximately 1.0 acre and slopes towards the sea, from Hana Highway to Uakea Road.

There are no structures on the site. A recently bulldozed access road with cinder cover presently enters the property from the County Baseyard. Portions of the parcel have recently been disturbed by grubbing and bulldozing activity. Approximately 40% of the parcel is covered by new growth vegetation, while the remainder is wooded (see section II.A.5 Flora and Fauna, below.)

Ownership of the parcel was recently transferred to the County of Maui by Keola Hana Maui.

B. PROJECT NEED

The proposed project will improve service response in the Hana region of the County. Existing fire protection services in Hana are provided by the Maui County Fire Department which has a substation at the site of the County's Equipment Baseyard, adjacent to the project site. The existing service is limited. There is presently one full-time fire fighter stationed there who is assisted by approximately 25 volunteers. This fire fighter works five days a week, 8 to 12 hours a day. Weekends are covered by

the volunteers who have an emergency plan when the full-time fire fighter is off duty. Existing fire stations which provide service to the eastern portion of the island are the Paia and Makawao stations. In the case of emergencies requiring outside assistance, it takes over three hours for equipment and personnel from these stations to reach the Hana area. In the event that additional fire personnel are needed they must be flown in by helicopter from Kahului. Although the existing service level does provide some protection for Hana residents, service capability is limited due to inadequate staffing levels and the region's remote location.

The proposed fire station will improve the staffing situation in Hana by providing 24 hour protection, seven days a week. Fifteen personnel will be assigned to the station, with five fire fighters on duty per 24 hour shift. By strategically locating a station in the middle of the remote Hana region, response times for emergency rescue situations will be dramatically improved. The station will also provide assistance in medical emergency situations. In sum, the station will provide improved coverage for the residents of the Hana area, and will add to the service capability within the remote areas of East Maui.

C. PROPOSED IMPROVEMENTS

The proposed Hana Fire Station consists of a single story concrete masonry unit (CMU) and wood-framed structure of approximately 3,900 square feet, which will include a parking garage for two (2) fire trucks, a dining/meeting room, a kitchen, a dormitory, providing space for six (6) beds, lavatories, showers, officer's quarters, office space, an emergency generator room, a fire extinguisher room, and a weight room. See Figures 3 through 6. In addition to the CMU structure, there will be an above-ground fuel storage tank, a concrete pad truck turn-around and wash area (approximately 33 by 35 feet), an oil interceptor, emergency traffic signal lights and a septic tank.

Access to the new station will be from Hana Highway. A total of fourteen (14) parking stalls and a handicapped stall are proposed for employee and public use.

Preliminary estimates indicate that the project will cost approximately \$1.2 million. Assuming applicable permits are obtained, construction of the proposed project is scheduled to begin in the second half of 1994, with completion targeted for early 1995.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL SETTING

1. Surrounding Land Use

The Hana area in the vicinity of the project site is characterized by a rural setting, consisting of single family residential houses on a variety of lot sizes, interspersed with a number of small farms and the large land holdings of Keola Hana Maui.

To the north of the property, at the intersection of Hana Highway and Uakea Road, is the County's Hana Equipment Baseyard and Hana District Police Station. The Hana Medical Center is located off Hana Highway, within 100 ft. to the northwest of the intersection of Hana Highway and Uakea Road. To the east, across Uakea Road, are a number of residential houses on lots ranging from 1 to 2 acres in size. To the west, across Hana Highway, are vacant lands owned by Keola Hana Maui which are densely vegetated. To the south of the parcel lies the Holoinawawae stream bed. Further east, towards Hana Town, are some vacant lands and, about 1/4 of a mile from the project site, the Hana Ranch Houselots subdivision.

2. Climate

Hana's climatic pattern is heavily influenced by the northeasterly tradewinds and is typical of windward areas in the Hawaiian islands. Rainfall averages approximately 75 inches annually with showers usually more frequent during the night and early morning. Average temperatures range from lows in the low 60's to highs in the mid 80's.

3. Topography and Soil Characteristics

The subject property is located on the eastern edge of Haleakala at an elevation of 114± M.S.L. to 81± M.S.L. The region is typified as having moderate slopes that are cut by numerous streams and gullies. The average slope of the project site is approximately 10%, sloping down in an easterly direction from the high point along Hana Highway, towards Holoinawawae stream and Uakea Road to the northeast. An existing drainageway traverses along the easterly boundary.

Underlying the site and surrounding lands are soils belonging to the Hana-Makaalae-Kailua association. According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soil types specific to the site are the Hana very stony silty clay loam 3 to 25 percent slopes (HKLD), and Hana extremely stony silty clay loam, moderately deep variant, 3 to 15 percent slopes (HKOC). Permeability for both of these soil types is moderately rapid, runoff is slow to medium, and the erosion hazard is slight to moderate.

Lands underlying the project site are designated "D" lands by the University of Hawaii Land Study Bureau. The classification system rates land on a scale of "A" to "E", reflecting land productivity characteristics. Lands designated "A" are considered to be of highest productivity, with "E" rated lands ranked lowest.

4. Flood Hazard

The proposed project site is designated by the Flood Insurance Rate Map as Zone C, an area of minimal flooding and no tsunami hazard.

5. Flora and Fauna

According to the botanical survey prepared for the project, flora on the site reflects a native habitat which has been heavily invaded by introduced species due to the actions of past human disturbances. No plants which are listed as threatened or endangered by the U.S. Fish and Wildlife Service were found on the property.

6. Archaeological Resources

As noted above, a substantial portion of the project site has been previously disturbed, thus, minimizing the potential of encountering significant cultural resources. An archaeological survey of the site concluded that no apparent significant cultural resources are located on the project site. (For complete results of the Archaeological Survey and Botanical Report see appendix A.)

7. Air Quality

There are no point sources of airborne emissions in the immediate vicinity of the project site. The air quality of the Hana region is considered good, with any existing airborne pollutants attributed to automobile exhaust. The immediate area is periodically subject to equipment emissions associated with the County's Hana Equipment Baseyard.

8. Noise Characteristics

Surrounding noise levels in the Hana Region are characteristic of its rural atmosphere and are considered relatively low. Background noise levels are attributed to natural (e.g. wind) conditions, traffic from Hana Highway and Uakea Road, and the periodic operation of County maintenance equipment such as backhoes, dump trucks, graders, etc.

9. Visual Resources

The site's topography and vegetation is typical of the Hana region and does not represent an important or unique visual resource. Views from the project site are somewhat limited both in the mauka and makai directions.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population

The population of the County of Maui has exhibited relatively strong growth over the past decade with the 1990 population estimated to be 100,374, a 41.7% increase over the 1980 population of 70,847. Growth in the County is expected to continue, with resident population projections to the years 2000 and 2010, estimated to be 123,900 and 145,200, respectively (DBED, 1990).

The estimated 1990 population of the Hana Community Plan region is 1,895. A projection of the region's population estimates an increase to 2,170 by the year 2000. By the year 2010, population in the region is anticipated to range between 2,349 to 2,452 (Community Resources, Inc., 1992)

2. Economy

The economy of the Hana region is dominated by the tourism industry, other economic activities include diversified agriculture and ranching. The Hotel Hana-Maui is the region's largest employer; in 1991 the Hotel employed 190 full-time and 52 part-time employees (before layoffs). The region is a popular day trip destination for tourists. The non-overnight traveler generates significant economic activity for the region.

C. PUBLIC SERVICES

1. Police and Fire Protection

The County of Maui's Police Department is headquartered at its Wailuku Station. The Hana region is served by the Hana District Police Station which is located adjacent to the project site.

Presently, fire protection services for the Hana region are provided by the Maui Department of Fire Control which has a substation located at the County's Hana equipment baseyard. There is presently one full-time fire fighter (40 hours per week) stationed there who is assisted by approximately 25 volunteers. The volunteers are primarily made up of County Public Works employees whom train two to three times a year.

The substation includes a garage for a fire truck along with minimal living quarters for the full-time fire fighter. The fire truck can hold up to 750 gallons of water and is capable of pumping 1500 gallons of water per minute.

2. Solid Waste

Currently on Maui there are only two operating landfills, the Central Maui Landfill in Puunene and the Hana Landfill. The Hana landfill is a County maintained facility located makai of Hana Highway near Kainalimo Cove and is 30 acres in size. County Public works staff have indicated that the site is about 20 percent filled and has an estimated remaining life of 20 to 25 years.

3. Schools

The State of Hawaii, Department of Education, operates the Hana High and Elementary School which serves the Hana Region. Current enrollment for the school is 455.

4. Recreational Facilities

Public recreational facilities in the region consist of Koki Beach Park, Hana Bay Beach Park, Hana Community Center, Hana Ball Park, Hana Tennis Courts and the Hana High and Elementary School gymnasium.

D. INFRASTRUCTURE

1. Roadways

Hana Highway (State Highway 36 & 31) is the main roadway serving the Hana region. Hana Highway is a belt highway which circumvents Haleakala and provides access to central Maui via Keanae or Kipahulu. Uakea Road provides a secondary access to Hana Town and Harbor. The project site is located in the vicinity of the intersection of Uakea Road and Hana Highway; both roadways border the project site. Access to the project site will be via Hana Highway.

2. Wastewater

The Hana region is not presently served by a County wastewater treatment facility. Facilities in this region must provide individual treatment systems. The State Department of Health regulates wastewater disposal through the implementation of Chapter 62, Hawaii Administrative Rules.

3. Water

The subject area is served by the Department of Water Supply's Hana water system. The system is served by three deep wells, two at Wakiu and one at Hamoa, located at the north and south ends of the system, respectively. A series of pipelines connect the Wakiu source to the project site. According to the 1990 Maui Water Use and Development

Plan, the Hana sources are expected to meet the water needs of the Hana-Hamoa-Wailua area to the year 2010.

4. Drainage

there is an unnamed drainageway which crosses Hana Highway immediately northwest of the project site. The drainageway meanders adjacent to the existing buildings within the County baseyard and traverses along the easterly boundary of the project site. It then runs parallel and mauka of Uakea Road until it intersects with Holoinawawae Stream approximately 400 feet south of the project site. At this intersection, the combined drainageway crosses Uakea Road and eventually discharges into Hana Bay.

The crossing at Uakea Road consists of a 102" culvert and a 9' X 5.5' arch pipe. It is estimated that this drainage system can convey approximately 1,200 cfs under Uakea Road before overtopping the roadway.

Drainage study calculations show that approximately 2.1 cfs currently sheet flow across the site into the existing drainageway.

5. Electrical

Maui Electric Company, which has utility poles and over head lines located adjacent to the project site, will provide electrical service to the site.

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Surrounding Uses

The project site is located adjacent to the County's Hana Equipment Baseyard and the Hana District Police Station. The Hana Medical Center is also located just northwest of the Hana Highway/Uakea

Road intersection. The State operated Ambulance is also located at, and operates out of, the Hana Medical Center. Therefore, various public uses are currently established in the immediate vicinity of the project site. The proposed project is not anticipated to have any adverse effects on surrounding land uses.

2. Topography/Landform

The proposed project will involve the clearing, grubbing and grading of approximately one (1) acre of land that is presently undeveloped. Excavation and filling will be required for the construction of the new facility. In general, however, finished contours will follow existing grades to minimize earthwork costs. Therefore, the project is not expected to result in any negative impacts to the topography or landform.

3. Flora and Fauna

The proposed project will result in a removal of existing vegetation from the site, however, the botanical survey performed for the project concludes that no apparent significant floral resources are located on the site. The project will be landscaped with plants which are consistent with the character of the Hana region.

4. Archaeological Resources

Results from the archaeological inventory survey indicate that no apparent significant cultural resources are located on the subject parcel, thus, there should be no impact to cultural resources. In the event that cultural remains are encountered during the site excavation process, an adequate mitigation plan will be developed in conjunction with the State Historic Preservation Office.

5. Air Quality

Air quality in the immediate vicinity of the project is anticipated to be affected over the short term by construction activities. Proper emission control devices and dust control measures, such as regular watering, will minimize these potential impacts.

On a long-term basis, the project will not generate adverse air quality conditions. The Hana Fire Station facility operations will not result in the release of noxious gases, particulates or odors.

6. Noise

Ambient noise conditions will be affected over the short-term by construction activities. Construction equipment, such as bull dozers, front end loaders and materials-carrying trucks, would be the dominant source of noise during the site construction period. Construction is anticipated to be limited to daylight hours only and will be minimized through proper adherence to Department of Health noise regulations regarding construction equipment. Construction noise should not have a significant adverse impact on the vicinity.

On a long-term basis, fire alarms and fire truck sirens normally associated with fire department activities will generate noise for brief periods. However, these sirens and alarms are intended for immediate responses to emergency situations, and are necessary from a public safety standpoint. The proposed project is not anticipated to generate adverse noise conditions for sustained periods of time.

7. Visual Resources

The proposed project is not part of a scenic corridor and will not have an adverse impact upon the visual character of the area.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population and Local Economy

On a short-term basis, the project will support construction and construction-related employment.

On a long-term basis, the project will aid the long-term economic vitality of the region by ensuring the integrity of fire protection services for its residents and business. Additionally, improved fire protection resulting from the proposed project will promote the public health, safety and welfare of the Hana region.

2. Public Services

The proposed project will improve emergency services within the Hana region as described in section I.B above.

The Hana Fire Station will require the employment of 5 full time firefighters. At this staffing level, the employment related impacts of the project upon public service needs, such as police, medical facilities, and schools are not considered significant.

C. INFRASTRUCTURE

1. Roadways

Emergency access for firefighting vehicles will be directly to Hana Highway. Emergency traffic signal lights are proposed to be constructed at the emergency access driveway's intersection with Hana Highway. The lights are needed from a traffic safety standpoint and would be utilized only during emergency situations. Implementation of the signal lights will be coordinated with the Department of Transportation.

Five (5) employees are projected to be stationed at the fire station per 24-hour shift. There will be three (3) work shifts with a total of fifteen (15) employees assigned to the Hana Fire Station. With the relatively low number of trips generated by the proposed use, the project's impacts upon the public roadway system are not expected to be significant. According to State Department of Transportation personnel, all traffic movements at the intersection of Hana Highway and Uakea road experience little or no delay during both morning and afternoon peak hours.

2. Water

The proposed project is anticipated to generate an average daily water demand of 600 gallons per day. Moreover, the project would incorporate Xeriscape® principles to minimize the impact of water usage for landscape irrigation. Appropriate water system improvements will also be constructed to address fire flow requirements. The project is not expected to have a significant impact upon the water source, storage and transmission system in Hana.

3. Drainage

Runoff from the project site will continue to flow into the existing drainageway and along its existing pattern. Alterations to the existing drainage pattern will be kept to a minimum. Drainage study calculations show that approximately 3.7 cfs of surface runoff will be generated from the project site after development. Accordingly, there will be a net increase of 1.6 cfs (3.7 cfs - 2.1 cfs) due to the proposed development. The drainage study concluded the proposed development will not have an adverse effect on the adjoining properties downstream or on coastal waters.

4. Wastewater

The proposed project is anticipated to generate an average daily flow of approximately 400 gallons per day of wastewater. The site is not

serviced by a County wastewater treatment system and is considered a critical wastewater disposal area. Thus, septic tanks will be utilized for wastewater disposal.

5. Other Infrastructure Systems

The proposed project will not have any significant impact on solid waste or electrical systems. With a building floor area totaling approximately 3,900 sq. ft. and a staff level of five (5), the impacts upon the infrastructure systems are expected to be negligible.

IV. RELATIONSHIP TO GOVERNMENT PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

The Hawaii Land Use Law, Chapter 205, Hawaii Revised Statutes, establishes four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agriculture", and "Conservation". The subject property is located within the "Rural" district. Public uses are permitted within the State "Rural" district, thus, the proposed fire station is consistent with the State Land Use Law.

B. GENERAL PLAN OF THE COUNTY OF MAUI

The General Plan of the County of Maui (1990) update provides long term goals, objectives and policies directed toward the betterment of living conditions in the county. Addressed are social, environmental, and economic issues which influence future growth in Maui County. The following General Plan objective and policies are addressed by the proposed project:

Objective: To create an atmosphere which will convey a sense of security for all residents and visitors and aid in the protection of life and property.

Policy:

- Reduce fire losses by improving and maintaining fire fighting apparatus.
- Locate fire, police and life saving stations in convenient areas.
- Improve personal and community safety programs.

C. HANA COMMUNITY PLAN

Nine (9) community plan regions have been established in Maui County. Each region's growth and development is guided by a Community Plan which contain objectives and policies in accordance with the County General Plan. The purpose of the Community Plan is to outline a relatively detailed agenda for carrying out these objectives.

The proposed project is located within the Hana Community Plan region. The proposed project would facilitate implementation of the Hana Plan by addressing the objective to "Provide emergency rescue and medical services."

Maps are included within each Community Plan in order to capture spatially the intent of the plan. The project site is designated "Single Family" by the Hana Community Plan Land Use Map.

The County of Maui Planning Department is currently undertaking a ten year review all nine (9) community plans. Citizen Advisory Committees (CACs) have been established for the purposes of recommending appropriate revisions to the plans. The Hana CAC completed its work in late 1992. The CAC recommended amending the Land Use Map by designating the project site as Public/Quasi Public in order to accommodate the proposed fire station.

V. FINDINGS AND CONCLUSIONS

The proposed Hana Fire station will increase service and improve response times in the Hana region. Improved fire protection resulting from the proposed project will promote the health, safety and welfare of the region.

The proposed project will involve earthwork and building construction activities. In the short term, these activities may generate temporary nuisances normally associated with construction activities. All construction activities are anticipated to be limited to normal daylight working hours. Impacts generated from construction activities are not considered adverse.

From a long-term perspective, the proposed project is not anticipated to result in adverse environmental impacts. The proposed project is anticipated to have "no effect" on significant historic sites. Fire alarms and fire truck sirens normally associated with emergency activities may be significant noise generators for brief but intense periods of time. However, adverse noise conditions are not anticipated for sustained periods of time.

With five (5) employees projected to be stationed at the fire station per 24-hour shift, the proposed project is not anticipated to have an adverse effect upon public service needs, such as police, medical facilities and schools. In addition, the impact upon roadways, water, wastewater, drainage and other infrastructure systems are not considered significant.

In light of the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

VI. AGENCIES CONTACTED IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

The following agencies were consulted in preparing this environmental assessment:

County of Maui

1. Department of Planning
2. Department of Public Works and Waste Management

Engineering Division

State of Hawaii

1. Department of Land and Natural Resources

Division of Historic Sites

2. Department of Transportation

FIGURES

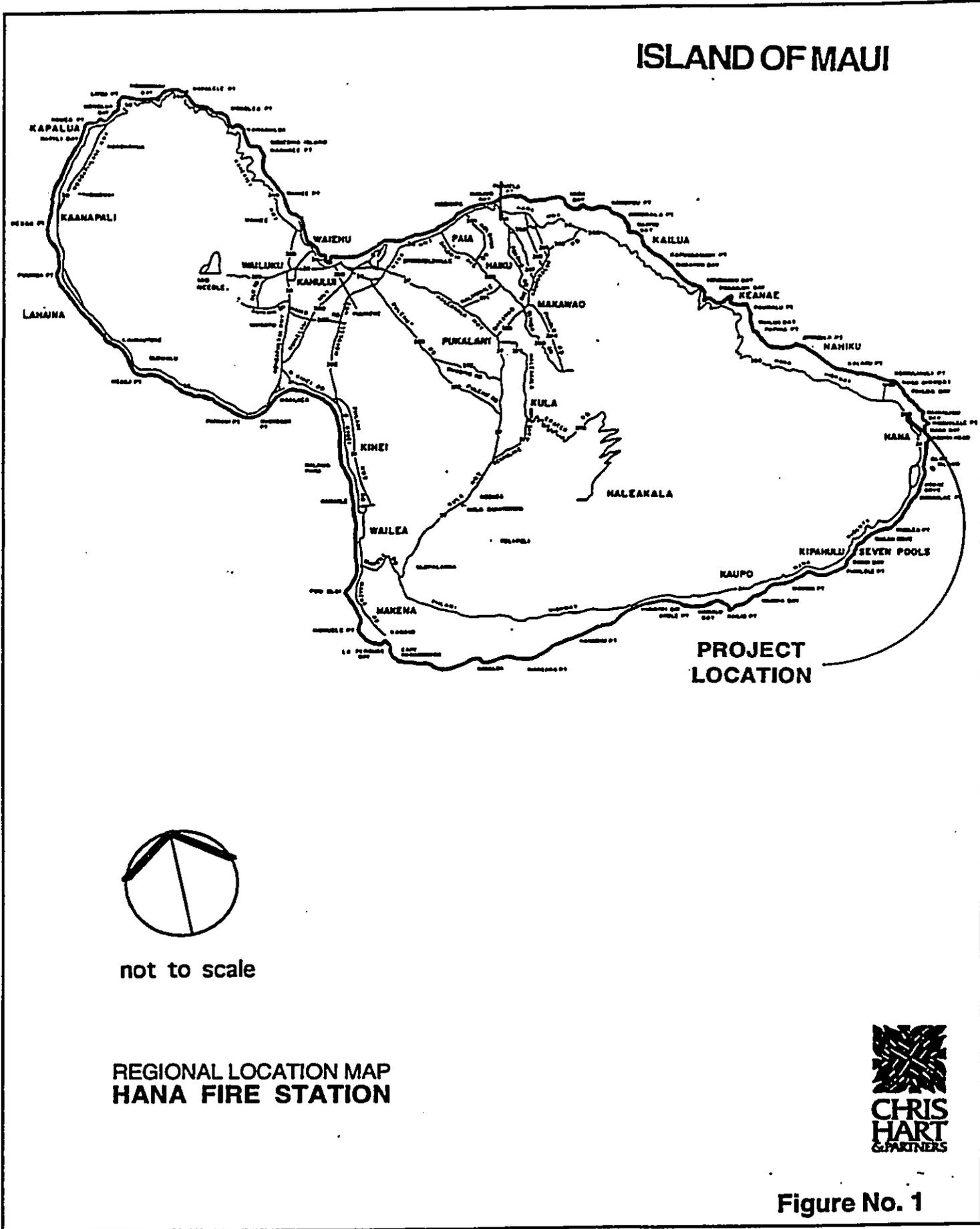
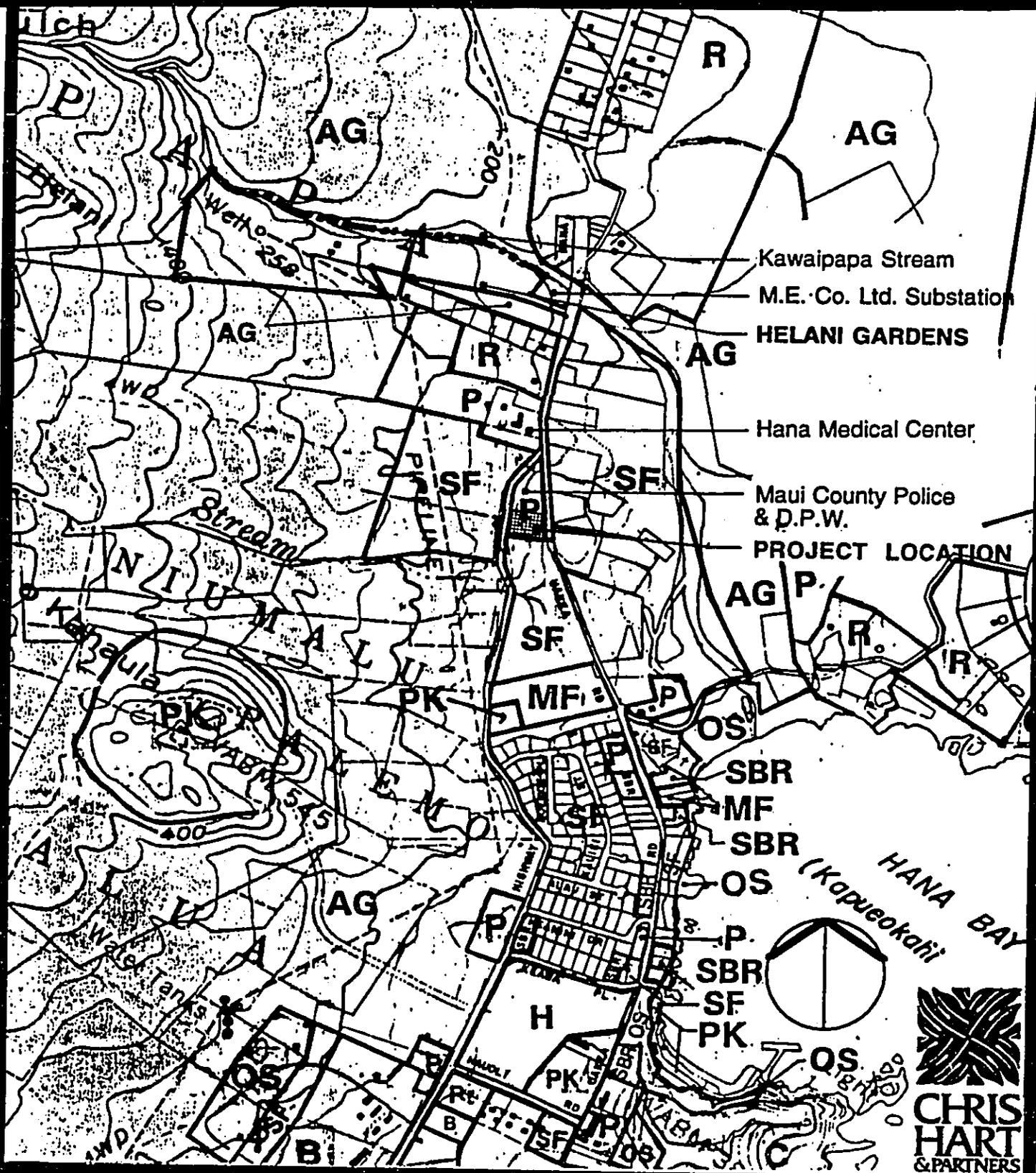


Figure No. 1



HANA FIRE STATION
 Hana, Maui, Hawaii
 TMK 1-4-6: 2

LOCATION MAP

FIGURE NO. 2

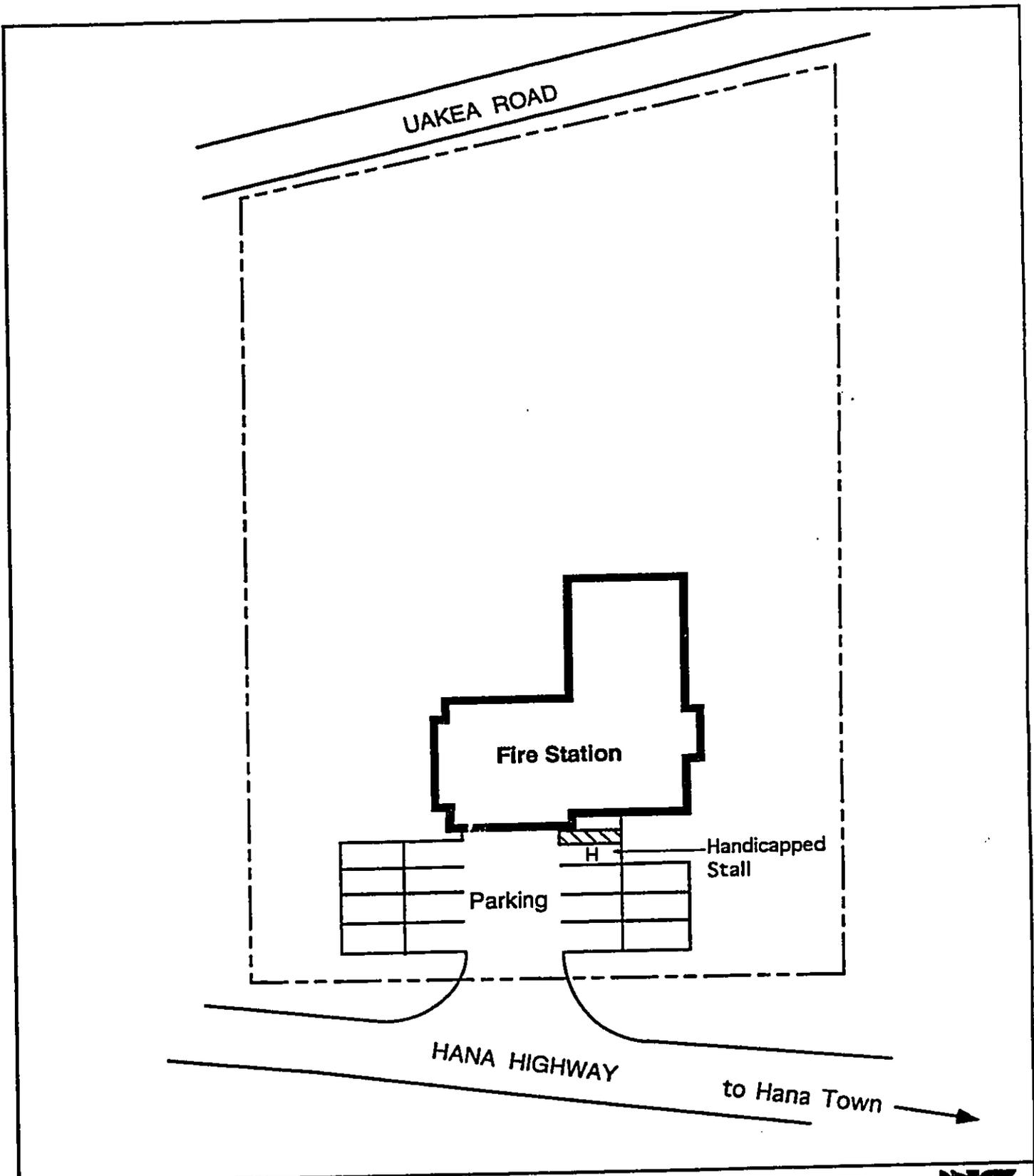


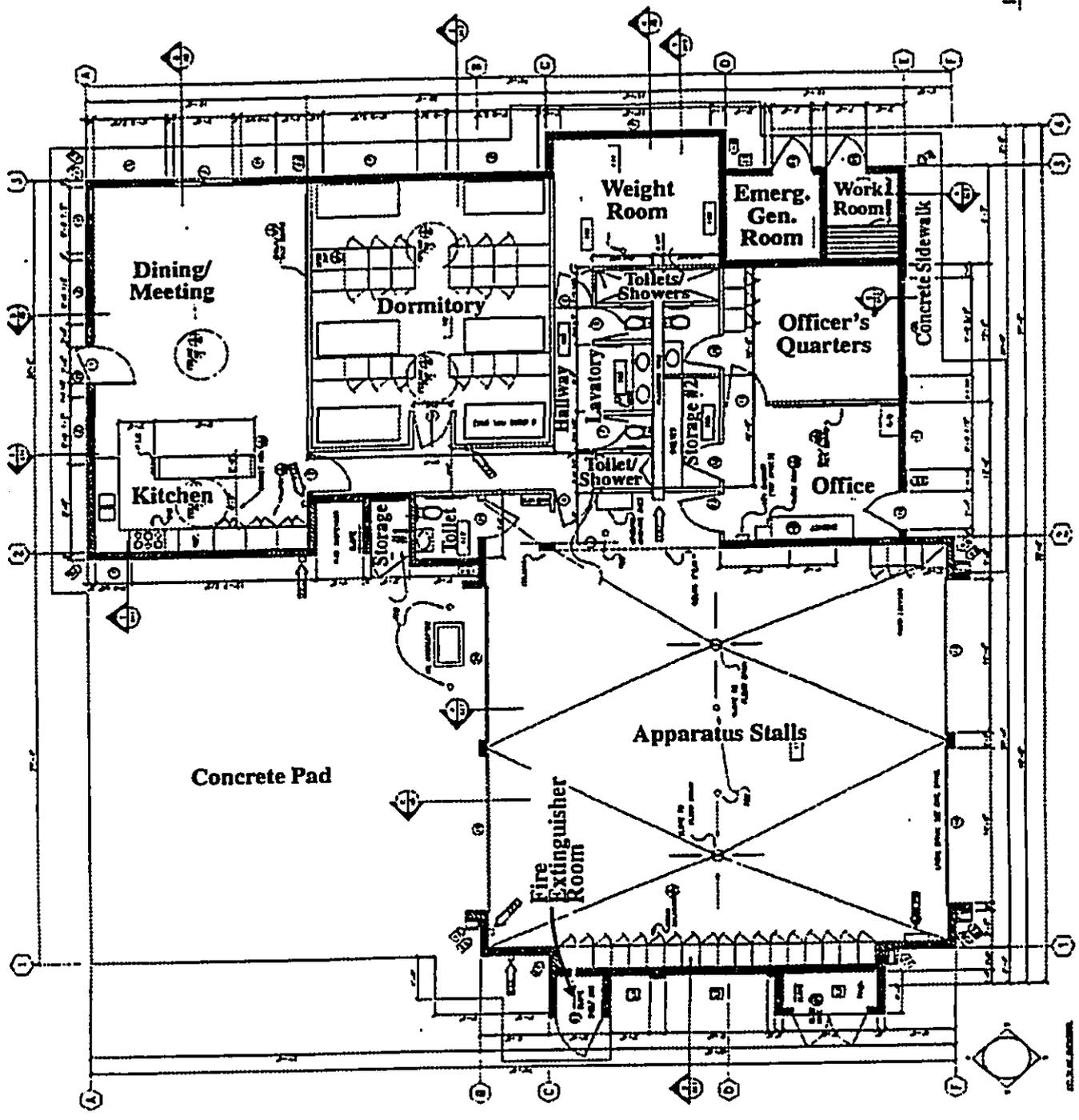
Figure 3



1"=40'-0"

HANA FIRE STATION
Preliminary Project Site Plan





Source: Bayless Architects, Inc.

Figure 4

Hana Fire Station
Preliminary Floor Plan



NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire Control

Appendix A
Archaeological and Botanical Survey Report

**AN ARCHAEOLOGICAL INVENTORY
SURVEY ON A PARCEL OF LAND LOCATED IN THE
AHUPUA'A OF KAWAIPAPA AND
NIUMALU, HANA DISTRICT, ISLAND
OF MAUI
(TMK 1-4-06: 2)**

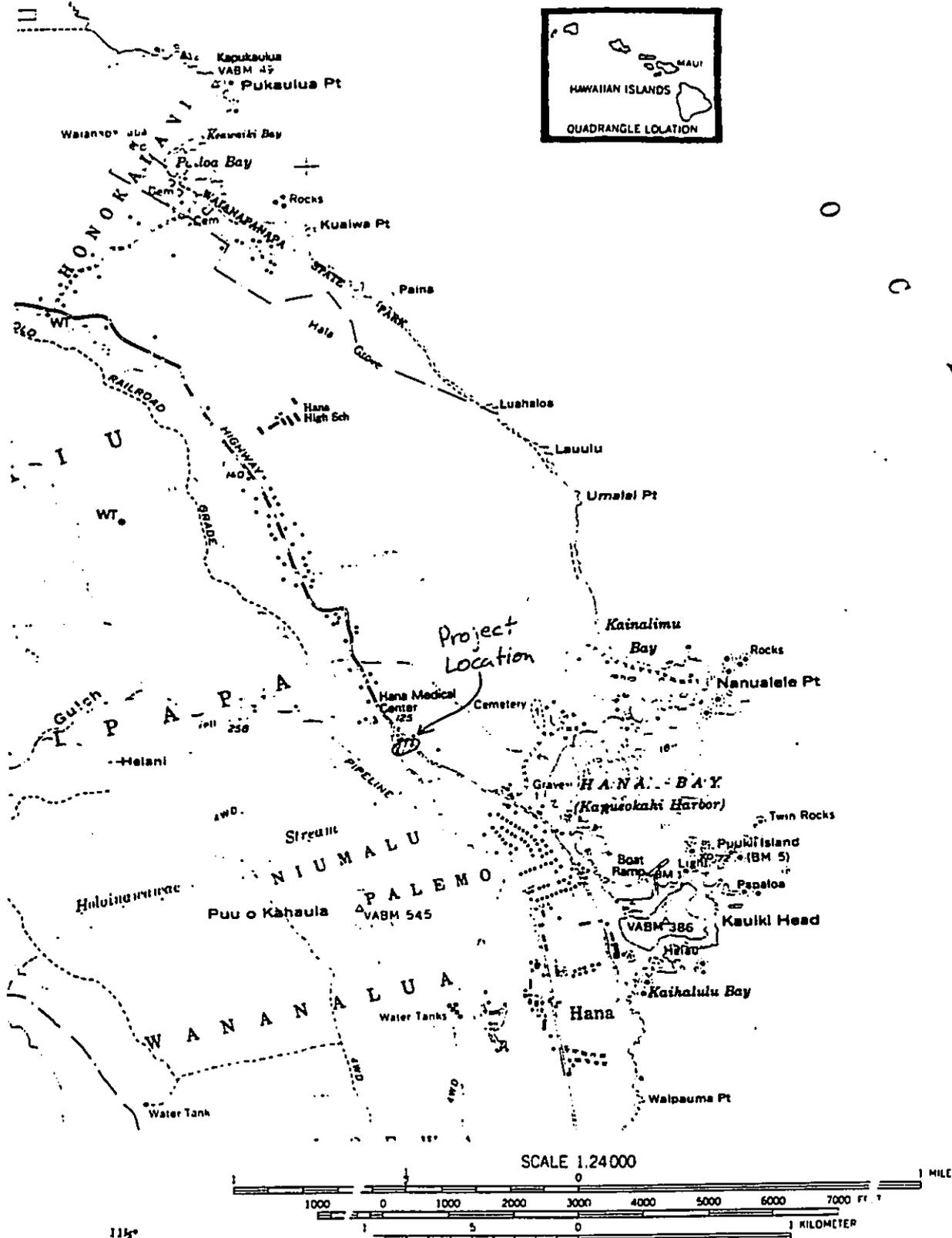
Prepared for:

**Chris Hart & Partners
305 E. Wakea Ave.
Kahului, Hawaii**

Prepared by:

**Walter M. Fredericksen
Erik M. Fredericksen
Demaris L. Fredericksen**

November, 1993



MAP 1 - Topographic Map, Hana Quadrangle, U.S. G.S. Scale 1:24,000.

TABLE OF CONTENTS

List of Maps, Figures and Photographs.....	i
Abstract.....	1
Introduction.....	2
Study Parcel.....	2
Historical Background Research.....	3
Archaeological Background Research.....	4
Archaeological Field Methods.....	5
Archaeological Field Results.....	5
Summary and Conclusions.....	7
Bibliography.....	8
Appendix I - Botanical Study, by David Paul.....	9
Maps.....	16
Figure.....	19
Photographs.....	20

LIST OF MAPS, FIGURES AND PHOTOGRAPHS

MAP 1 - Topographic Map. Hana Quadrangle. U.S. G.S. Scale 1:24,000.

**MAP 2 - Tax Map, Department of Tax Commissioner. Taxation Map Bureau.
State of Hawaii. Zone 1. Section 4, Plat 06.**

**MAP 3 - Topographic Site Map. produced by Akamai Land Surveying, Makawao.
Maui, showing test units done by Namanek Researches.**

MAP 4 - Ahupua'a of Hana Area

FIGURE 1 - Test Unit 1: West Face Profile.

PHOTO 1 - View from Hana Highway Across Subject Parcel to the East

PHOTO 2 - View of the Parcel Looking Toward the Southwest.

PHOTO 3 - Test Unit #1 - Excavation in Process.

ABSTRACT

An archaeological inventory survey was conducted at TMK 1-4-06:2, a one acre parcel at Hana, Maui, the proposed site for a new Fire Station. Both a surface survey and subsurface testing were undertaken and completed. The parcel had been disturbed by previous agricultural and land-grubbing activities. There were no cultural materials or features discovered during the survey and subsurface tests. No further archaeological work is recommended for the parcel.

A botanical survey was also completed. An extensive catalog of flora on the parcel is presented in this report as Appendix 1. No rare or endangered plants were found. No biological resource was found deserving priority for legal protection or conservation. The proposed project will have no adverse effect on significant plant communities.

INTRODUCTION

Chris Hart & Partners contacted Xamanek Researches by letter, August 5, 1993, regarding an archaeological inventory and botanical survey for a one acre parcel of land in the *ahupua'a* of Kawaipapa and Niunalu, Hana District, Island of Maui (Map 1). It is shown on TMK 1-4-06: 2 and is the proposed site for the Hana Fire Station (Map 2). We submitted our proposal for the project on August 10, 1993, and were notified of acceptance on September 23, 1993.

Because a previous reconnaissance survey done by Paul Cleghorn in October, 1988, had located four sites on TMK 1-4-06: 1, an inventory survey was included as a requirement for the SMA permit. The botanical survey was also stipulated among the criteria for the EA permit (Letter from Chris Hart, dated September 23, 1993).

STUDY PARCEL

The project site area is about one acre in extent, bordered on the north by the existing Hana Police Station and Maui County Base Yard (Map 3). The western border is formed by Hana Highway and the eastern by Uakea Road. The southern border is wooded. The parcel's topography slopes from west to east towards the sea. There is an intermittent stream bed that traverses the northern portion of the property. A recently bulldozed cinder covered access road enters the subject parcel from the County Base Yard. Central portions of the study parcel have been grubbed and cleared (Photos 1 & 2). Approximately 50% of the parcel exhibits new vegetative growth, while the remainder is wooded.

Natural History

Uncleared portions of the subject parcel are representative of the *Coastal Mesic Forest* typical of the Hana region on the windward side of Maui (Gagne and Cuddihy, 1990). Recent grubbing and bulldozing activities have modified the land, causing surface and some subsurface disturbance.

The area falls within the physiographic region, *Hana Dissected Upland*, and geologically is part of the post-erosional lavas (University of Hawaii, 1973, pp. 30, 34). Elevations for the parcel range from 78 to 114 feet AMSL (Topographic Survey Map, Akamai Land Surveying, 1993). Annual rainfall for this region averages 1750 mm. or 69 inches (University of Hawaii, 1973, p. 55-56).

The major soil classification includes *Inceptisols*, which typically have developed on a thin mantle of volcanic ash, overlying *a'a* lava (Ibid., p. 41). The soils in this region are classified as part of the Hana Series and are described as well-drained clayey loam with stony inclusions (Foote, et al., 1972, p. 37).

Vegetation type on the parcel is identified as *Coastal Mesic Forest*, heavily invaded by introduced species due to the actions of past human disturbances. For a detailed listing and description of the flora on the subject parcel, see Botanical Survey, by David Paul, Appendix 1 of this report.

HISTORICAL BACKGROUND RESEARCH

Land Use

The subject parcel is part of Grant 1982, to Kahananui, et al., in the *ahupua'a* of Kawaipapa and Niumalu, Hana District, Maui, Hawaii, which was granted in 1856. The original grant totaled 96.56 acres, and comprises only a portion of Tax Map Key 1-4-06. The survey parcel is listed as TMK 1-4-06: 2, and was formerly owned by Hana Ranch. Keola Hana Maui, the most recent owner of the subject parcel, donated the parcel to the County of Maui (Maui News, September 26, 1993). The County plans to build a Fire Station on the parcel.

Archaeological studies at Wainapanapa State Park produced examples of unusual cultural adaptive strategies (Pearson, 1970). In terms of prehistoric settlement patterns, the Hana area exemplifies aspects of human ecology not as readily accessible anywhere else in Hawaii. Exploitation of the wet, exposed windward shores of the islands resulted in variations in settlement patterns which included scattered homesteads instead of the more typical nucleated villages found elsewhere (Pearson, 1970, pp. 25-26). Because of the dense undergrowth typical of the Hana area, discovery of relevant features has been difficult (Ibid.). Also, agricultural and ranching activities, and more recently tourism construction, have undoubtedly destroyed many sites (Ibid., pp. 27-29).

A useful discussion of legends and myths, and traditional and historic land use in Hana is presented by Rogers (Cleghorn and Rogers, 1987, pp. 4-12) in "A Historical Sketch of Hana". The reader is referred to this work for a more complete presentation of land use in the Hana area. The brief discussion which follows is based on her work.

In discussing probable prehistoric and historic land use for the Hana area, Rogers (Ibid., p. 11) notes that: "The testimony records give clues on how the land was used--taro (both wet and dry) and sweet potatoes were cultivated as were sugar and coconuts. Pigs were also raised."

Whaling activity and industry, begun in the 1840's, decreased in importance toward the middle of the 19th century, and commercial sugar began to replace it as the economic base in Hawaii. Hana had six sugar companies operating in the area, with two of them, Hana Plantation (founded 1851) and Reciprocity Sugar Company (founded 1883) being the largest ones (Ibid., pp. 11-12).

Sugar production was plagued by labor difficulties, and in 1946 Paul Fagan purchased what is now known as Hana Ranch as an economic buffer against the failing sugar industry. During that same year he opened the Hotel Hana-Maui, bringing tourism to the area (Ibid., p. 12).

Presently, ranching activities continue as an important facet in the local economy. Tourism is growing, however, and plays an increasingly important economic role in Hana.

Historic agricultural land use in the Hana area has undoubtedly had an effect on surface and subsurface archaeological features that were formerly present. As Cleghorn states in his report on archaeological work in Hana (1988, p. 4):

"...this area was extensively utilized in historic times, first for commercial sugar production and later for cattle ranching. There is a strong possibility that these activities obliterated evidence of earlier land use, leaving an extensively flattened and modified landscape with no remaining surface archaeological features."

ARCHAEOLOGICAL BACKGROUND RESEARCH

A review of records of the Department of Land and Natural Resources indicates the presence of four archaeological sites on the parcel south of the subject parcel. The four known sites are located on TMK 1-4-06: 1. They were discovered by Cleghorn during a 1987 archaeological survey. All of the sites were visual surface features found during their pedestrian survey (Ibid.). The State of Hawaii site numbers are: 1) 50-13-1834, 2) 50-13-1835, 3) 50-13-1836, 4) 50-13-1837.

Site 1834 is a double-faced, core-filled stone wall, considerably disturbed by road construction. Site 1835 consists of an overhang shelter containing midden material. Site 1836 is a possible irrigated agricultural system composed of two terraces, a modified outcrop and the remains of an irrigation ditch (or *'auwai*). Site 1837 is a probable historic stone retaining wall (Ibid., pp. 5 - 8).

Of the four sites, Site 1834 is nearest the subject parcel. However, this site appears to be approximately 70-80 meters to the southeast of the study area. The relative proximity of Site 1834 and the three other sites was a consideration in the decision to undertake the present archaeological inventory survey.

ARCHAEOLOGICAL FIELD METHODS

On-site fieldwork was conducted by four research personnel on October 10, 1993. Initially, the one acre parcel was visually inspected for surface signs of cultural material. As noted earlier in this report, a substantial portion of the study area appears to have been recently grubbed by a bulldozer. Due to the lack of surface features and the disturbed nature of a significant amount of the parcel, subsurface testing was deemed to be an appropriate part of the survey.

Two manually excavated test units (each .5 m. x 1 m.), six shovel tests (S.T.) and six auger tests (A.T.) were placed in the disturbed portion of the parcel (Map 3). Field personnel sifted all soil from the test units through .25 inch mesh screen. Shovel test and auger test back dirt was visually inspected. Field notes were recorded on site and photographs were taken where appropriate. All subsurface tests were plotted on a site map. Possible artifacts were collected after field recording for later description and analysis.

ARCHAEOLOGICAL FIELD RESULTS

Surface Walkover

The walkover survey revealed a substantial lava rock wall along the eastern border or Uakea Road side of the parcel, and a low wire fence along the Hana Highway. However, this fence is just off the subject parcel. There were no other features observed on the surface of the property.

The lava rock wall is well constructed and approximately .9 to 1 meter in height by 1 to 1.2 meters in width. It is three to four stone courses in height, double faced and core-filled. This wall begins at the northeastern corner and serves as the eastern boundary for the parcel. The wall parallels Uakea Road and continues for some distance to the southeast beyond the subject property. This rock wall is covered with vegetation and generally obscured from view. Some concrete appears to have been utilized in portions of this structure.

Results of Subsurface Testing

As previously mentioned, subsurface testing consisted of two hand-excavated test units, six shovel tests and six auger tests (Map 3). A brief discussion of these results is presented below.

Test Unit I

Dimensions of this test unit were .5 x 1 meter by .75 meter deep. Two soil layers were encountered (Figure 1). Layer I was approximately 25 cm. thick. This soil was reddish brown in color (5YR 3/3) with a granular texture. Quantities of small (4-8 cm. diameter), angular lava rock were present in this soil layer. Some scattered charcoal flecking was encountered within 10 - 15 cm. of the surface. No effort was made to accumulate a testable sample of carbon for Carbon 14 analysis since no cultural material was discovered during the survey.

No midden was located during the screening process (100% sample, .25 inch mesh screen). However, one small (5 cm. diameter) water worn stone was found in this layer. Visual inspection showed that the stone was unmodified.

Layer II (25 - 75 cm. b.s.) soil was more brownish in color (5YR 3/4) than Layer I soil. Layer II soil had a higher clay content and was finer textured than Layer I. Lava rock inclusions decreased as depth of excavation increased. No midden was found in Layer II material (100% sample, .25 inch mesh). One possible artifact was recovered. It is a relatively large basalt flake (59.5 mm. length by 27.4 mm. width by 14.5 mm. thick). The basalt is coarse grained and of poor quality. This flake does not appear to have been utilized or worked. In addition, one fire cracked rock was noted in Layer II. Both the flake and fire cracked rock were found at a depth of 30 to 40 cm. below surface.

Test Unit II

Dimensions of this test unit were .5 x 1 meter by .6 meter deep. Soil stratigraphy was similar to Test Unit I. However, no charcoal flecking was noted in this excavation. No midden was located during the screening process (100% sample, .25 inch mesh screen). Layer I (0 - 20 cm. b.s.) was sterile, while Layer II (20 - 60 cm. b.s.) yielded one possible polishing stone (61 mm. long by 51.5 mm. wide by 34.5 mm. thick). This stone is water worn and may be an ecofact.

Shovel Tests

As noted earlier, each shovel test was visually inspected for cultural material. All six tests were sterile. S.T. 1, 2, 3 and 4 were approximately 25 cm. deep, while S.T. 5 and 6 were 20 and 30 cm. deep, respectively. All tests were c. .5 meter in length. All shovel tests exhibited fairly rocky fill.

Auger Tests

Back dirt from each hand auger test was visually inspected for cultural material. All six tests were sterile. Auger tests generally did not go below 15 cm., due to the rockiness of the soil.

SUMMARY AND CONCLUSIONS

There were no surface archaeological features or architectural structures discovered during the course of the survey, either in the wooded areas or cleared parts of the parcel. No artifacts were encountered during surface walkover observations.

The subsurface test units, shovel tests and auger test produced no midden or other cultural materials. There were no verifiable artifacts recovered from any of the subsurface excavations.

In terms of settlement patterns, historical and archaeological records indicate agricultural land use, including wet and dry taro and sweet potato, for the general Hana area. No surface or subsurface features supporting this land use were discovered during the course of the survey on the subject parcel. More recent activities, including sugarcane production and cattle grazing may well have contributed to the destruction of potential evidence of past land use. It was apparent during the survey that much of the parcel had been disturbed by recent earth moving activities. These actions may have inadvertently obscured any evidence of past land use. However, the general lack of cultural material remains suggests that no surface features were located on the subject parcel.

Considering the results of the survey, it is recommended no further archaeological work be undertaken on this parcel. In terms of the Significance Criteria (SHPD), the study parcel does not exhibit any of the criteria that would deem it significant.

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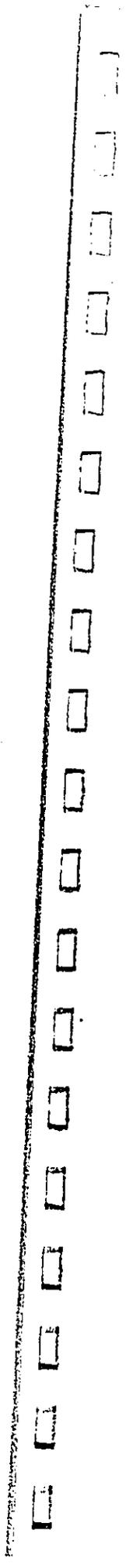
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APPENDIX I

BOTANICAL SURVEY

By

David Paul



BOTANICAL SURVEY

Introduction

A botanical survey was conducted by David Paul (ethnobotanist and consultant to Xamanek Researches) on Oct. 10, 1993 in the area of the proposed fire station (TMK 1-4-06:2) on Niunalu *uhupua'a* in Hana, Maui.

The purpose of this study is to describe the vegetation existing on the land and identify ecologically sensitive plants and communities which may be impacted by the project planned there. Careful consideration was taken in the search for rare and endangered species which are protected by law and might require mitigation.

Methods

The study was initiated by searching literature to point out any plant species which are listed as threatened or endangered by the U.S. Fish and Wildlife Service that might occur within the region. Those listed plants are protected by Federal and State law. Updated lists of threatened and endangered species were researched (from the USFWS, Pacific Islands Office, Honolulu, HI, July 9, 1993) and the plants geographical ranges were determined from the "Manual of Flowering Plants of Hawaii" (Wagner, et al. 1990).

The botanical field survey was executed by walking the perimeters of the property, then going catcomered, and meandering through it. All species of vascular plants which were encountered were recorded. The plant community was matched up with a general vegetation type. Nomenclature used for flowering plants follow Wagner, et al. (1990). Nomenclature for ferns and gymnosperms follow Neal (1965).

Results

Vegetation Type - The existing community is known as "Coastal Mesic Forest" (Gagne & Cuddihy, 1990). It is dominated by a canopy of African tulip (*Spathodea campanulata*), kukui (*Aleurites moluccana*), and Java plum (*Syzygium cumini*). The understory is mostly covered by *pikake hohono* (*Clerodendrum philippinum*), guava (*Psidium guajava*), and *haole koa* (*Leucaena leucocephala*) which are strung with morning glory vines (*Ipomoea alba* & *Ipomoea* sp.); except for areas that were recently disturbed by bulldozing which are covered by castor bean (*Ricinus communis*). The ground cover includes trailing vines of *Philodendron* sp., *'awapuhi* ginger (*Zingiber zerumbet*), *laua'e* fern (*Microsorium scolopendria*) and other shade tolerant species (except in the disturbed areas). A wall which borders the *makai* side of the property is covered by *Wedelia trilobata*. An intermittent stream located behind the *makai* wall has a number of native

hala saplings (*Pandanus tectoris*) along its banks.

This community reflects a native habitat which has been heavily invaded by introduced species due to the actions of past human disturbances.

Rare or Endangered Plants - No plants which are listed as threatened or endangered by the U.S. Fish and Wildlife Service were found on the property. A review of the listed threatened or endangered plant species showed that *Melicope ovalis*, a proposed endangered species, was found in the hills above Hana, Maui in 1920 (Wagner, et al. 1990, p.1198). No members of this species were found on the property.

Discussion and Recommendations

Biological Resource Value of the Vegetation - For the purpose of this report, alien plants and alien dominated plant communities are considered to have no biological resource value. Plants and communities that are considered to have value are 1) rare and endangered native plants, and 2) native plant dominated communities. Plant communities are especially valuable when they contain a variety of plant species found nowhere else.

No legally protected, threatened or endangered species were found on the property. No plants unique to the area were found either. The plant community is dominated by alien species, and only one native species was found in it. All the species are commonly found in similar communities in the State.

Recommendations - No biological resources can be found by this study which deserve or require priority for legal protection or conservation. Therefore, the actions of the project will not impact any species or plant communities with significant biological resource value.

To maintain the plant community in the area, native species such as *hala* (*Pandanus tectoris*) and *naupaka* (*Scaevola sericea*) could be replanted in the area once development is complete. This would reduce the edge effect caused to any surrounding vegetation, stimulate the growth of plants with significant biological resource value in the area, and maintain a tropical Polynesian appeal for the area.

Species List

Key - Botanical Name - comprised of the Genus and species of a plant under it's Family and Sub-Class as depicted by Western binomial nomenclature.

Common Name - comprised of Hawaiian or other locally common terms.

Status - E = endemic, specific to the immediate area.

I = indigenous, specific to a confined geographical region.

P = Polynesian, introduced to Hawaii prior to 1778 (Western contact).

A = alien, introduced into historical or contemporary Hawaii.

The following list is comprized of the plant species which were found during the botanical survey of this property on the 10th of Oct., 1993:

Botanical Name	Common Name	Status
PTERIDOPHYDAE		
POLYPODLACEAE		
<i>Dryopteris dentata</i>	oak fern	A
<i>Microsorium scolopendria</i>	<i>lau:'e</i>	P?
<i>Nephrolepis hirsutula</i>	sword fern	A
GYMNOSPERMIAE		
ARAUCARIACEAE		
<i>Araucaria columnaris</i>	Cook Island pine	A
MONOCOTYLEDONAE		
AGAVACEAE		
<i>Cordyline fruticosa</i> hyb.	colored <i>n</i>	A
ARACEAE		
<i>Alocasia macrorrhiza</i>	<i>'upe</i>	P
<i>Dieffenbachia picta</i>	dumb cane	A
<i>Philodendron</i> sp.	Philodendron	A
ARECACEAE		
<i>Archontophoenix alexandrae</i>	Alexandria palm	A
COMMELINACEAE		
<i>Commelina diffusa</i>	<i>honohono</i>	A
COSTACEAE		
<i>Costus speciosus</i>	Malay ginger	A

CYPERACEAE		
Cyperus rotundus	nutgrass	A
Kyllinga brevifolia	kili'e opu	A
Kyllinga nemoralis	white Kyllinga	A
DIOSCOREACEAE		
Dioscorea bulbifera	pi'oi - wild yam	P
LILIACEAE		
Hippeastrum puniceum	Amaryllis	A
MUSACEAE		
Musa paradisiaca	apple banana	A
PANDANACEAE		
Pandanus tectoris	hala	I
POACEAE		
Brachiaria mutica	California grass	A
Chloris radiata	fingergrass	A
Digitaria ciliaris	crabgrass	A
Eleusine indica	goosegrass	A
Oplismenus hirtellus	hono'hono kukui	A
Panicum maximum	Guinea grass	A
Paspalum conjugatum	Hilo grass	A
Setaria gracilis	yellow foxtail	A
Sporobolus indicus	smutgrass	A
ZINGIBERACEAE		
Alpinia purpurata	red ginger	A
Zingiber zerumbet	'iwapuhi	P
DICOTYLEDONAE		
AMARANTHACEAE		
Amaranthus spinosus	spiny amaranth	A
ANACARDIACEAE		

<i>Mangifera indica</i>	mango	A
APLACEAE		
<i>Centella asiatica</i>	<i>pohe kula</i>	A
ASTERACEAE		
<i>Bidens pilosa</i>	<i>ki nehe</i>	A
<i>Emilia fosbergii</i>	<i>pualele</i>	A
<i>Pluchea symphytifolia</i>	sourbush	A
<i>Sigesbeckia orientalis</i>	little crown beard	A
<i>Wedelia tilobata</i>	Wedelia	A
<i>Xanthium strumarium</i>	<i>kikania</i> : cocklebur	A
<i>Youngia japonica</i>	hawksbeard	A
BEGONIACEAE		
<i>Begonia hirtella</i>	<i>pikoma</i>	A
BIGNONIACEAE		
<i>Spathodea campanulata</i>	African tulip	A
CARICACEAE		
<i>Carica papaya</i>	<i>mikama</i>	A
CARYOPHYLLACEAE		
<i>Drymaria cordata</i>	<i>pipi:</i>	A
CONVOLVULACEAE		
<i>Ipomoea alba</i>	moon flower	A
<i>Ipomoea sp.</i>	morning glory	A
CUCURBITACEAE		
<i>Momordica charantia</i>	bitter melon	A
EUPHOBIAEAE		
<i>Aleurites moluccana</i>	<i>kukui</i>	P
<i>Chamaesyce hirta</i>	garden spurge	A

<i>Chamaesyce hypericifolia</i>	graceful spurge	A
<i>Chamaesyce prostrata</i>	prostrate spurge	A
<i>Euphorbia heterophylla</i>	<i>kaliko</i>	A
<i>Manihot glaziouii</i>	rubber tree	A
<i>Phyllanthus debilis</i>	spurge	A
<i>Ricinus communis</i>	castor bean	A

FABACEAE

<i>Canavalia cathartica</i>	<i>Maunaloa</i>	A
<i>Chamaecrista nictitans</i>	partridge pea	A
<i>Desmodium sandwicense</i>	Spanish clover	A
<i>Desmodium tortuosum</i>	Florida beggarsweed	A
<i>Leucaena leucocephala</i>	<i>haole koa</i>	A
<i>Senna alata</i>	candle bush	A

LYTHRACEAE

<i>Cuphea carthagenensis</i>	tar weed	A
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MALVACEAE

<i>Abutilon grandifolium</i>	hairy Abutilon	A
<i>Sida rhombifolia</i>	faise <i>'ilima</i>	A

MYRSINACEAE

<i>Ardisia elliptica</i>	shoeburton Ardisia	A
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MYRTACEAE

<i>Psidium cattleianum</i>	<i>waiawi</i>	A
<i>Psidium guajava</i>	guava	A
<i>Syzygium cumini</i>	Java plum	A

OXALIDACEAE

<i>Oxalis corniculata</i>	<i>'ihi 'ai</i>	P?
<i>Oxalis corymbosa</i>	<i>'ihi pehu</i>	A

PROTEACEAE

<i>Grevillea robusta</i>	silver oak	A
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RUBIACEAE

Coffea arabica coffee A

SOLANACEAE

Solanum americanum *popolo* I?

VERBENACEAE

Clerodendrum philippinum *pikake hohono* A
Stachytarpheta urticifolia nettle leafed vervain A

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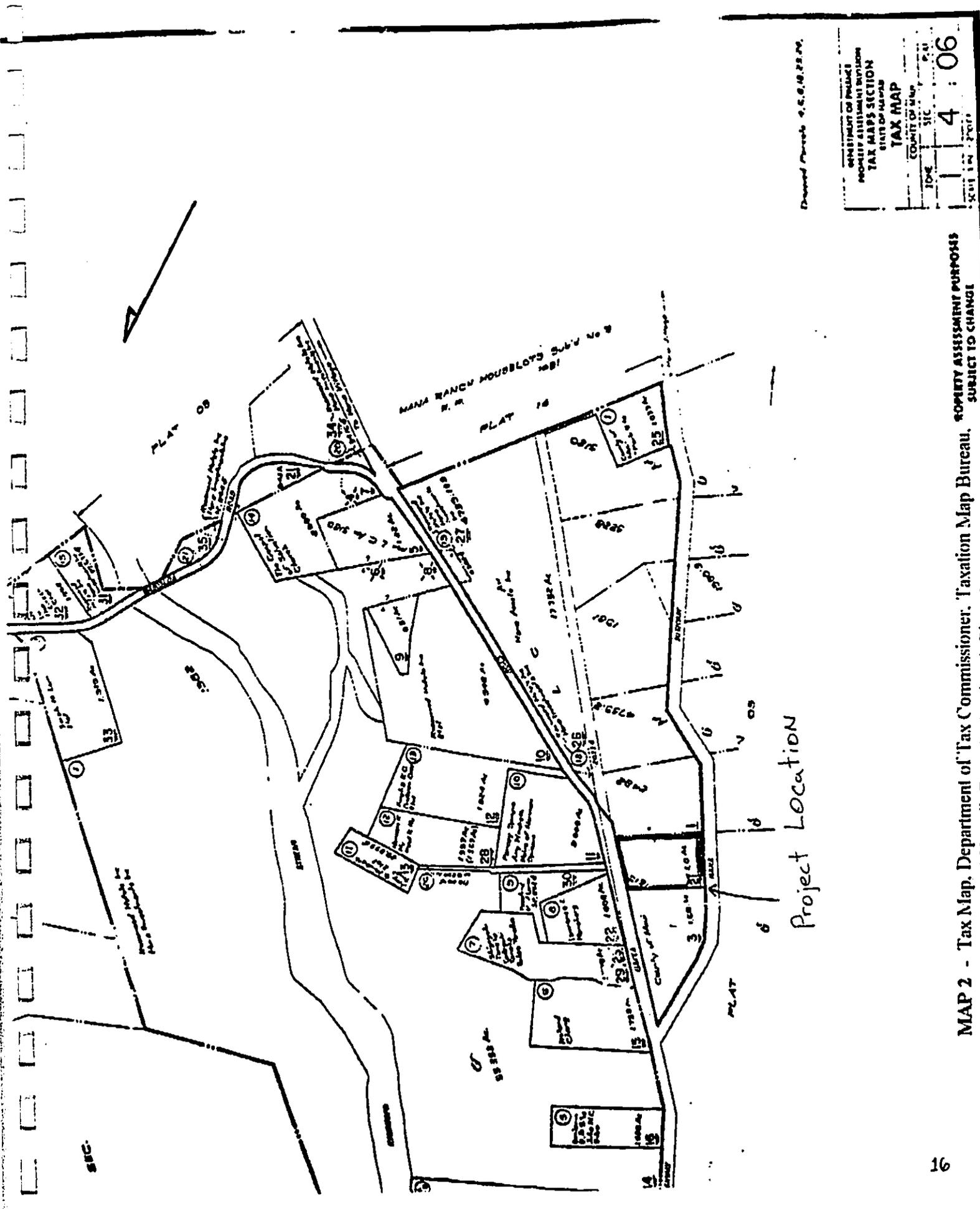
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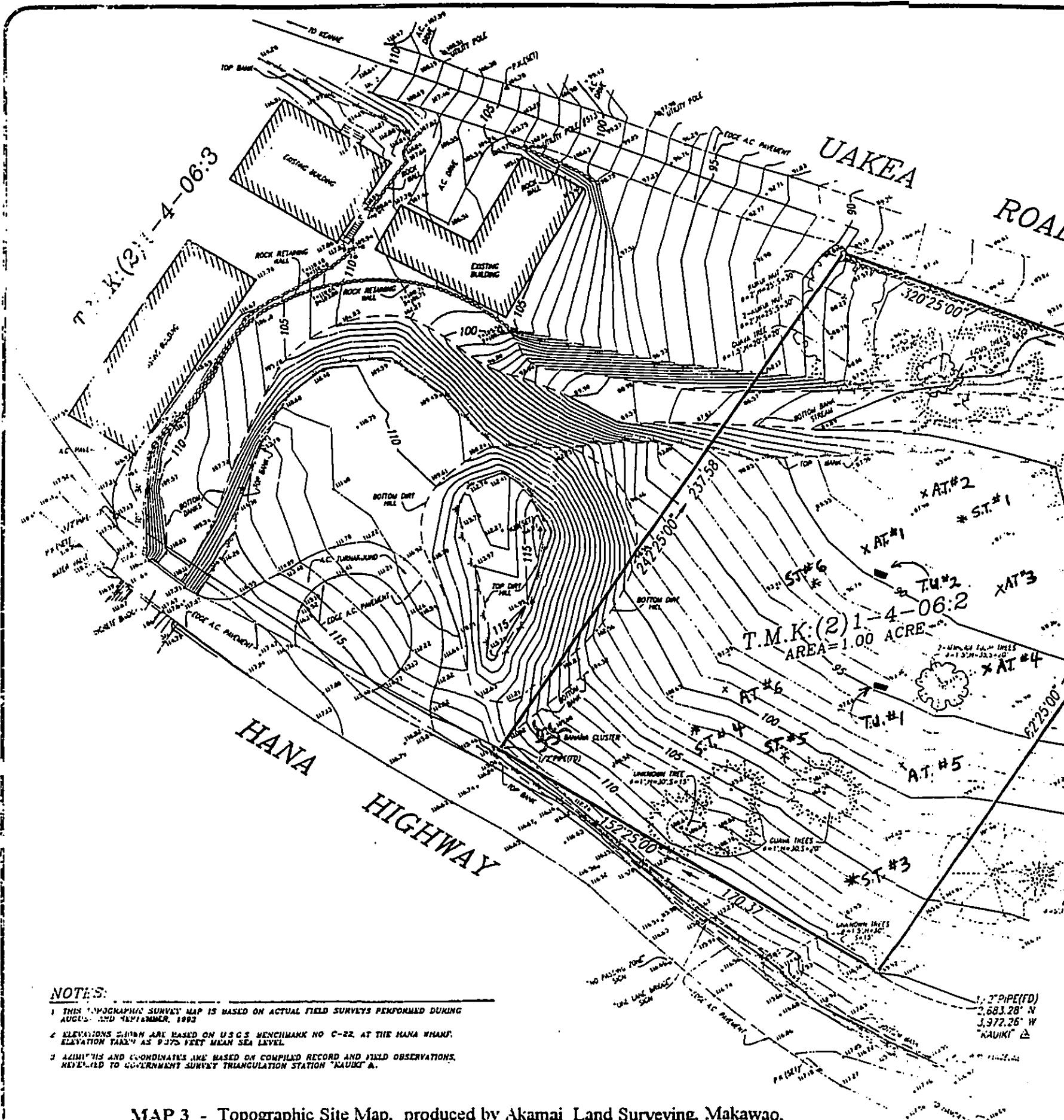
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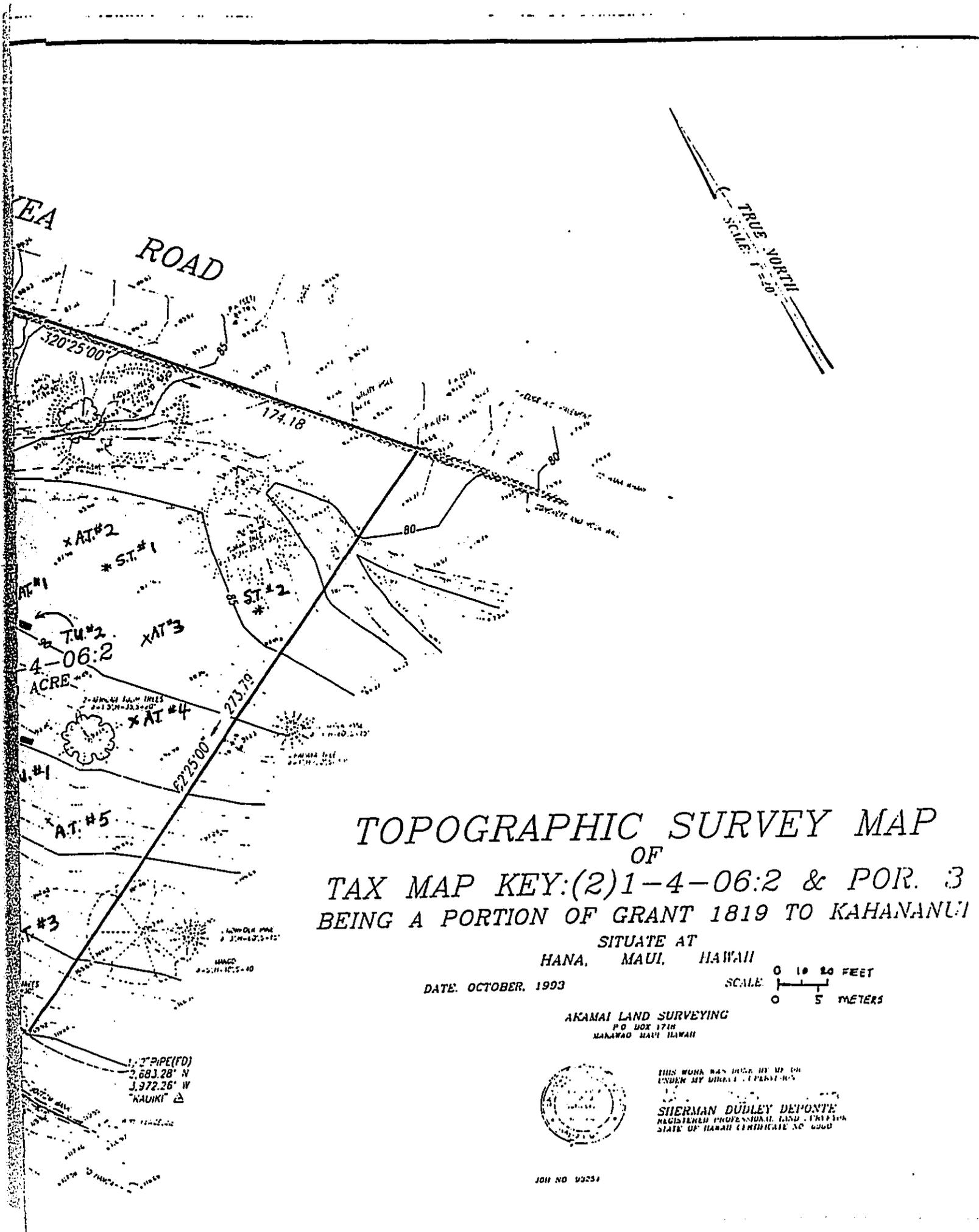
Drawn March 4, 1906, P.M.

DEPARTMENT OF PUBLICS	
PROPERTY ASSESSMENT DIVISION	
TAX MAPS SECTION	
STATE OF HAWAII	
TAX MAP	
COUNTY OF MAUI	P.L.
ZONE	SIC
	4 : 06
SCALE IN FEET	



MAP 2 - Tax Map, Department of Tax Commissioner, Taxation Map Bureau, PROPERTY ASSESSMENT PURPOSES
 State of Hawaii, Zone I, Section 4, Plat 06.





TOPOGRAPHIC SURVEY MAP
 OF
 TAX MAP KEY: (2)1-4-06:2 & POR. 3
 BEING A PORTION OF GRANT 1819 TO KAHANANUI

SITUATE AT
 HANA, MAUI, HAWAII

DATE: OCTOBER, 1993

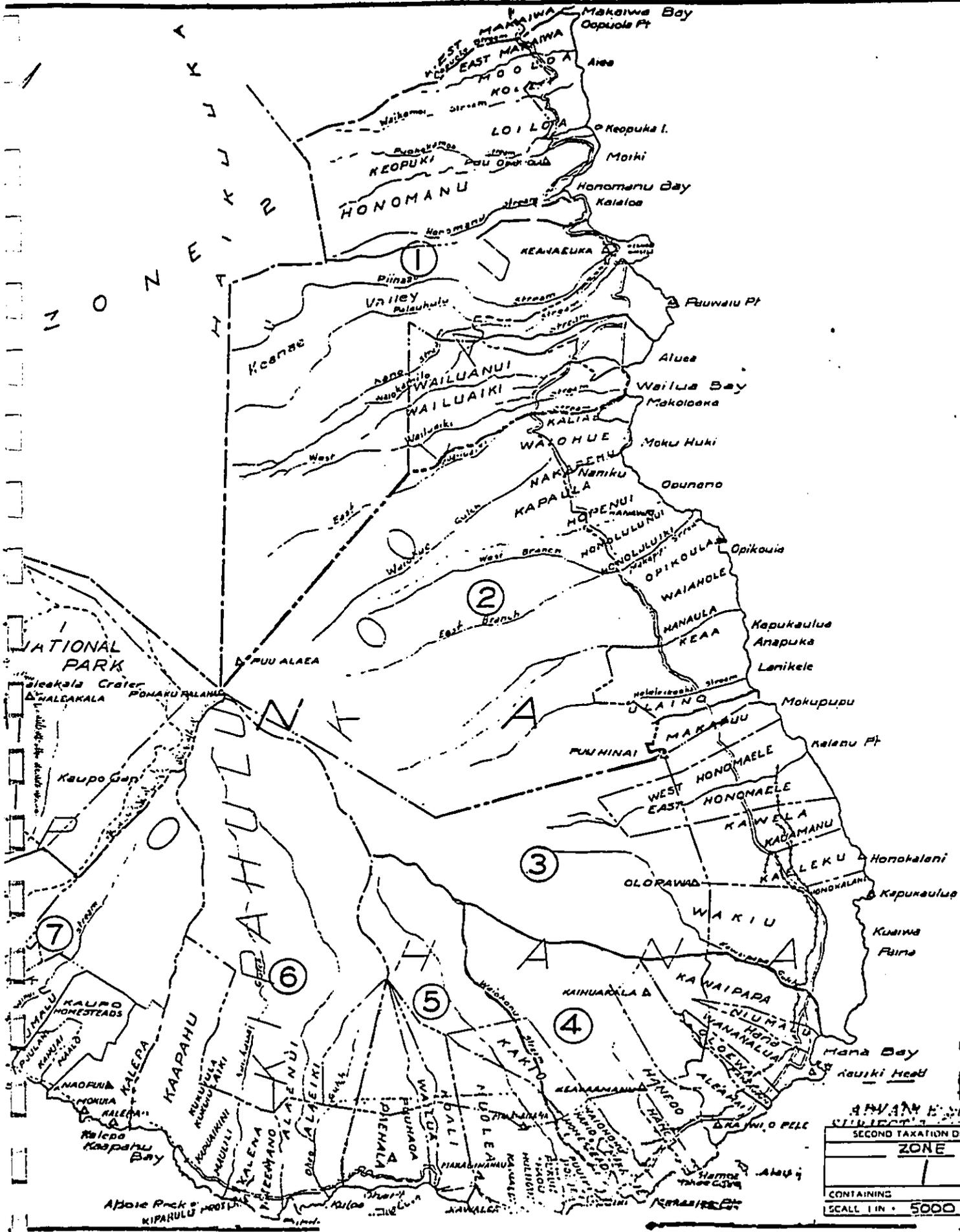
SCALE: 0 10 20 FEET
 0 5 METERS

AKAMAI LAND SURVEYING
 P.O. BOX 1718
 MAHAKOHAU, MAUI, HAWAII



THIS WORK WAS DONE BY ME OR
 UNDER MY DIRECT SUPERVISION
 SHERMAN DUDLEY DEPONTE
 REGISTERED PROFESSIONAL LAND SURVEYOR
 STATE OF HAWAII LICENSE NO. 6560

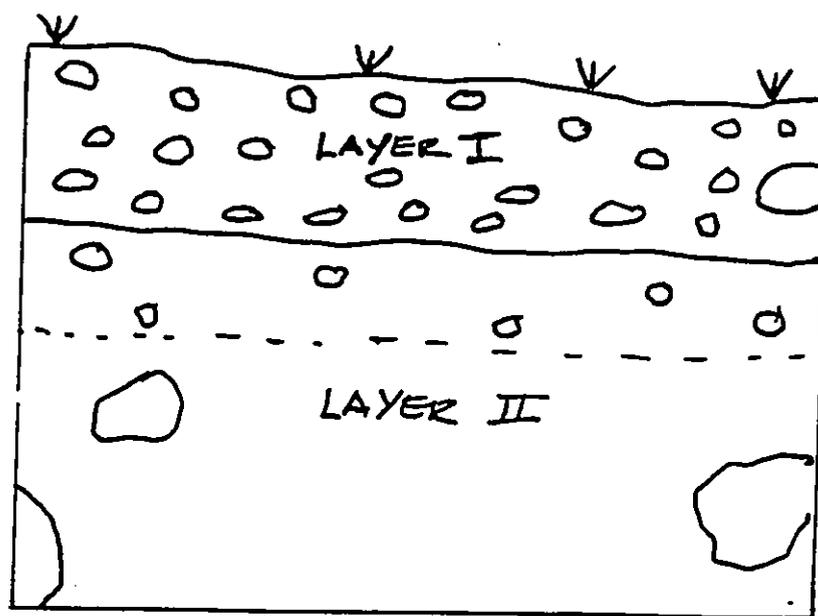
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MAP 4 - Ahunua of Hana Area

 TERMINAL MAP SECOND TAXATION DISTRICT	
ZONE _____	
CONTAINING	PARCELS
SCALE 1 IN. = 5000 FT.	

FIGURE #1 - HANA FIRE STATION
Test Unit #1 - Profile of West Face



0 10cm.
SCALE

unexcavated

Layer I: Reddish-brown soil (5YR 3/3) with some slight charcoal flecking. Rocky soil, with grainy texture.

Layer II: Slightly browner than Layer I (5YR 3/4). Upper 10 cm. is rocky, grading into finer textured soil.

FIGURE 1 - Test Unit 1: West Face Profile.



PHOTO 1 - View from Hana High Across Subject Parcel to the East

DOCUMENT CAPTURED AS RECEIVED



PHOTO 2 - View of the Park Looking Toward the Southwest.

DOCUMENT CAPTURED AS RECEIVED



PHOTO 3 - Test Unit #1 - Excavation in Process.

DOCUMENT CAPTURED AS RECEIVED

Appendix B
Preliminary Drainage and Soil
Erosion Control Report

IV. EXISTING DRAINAGE CONDITIONS

There is an unnamed drainageway which crosses Hana Highway immediately northwest of the project site. The drainageway meanders adjacent to the existing buildings within the County baseyard and traverses along the easterly boundary of the project site. It then runs parallel and mauka of Uakea Road until it intersects with Holoinawawae Stream approximately 400 feet south of the project site. At this intersection, the combined drainageway crosses Uakea Road and eventually discharges into Hana Bay.

The unnamed drainageway crosses Hana Highway via a 14' X 4.5' bridge. It is estimated that the bridge can convey approximately 530 cfs under Hana Highway before overtopping the roadway.

The crossing at Uakea Road consists of a 102" culvert and a 9' X 5.5' arch pipe. It is estimated that this drainage system can convey approximately 1,200 cfs under Uakea Road before overtopping the roadway.

Our calculations show that approximately 2.1 cfs currently sheet flows across the site into the existing drainageway.

V. FLOOD AND TSUNAMI ZONE

According to Panel Number 150003 0320 B of the Flood Insurance Rate Map, June 1, 1981, prepared by the United States Federal Emergency Management Agency, the entire project site is situated in Flood Zone C. This zone represents areas of minimal flooding and no tsunami hazard.

VI. PROPOSED DRAINAGE PLAN

Runoff from the project site will continue to flow into the existing drainageway and continue along its existing pattern. Alterations to the existing drainage pattern will be kept to a minimum.

Our calculations show that approximately 3.7 cfs of surface runoff will be generated from the project site after development. Accordingly, there will be a net increase of 1.6 cfs (3.7 cfs - 2.1 cfs) due to the proposed development.

VII. HYDROLOGIC 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 (cfs)

C = rainfall coefficient

I = rainfall intensity for a duration equal to the time of concentration (inches/hour)

A = drainage area (Acres)

See Appendix A for Hydrologic Calculations

VIII. SOIL EROSION CONTROL PLAN

A. General:

Based on the Hawaii Environmental Simulation Laboratory (HESL) equations to estimate soil loss during the construction period, and complemented by the following erosion control plan, the soil loss during the construction period is well within the tolerable limits (See Appendix B).

Based on the County Erosion Control Standards and Guidelines, the allowable erosion rate is 6,250 tons/acre/year for a 6-month grading period and the maximum tolerable severity rating number (H) is 50,000.

B. Erosion Control Plan:

The following measures will be taken to control erosion during the site development period (estimated 6 months).

1. Minimize time of construction.
2. Retain existing ground cover until latest date to complete construction.
3. Early construction of drainage control features.
4. Use temporary area sprinklers in non-active construction areas when ground cover is removed.
5. Station water truck on site during construction period to provide for immediate sprinkling, as needed, in active construction zones (weekends and holidays included).
6. Use temporary berms and cut-off ditches, where needed, for control of erosion.
7. Graded areas shall be thoroughly watered after construction activity has ceased for the day and on weekends.

8. All cut and fill slopes shall be sodded or planted immediately after grading work has been completed.

The development project is provided with adequate facilities for drainage control and storm water disposal. This, together with ultimate ground cover, shall preclude any appreciable onsite erosion.

IX. CONCLUSION

The construction of the proposed Hana Fire Station is expected to generate an additional 1.6 cfs of onsite surface runoff. The proposed drainage plan will allow surface runoff to be intercepted and diverted to the existing drainageway.

Together with the offsite surface runoff, the existing drainage pattern will be maintained. The existing drainage crossing at Uakea Road is capable of handling the increase in flow.

Based on our calculations, the sedimentation hazard to coastal waters and downstream properties is minimal (see Exhibit B). The soil loss per unit area and severity rating computed for the proposed development are well within the tolerable limits.

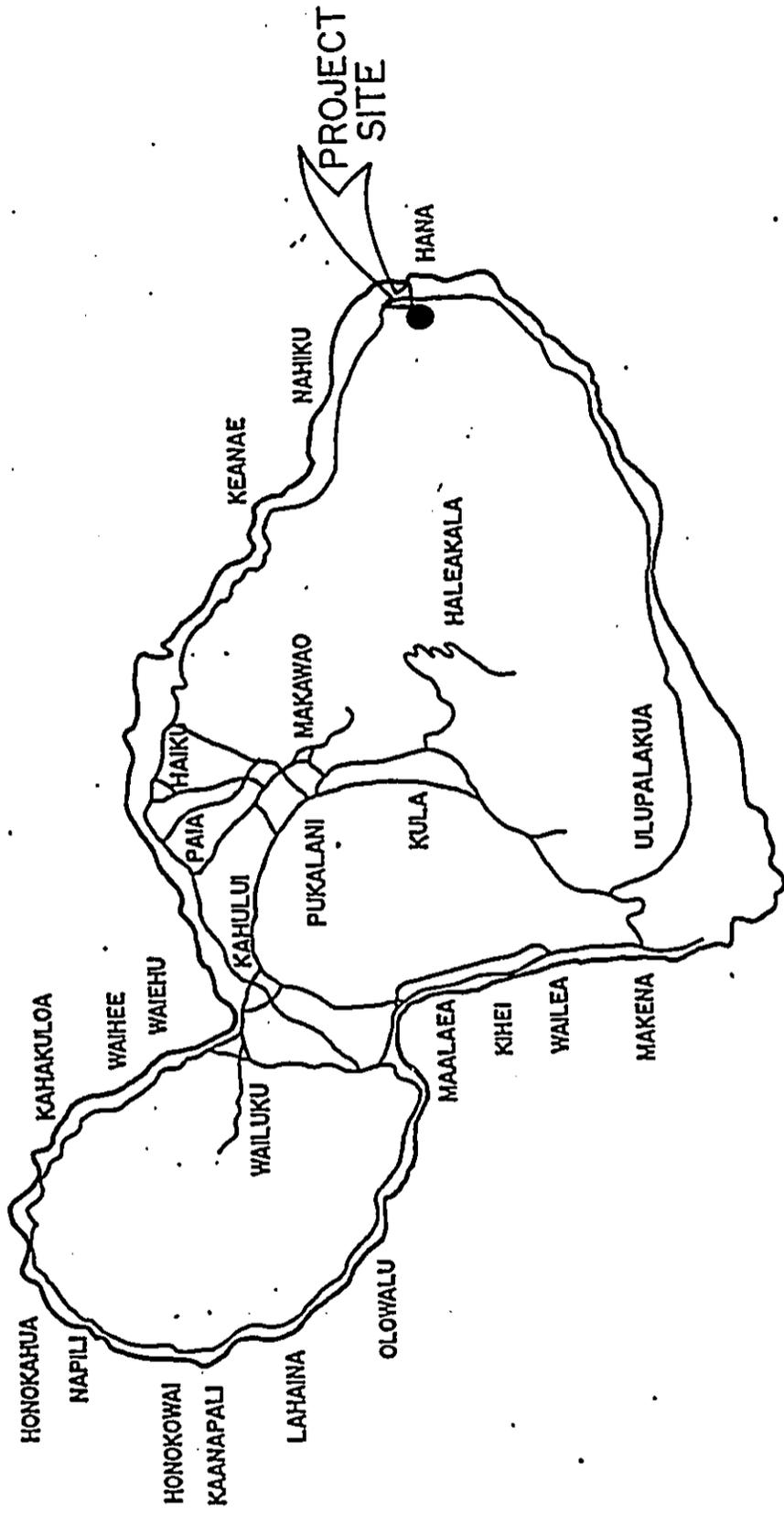
Therefore, it is our professional opinion that the proposed development will not have an adverse effect on the adjoining properties downstream.

X. REFERENCES

- A. Drainage Master Plans for the County of Maui, prepared by R. M. Towill Corporation, October 1971.
- B. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, August, 1972.
- C. Erosion and Sediment Control Guide for Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, March, 1981.
- D. Rainfall-Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau, 1962.
- E. Flood Insurance Rate Maps of the County of Maui, September, 1989.

EXHIBITS

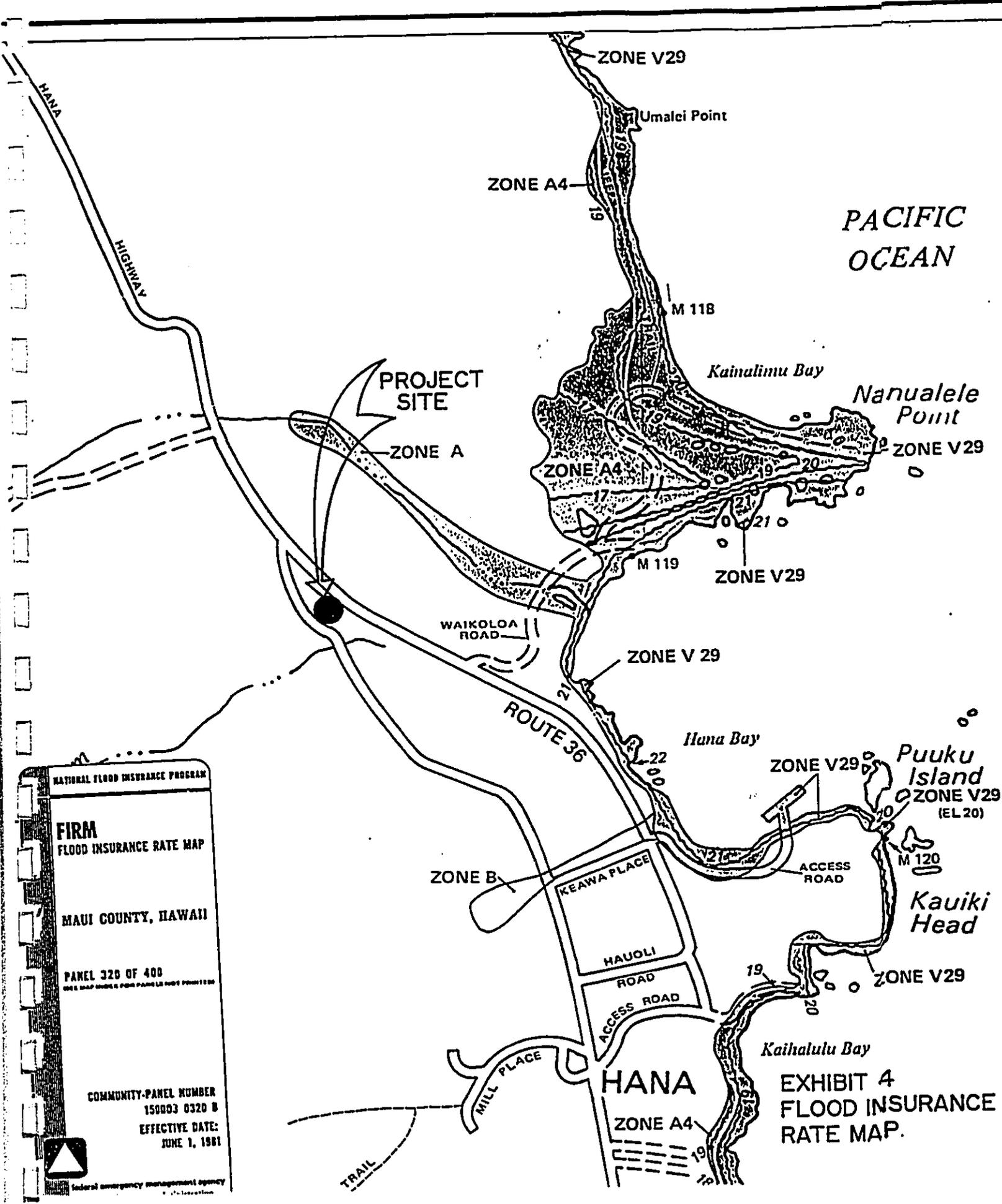
- 1 Location Map**
- 2 Vicinity Map**
- 3 Soil Survey Map**
- 4 Flood Insurance Rate Map**



ISLAND OF MAUI

NOT TO SCALE

EXHIBIT I
VICINITY MAP



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MAUI COUNTY, HAWAII

PANEL 320 OF 400
ONE MAP SHEET FOR PANELS NOT PRINTED

COMMUNITY-PANEL NUMBER
150003 0320 B
EFFECTIVE DATE:
JUNE 1, 1981

Federal Emergency Management Agency

EXHIBIT 4
FLOOD INSURANCE
RATE MAP.

APPENDIX A
HYDROLOGIC CALCULATIONS

Hydrologic Calculations

Purpose: Determine the increase in surface runoff from the development of the proposed project based on a 10-year storm.

A. Determine the Runoff Coefficient (C):

Existing Conditions:

Infiltration (Medium) = 0.07

Relief (Rolling) = 0.03

Vegetal Cover (Good) = 0.03

Development Type (Open) = 0.15

C = 0.28

Developed Conditions:

Pavement Areas:

Infiltration (Negligible) = 0.20

Relief (Flat) = 0.00

Vegetal Cover (None) = 0.07

Development Type (Industrial) = 0.55

C = 0.82

Roof Areas:

Infiltration (Negligible) = 0.20

Relief (Steep) = 0.08

Vegetal Cover (None) = 0.07

Development Type (Industrial) = 0.55

C = 0.90

Landscaped Areas:

Infiltration (High) = 0.00

Relief (Rolling) = 0.03

Vegetal Cover (High) = 0.00

Development Type (Open) = 0.15

C = 0.18

Pavement Areas = 0.2 Acres

Roof Areas = 0.2 Acres

Landscaped Areas = 0.6 Acres

Weighted C = $\frac{(0.2 \times 0.82) + (0.2 \times 0.90) + (0.6 \times 0.18)}{1.0} = 0.45$

B. Determine the 10-year 1-hour rainfall:

$i_{10} = 4.0$ inches

Adjust for time of concentration to compute Rainfall Intensity (I):

Existing Conditions:

$T_c = 14$ minutes

$I = 7.5$ inches/hour

Developed Conditions:

$T_c = 10$ minutes

$I = 8.2$ inches/hour

C. Drainage Area (A) = 1.0 acre

D. Compute the 10-year storm runoff volume (Q):

$$Q = CIA$$

Existing Conditions:

$$\begin{aligned} Q &= (0.28)(7.5)(1.0) \\ &= 2.1 \text{ cfs} \end{aligned}$$

Developed Conditions:

$$\begin{aligned} Q &= (0.45)(8.2)(1.0) \\ &= 3.7 \text{ cfs} \end{aligned}$$

Therefore, the increase in runoff due to the proposed development is $3.7 - 2.1 = 1.6$ cfs.

APPENDIX B
UNIVERSAL SOIL LOSS CALCULATIONS

Universal Soil Loss Calculations

A. HESL Soil Loss Calculations:

1. Erosion rate, as set forth by the County of Maui Ordinance:

$$E = R \times K \times LS \times C \times P$$

Where:

$$E = \text{Soil Loss in tons/acre/year}$$

$$R = \text{Rainfall Factor} = 300 \text{ tons/acre/year}$$

$$K = \text{Soil Erodibility Factor} = 0.05 \text{ (Hana Series)}$$

$$L = \text{Slope Length} = 320 \text{ ft.}$$

$$S = \text{Slope Gradient} = 0.10$$

$$LS = \text{Slope Length Factor} = 2.4$$

$$C = \text{Cover Factor, Use Bare Soil} = 1.0$$

$$P = \text{Control Factor, Construction Site} = 1.0$$

$$E = 300 \times 0.05 \times 2.4 \times 1.0 \times 1.0$$

$$= 36 \text{ tons/acre/year}$$

2. Maximum Allowable Soil Loss:

$$E_{\text{max}} = H_{\text{max}} / (2 F T + 3 D) A$$

$$\text{Coastal Water Hazard (D)} = \text{Class A} = 2$$

$$\text{Downstream Hazard (F)} = 2$$

$$\text{Duration of Site Work} = 6 \text{ months}$$

$$\text{Maximum Allowable Construction Area} \times \text{Erosion Rate} \\ = 6,250 \text{ tons/acre/year}$$

B. Severity Rating Number:

1. The degree of hazard from potential damage by erosion and sediment, known as "Severity Rating Number" will be determined for each grading site as follows:

$$H = (2 F T + 3 D) A E$$

Where:

H = Severity Rating Number

F = Unit Downslope/Downstream factor = 2

D = Unit Coastal Water Hazard = 2

T = Time of Distribution (years) = 0.5

A = Area of Disturbance (acres) = 1.0

E = Erosion Rate in tons/acre/year

$$H = ((2 \times 2 \times 0.5) + (3 \times 2)) \times 1.0 \times 36 = 288$$

The maximum allowable severity rating number established is 50,000, and is greater than 288 which is computed for the project.