SEP 23 2004

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
COUNTY OF MAUI

ALAN M. ARAKAWA
Mayor

ALICE L. LEE
Director

HERMAN T. ANDAYA
Deputy Director

200 SOUTH HIGH STREET • WAILUKU, HAWAII 96793 • PHONE (808) 270-7805 • FAX (808) 270-7165

September 8, 2004

RECEIVED

'04 SEP 13 P6:24

OFC. OF ENVIRONMENTAL QUALITY CONTROL

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

Dear Ms. Salmonson:

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT (DEA) FOR PROPOSED HALE MAHAOLU EHIKU ELDERLY HOUSING PROJECT, TMK (2) 2-2-002:073, KIHEI, MAUI, HAWAII

The County of Maui, Department of Housing and Human Concerns accepted the Final Environmental Assessment (FEA) for the subject project and issued a Findings of No Significant Impact (FONSI). Please publish the FEA in the September 23, 2004, Office of Environmental Quality Control (OEQC) Environmental Notice.

We have enclosed a completed OEQC Publication Form and four (4) copies of the FEA. Should you have any questions, please contact Karlynn Kawahara of Munekiyo & Hiraga, Inc. at (808) 244-2015.

Very truly yours,

ALICE L. LEE
Director

ALL
Enclosures
cc: Michael T. Munekiyo, Munekiyo & Hiraga, Inc.
hha\hmehiku\oeqcfea.transltr

2004-09-23 FONSI
HALE MAHAOLU EHIKU ELDERLY HOUSING

SEP 23 2004
FILE COPY

RECEIVED

'04 SEP 13 P6:25

OFC. OF ENVIRONMENTAL QUALITY CONTROL

Final Environmental Assessment

HALE MAHAOLU EHIKU ELDERLY HOUSING PROJECT

Prepared for:

Hale Mahaolu and the Accepting Authority:

County of Maui, Department of Housing and Human Concerns

September 2004

MUNEKIYO & HIRAGA, INC.

Final Environmental Assessment

HALE MAHAOLU EHIKU ELDERLY HOUSING PROJECT

Prepared for:

September 2004

Hale Mahaolu and the Accepting Authority:

County of Maui, Department of Housing and Human Concerns

MUNEKIYO & HIRAGA, INC.

CONTENTS

REFERENCES

LIST OF APPENDICES

LIST OF FIGURES

hhashmehikudraftea 001

Preface

In partnership with the Maui County Department of Housing and Human Concerns, the applicant, Hale Mahaolu, proposes the construction of the Hale Mahaolu Ehiku, a project consisting of 112 one-bedroom units and one three-bedroom manager's residence, a Senior Center/Community Building, a Maui Adult Day Care Facility and an Adult Residential Care Home. Identified by TMK 2-2-02:73, the project site consists of 6.012 acres and is situated in Kihei, Maui, Hawaii. Development of the project will be implemented through Section 201G-118, Hawaii Revised Statutes (HRS).

Pursuant to Chapter 343, HRS, and Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules, this Environmental Assessment documents the project's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the significance of the project.

Executive Summary

Applicant: Hale Mahaolu

Approving Agency: County of Maui, Department of Housing and Human Concerns

Agencies Consulted: A total of three (3) Federal Government agencies, nine (9) State of Hawaii Government agencies, seven (7) County of Maui agencies, one (1) private company and one (1) community group were consulted in making the assessment. For further information, refer to Chapter X of this Final Environmental Assessment.

General Description: The applicant is proposing the construction of the Hale Mahaolu Ehiku affordable elderly housing project with approximately 112 one-bedroom units, a three-bedroom resident manager's unit, a Senior Center/Community Center building, an Adult Day Care building and an Adult Residential Care Home in Kihei, Maui, Hawaii (TMK: 2-2-002:073).

A portion of the 6.012-acre site is currently being utilized for County of Maui Kihei recycling drop off station. The remainder of the project site is vacant with scrub vegetation. The project site is bordered by the old Welakahao Road to the north and the future Kihei Hope Chapel site beyond. South and west of the site are lands with existing residential uses. Bordering the site to the east is the State of Hawaii's Piilani Highway and the County of Maui Kihei Wastewater Treatment Facility beyond. An analysis with regards to the action's technical, economic, social and environmental aspects is provided in the following Final Environmental Assessment.

Chapter I

Project Overview

I. PROJECT OVERVIEW

A. GENERAL PROPERTY INFORMATION

Hale Mahaolu (applicant), in coordination with the Maui County Department of Housing and Human Concerns (DHHC), proposes to develop the Ehiku Elderly Housing Project in Kihei, Maui, on lands identified by Tax Map Key (2) 2-2-02:73. See Figure 1 and Figure 2. The County of Maui owns the subject property, which is approximately 6.012 acres in size. A portion of the property is used by the County of Maui for a community recycling drop-off station, with the balance of the property being vacant and undeveloped. Existing overhead electrical and telephone lines and an existing 30-inch water main traverse the property in an east-west direction along the southern extent of the property.

The subject property is located within the limits of the State Land Use Commission's Urban District. The Kihei-Makena Community Plan designates the subject property as Project District. Consistent with the Kihei-Makena Community Plan, the property is zoned Kihei-Makena Project District 5. The subject property is also located within the County of Maui's Special Management Area. Refer to Figure 1.

B. PROPOSED IMPROVEMENTS

The applicant proposes to develop approximately 112 one-bedroom units to be utilized for affordable elderly housing. The facility will also include a three-bedroom manager's unit, a Senior Center/Community Building, an Adult Day Care Center and an Adult Residential Care Home. See Figure 3. The individual housing units will be approximately 562 square feet in size and will be clustered in three (3) three-story buildings and five (5) one-story buildings. See Figure 4 and Figure 5. The Senior Center/Community Building and the Adult Day Care Center will be approximately 5,760 square feet and 6,280 square feet, respectively. The

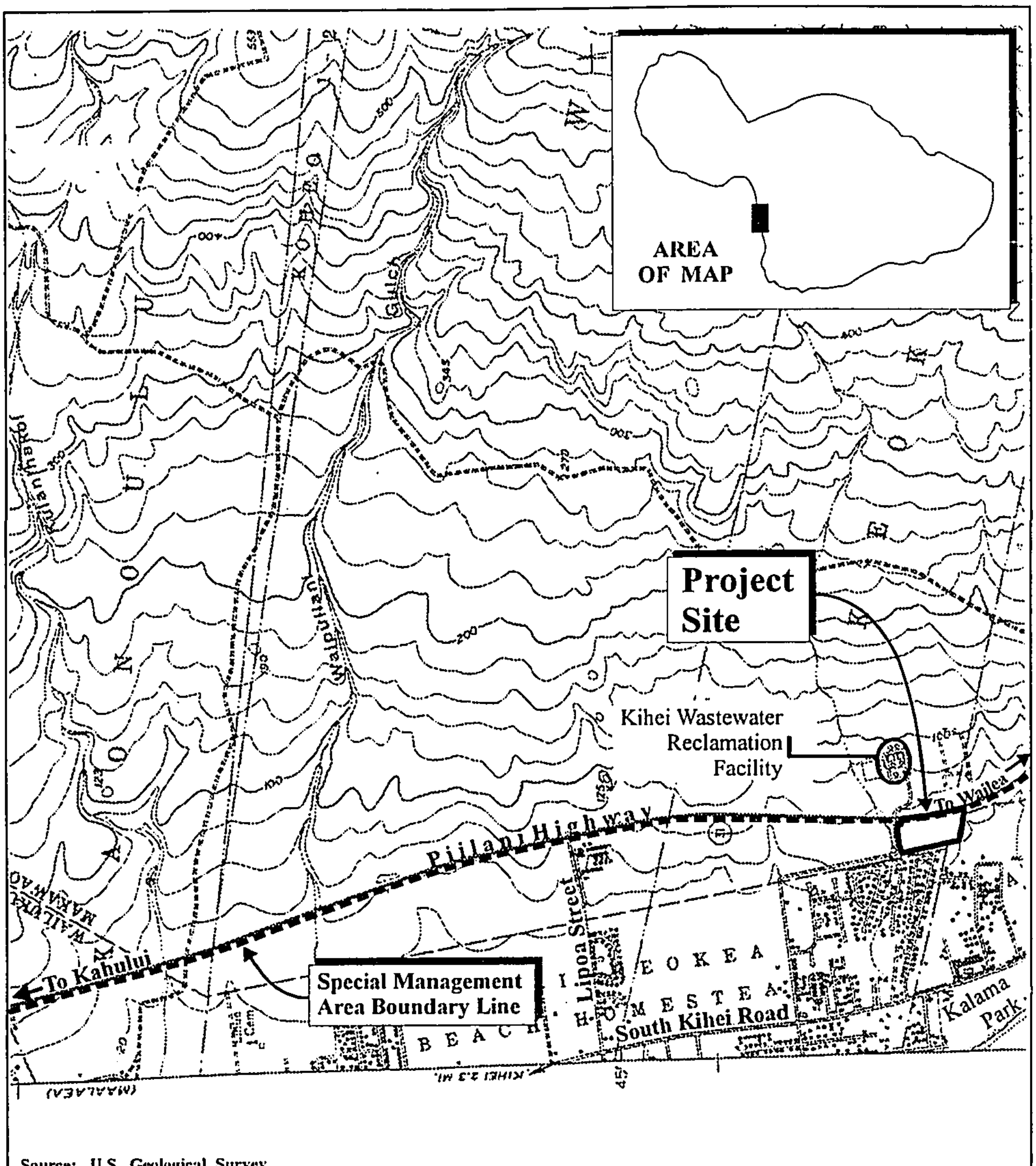
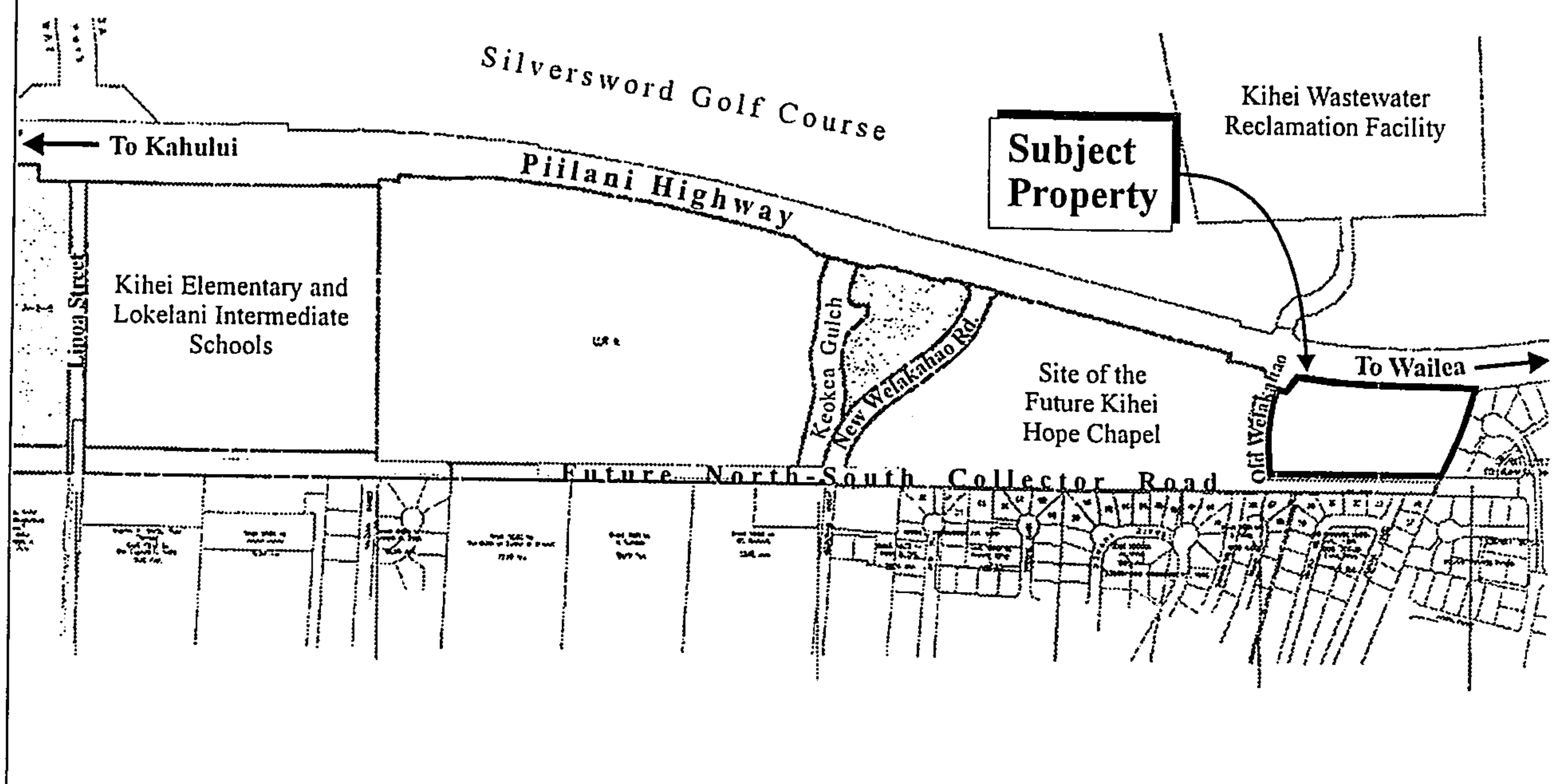


Figure 1

Hale Mahaolu Ehiku
Elderly Housing Project
Regional Location Map

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.



Source: Warren S. Unemori Engineering, Inc.

Figure 2

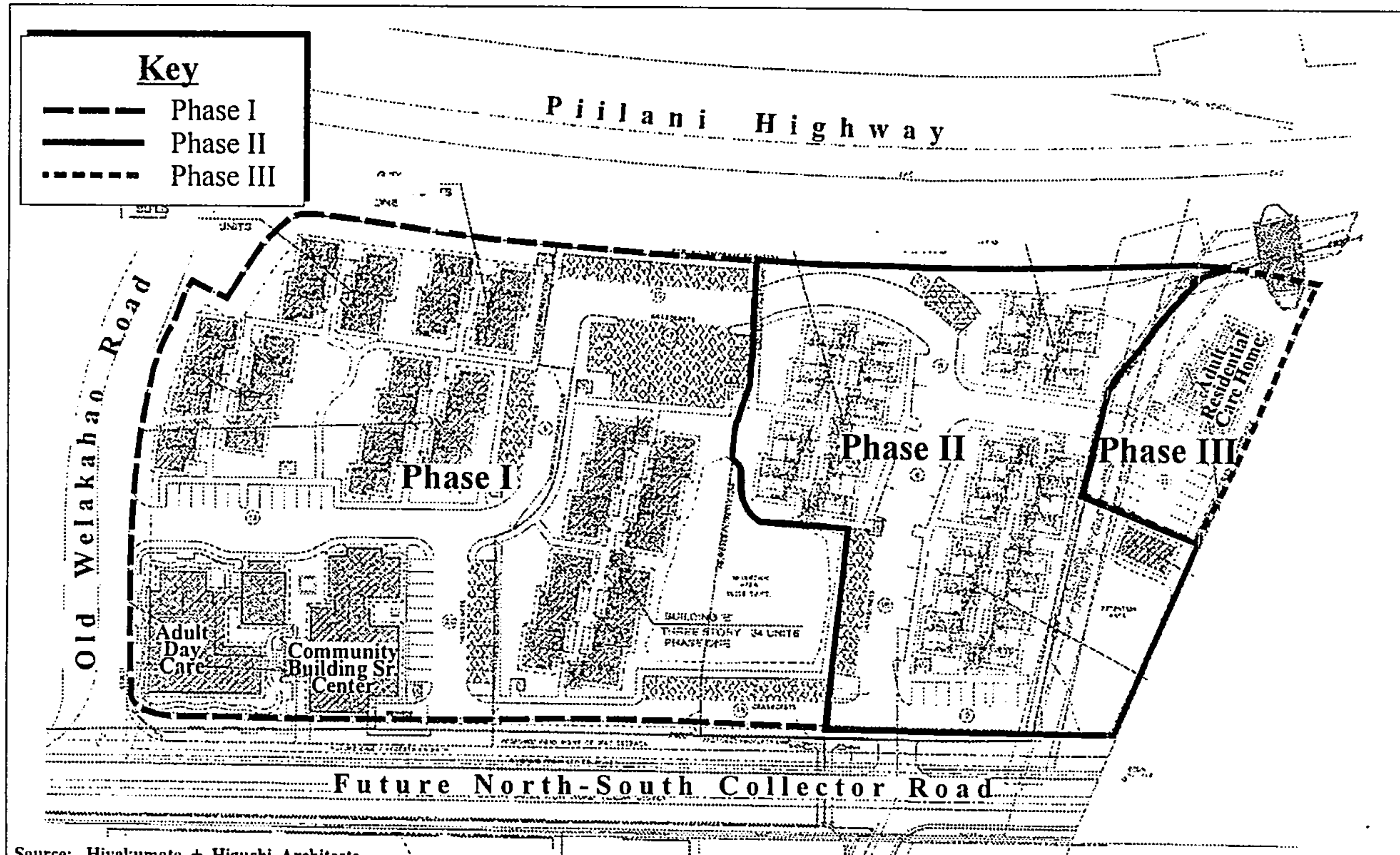
Hale Mahaolu Ehiku Elderly Housing Project

Site Location Map

NOT TO SCALE

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.



Source: Hiyakumoto + Higuchi Architects

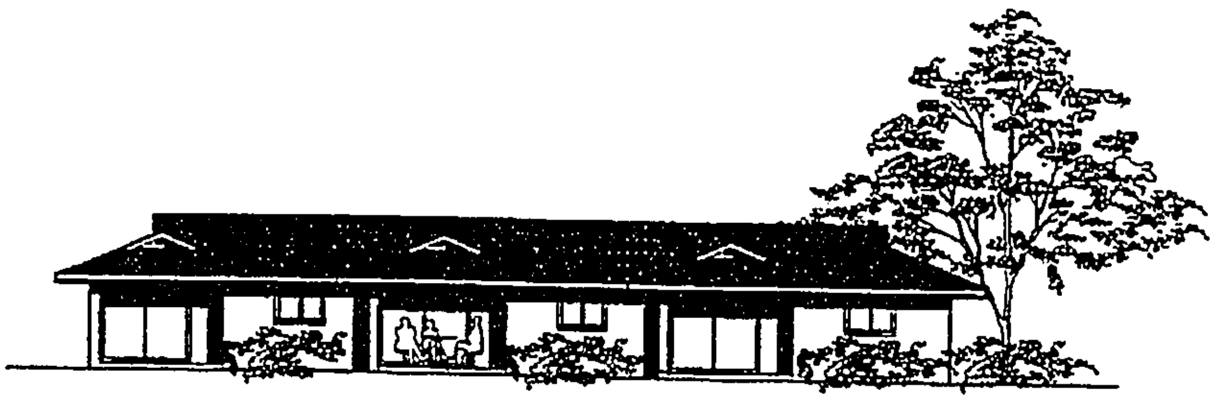
Figure 3

Hale Mahaolu Ehiku Elderly Housing Project
Master Plan

NOT TO SCALE

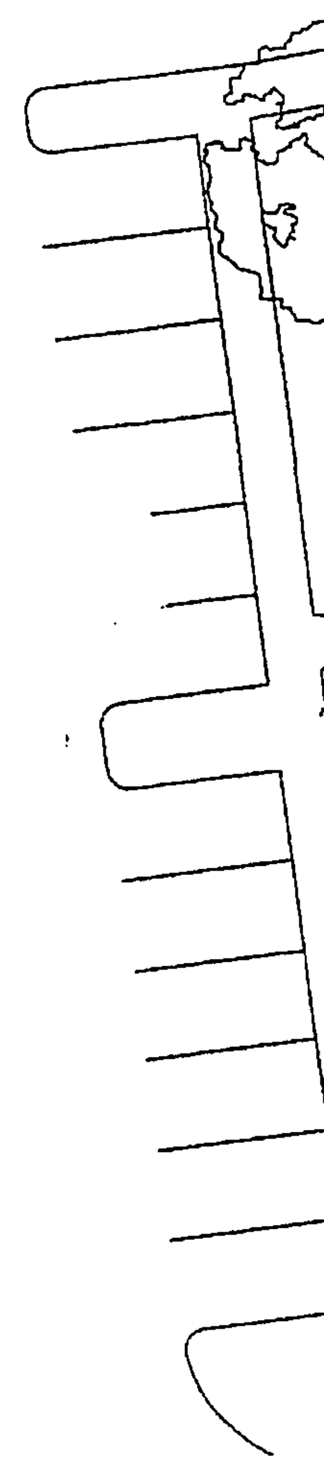
Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.



Conceptual North/South Elevations

Conceptual East/West Elevations

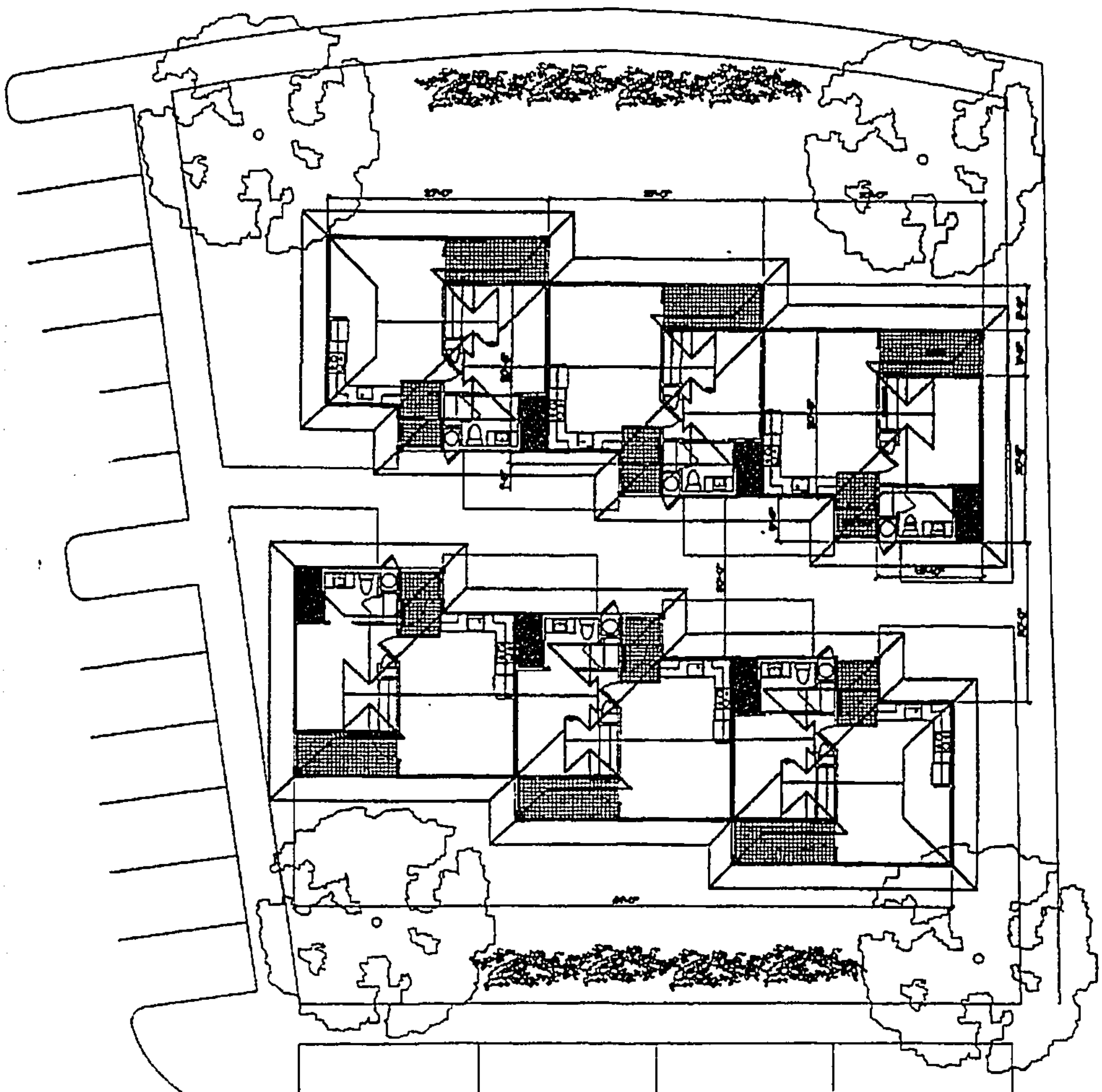


Source: Hiyakumoto + Higuchi Architects, Inc.

Figure 4

Hale Mahaolu Ehiku Elderly Hous
Typical One Story Elevations and Fl

Prepared for: Hale Mahaolu



Conceptual One Story Floor Plan

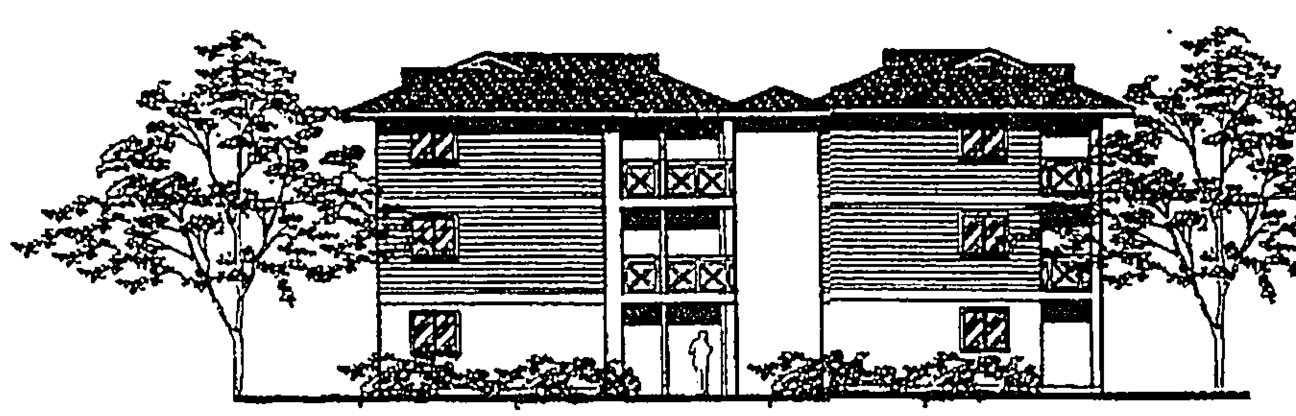
Elderly Housing Project

evations and Floor Plan

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Conceptual North/South Elevations



Conceptual East/West Elevations

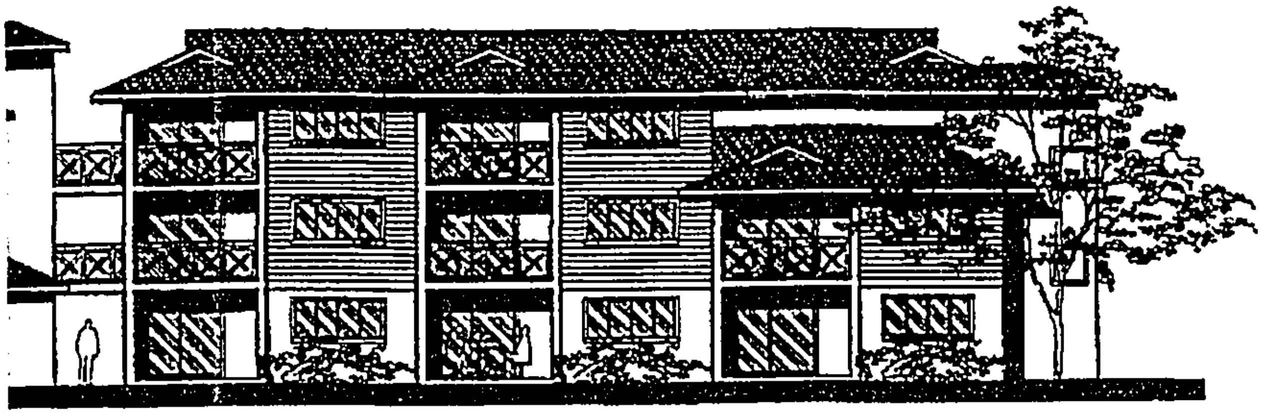
Source: Hiyakumoto + Higuchi Architects, Inc.

Figure 5

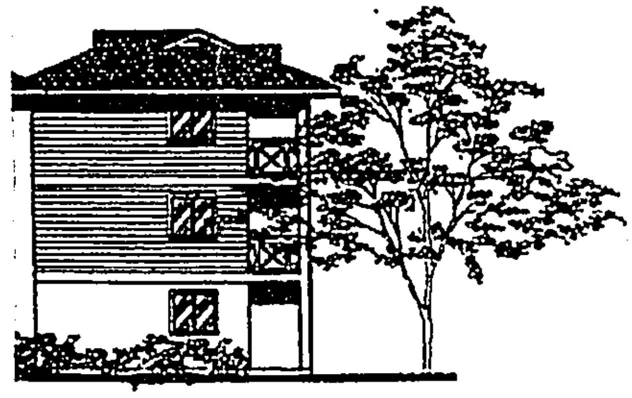
Hale Mahaolu Ehiku Elderly Housing

Typical Three Story Elevations

Prepared for: Hale Mahaolu



ı/South Elevations



:st Elevations

u Elderly Housing Project
'ee Story Elevations

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Adult Residential Care Home will be approximately 2,400 square feet in size.

The Senior Center/Community Building will be used by project residents as well as other area seniors for programs and activities such as workshops, arts and crafts, lectures and so forth which provide lifestyle enhancements for the senior living community. The Adult Day Care Center will provide a structured program for adult day care needs. The expected number of adult day care participants is estimated to be 70, including twelve (12) employees. The Adult Residential Care Home will meet the growing demand for care facilities for the frail and elderly. The care home will accommodate eight (8) residents, with two (2) employees.

Due to funding considerations, the project is proposed to be constructed in three (3) phases. Hale Mahaolu is seeking funds for the project from HUD grants, as well as private donations from foundations. Funding qualifications prevent the mixed use of monies, therefore, the first phase of the project will include the Adult Day Care and Community Senior Center buildings, as well as four (4) one-story residence clusters and one (1) three-story residence. A total of 54 one-bedroom units, as well as the three-bedroom manager's unit will be constructed along with a minimum of 78 parking stalls in the first phase. Phase I will also include drainage, landscaping, and roadway improvements, as well as the installation of utility lines for water, sewer, electrical, telephone and cable television service. Phase II will consist of two (2) three-story units and one (1) one-story unit for a total of 58 one-bedroom units, and a maximum of 59 additional parking spaces. The Adult Residential Care Home will be constructed in the final phase of the project.

To qualify for residency, tenants must be at least 62 years of age and qualify financially by having either a Low or Very-Low Income, as determined by the Department of Housing and Urban Development (HUD). According to HUD income limits for the fiscal year 2004, Low-Income for the County of Maui for a household size of one (1) person was determined to be $38,000.00 and the Very Low-Income was determined to be $23,750.00.

Rental subsidies will be awarded to qualified occupants through the HUD Section 202 Program and the Department of Agriculture's Rural Development program, both of which ensure that monthly rental rates do not exceed 30 percent of an occupant's adjusted gross income.

C. *PROJECT NEED*

As of January 2004, there were approximately 499 affordable elderly housing units on the island of Maui. Hale Mahaolu operates 457 of the units, distributed among six (6) facilities, including three (3) in the Kahului area and one (1) in Makawao, Lahaina and Waiehu. In addition, the State of Hawaii Housing and Community Development Corporation manages the 42-unit Piilani Elderly Housing Project, which is located in Lahaina, Maui. The State of Hawaii facility and the Hale Mahaolu facilities are all operating at full capacity. As of January 2004, the Hale Mahaolu facilities combined had a waiting list of 610 households. Generally, the average length of time for a waiting list can range between 18 to 24 months, depending on the individual facility and the type of unit desired.

In addition, available data from the United States Census 2000 and the County of Maui Office of Business and Economic Development indicates that:

- Maui's 2000 elderly population (residents age 65 years and older), numbered 13,185 residents, or approximately 11 percent of the island's total population;

- Maui's population between the ages of 60 to 64 years includes an additional 4,807 residents;

- In 2000, approximately 35 percent (2,790) of Maui's elderly households (65 years and older) earned less than $25,000.00 per year; and

- In 2000, for the age cohort 55 years and older, about 50 percent (1,740) of Maui's elderly households (65 years and older) were renting living units.

Given current demographics, the demand for elderly affordable units will continue to increase. The proposed Ehiku project is anticipated to help meet this demand.

D. *REGULATORY PROCESSING REQUIREMENTS*

To facilitate the timely review and processing of the project, the applicant will prepare an application pursuant to Section 201G-118 of the Hawaii Revised Statutes (HRS). The 201G-118 application will seek exemptions from certain regulatory and statutory requirements related to zoning, construction, subdivision, public services and administrative procedures. The application will be submitted for legislative review and approval by the Maui County Council. In addition, the subject property falls within the County of Maui's Special Management Area (SMA) and will therefore require a SMA Use Permit from the Maui Planning Commission. Finally, inasmuch as the underlying property is owned by the County of Maui, and work will occur within State and County roadways, an environmental assessment has been be prepared in accordance with Chapter 343, Hawaii Revised Statutes.

The subject property is designated Project District 5 by the Kihei-Makena Community Plan and is County-zoned Kihei-Makena Project District 5

(Multi-Family). Nursing and convalescent homes are special uses permitted within the project district. However, to facilitate project implementation, the 201G request incorporates exemptions from the project district requirements (Chapters 19.45 and 19.74 of the Maui County Code). A listing of proposed exemptions under the 201G application is contained in Appendix "A" of this document.

Estimated cost of the project is approximately $23 million, with construction to commence upon receipt of project funding and approval of the 201G-118 application and a Special Management Area Use Permit.

Chapter II

Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Use

The subject property is located immediately makai of Piilani Highway. To the north of the project site is Old Welakahao Road. Beyond Old Welakahao to the north is TMK (2)2-2-:02:72, which is owned by Kihei Hope Chapel. This parcel is proposed to be developed into a church facility. Immediately east of the project site is the Piilani Highway, while across Piilani Highway is the Goodfellow Brothers' Kihei Construction Baseyard and the County of Maui's Kihei Wastewater Reclamation Facility. South of the subject property is the Keala Hills single-family residential subdivision and west of the project site is the Wai Mahaihai single-family residential subdivision.

2. Climate

The Kihei coast is generally sunny, warm and dry the entire year. The average annual temperatures in Kihei range between the low 60's to the low 90's. June through August are historically the warmer months of the year, while the cooler months are January to March.

Average rainfall distribution in the Kihei-Makena region varies from under ten (10) inches per year to twenty (20) inches per year in the higher elevations. Rainfall in the Kihei-Makena region is highly seasonal, with most of the precipitation occurring in the winter months.

Northeast tradewinds prevail approximately 80 to 85 percent of the time. Winds average ten (10) to fifteen (15) miles per hour during afternoons, with slightly lighter winds during mornings and nights.

3. ***Topography and Soil Characteristics***

The subject property slopes from the northeast corner, at an approximate elevation of 80 feet above mean sea level (amsl) to the southwest corner, at an approximate elevation of 60 feet. The mauka-makai sloping pattern is generally consistent throughout the site. Underlying the subject property are soils belonging to the Pulehu-Ewa-Jaucas association. See Figure 6. The Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii characterizes the soils of this association as deep and well drained and located on alluvial fans and in basins.

The soil series specific to the parcel is Puuone Sand, 7 to 30 percent slopes (PZUE). See Figure 7. Puuone Sand, consists of excessively drained soils found on the sandhills near the ocean. Permeability is rapid, runoff is slow, and the erosion hazard from wind is moderate to severe.

4. ***Flood and Tsunami Hazard***

The Flood Insurance Rate Map in the project vicinity designates the majority of the subject property as being located within Zone "C", or areas of minimal flooding. See Figure 8.

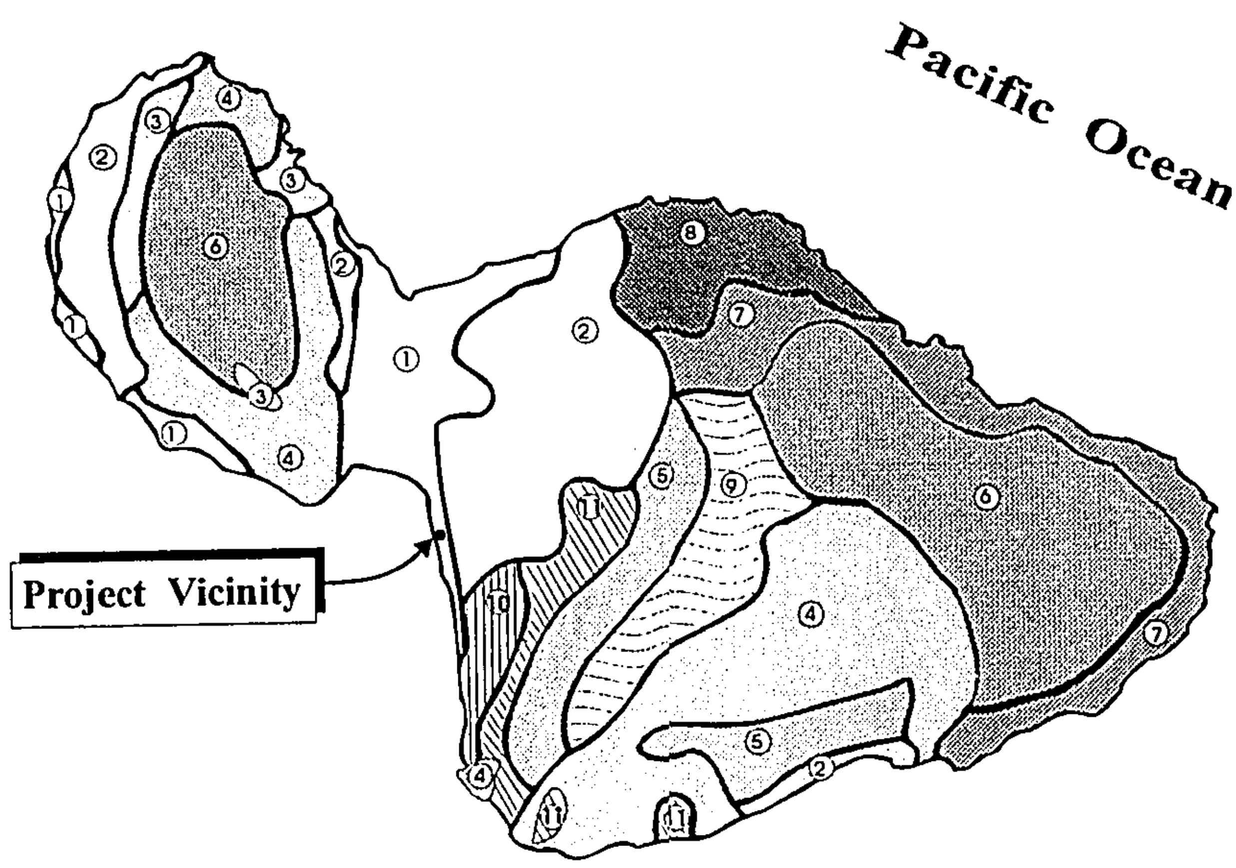
According to the Maui County Civil Defense Tsunami Evacuation Maps, the subject property is located well beyond the limits of tsunami wave action and evacuation boundaries.

5. ***Flora and Fauna***

A portion of the subject property has been partially paved for use

LEGEND

- ① Pulehu-Ewa-Jaucas association
- ② Waiakoa-Keahua-Molokai association
- ③ Honolua-Olelo association
- ④ Rock land-Rough mountainous land association
- ⑤ Puu Pa-Kula-Pane association
- ⑥ Hydrandepts-Tropaquods association
- ⑦ Hana-Makaalae-Kailua association
- ⑧ Pauwela-Haiku association
- ⑨ Laumaia-Kaipoipoi-Olinda association
- ⑩ Keawakapu-Makena association
- ⑪ Kamaole-Oanapuka association



Source: USDA Soil Conservation Service

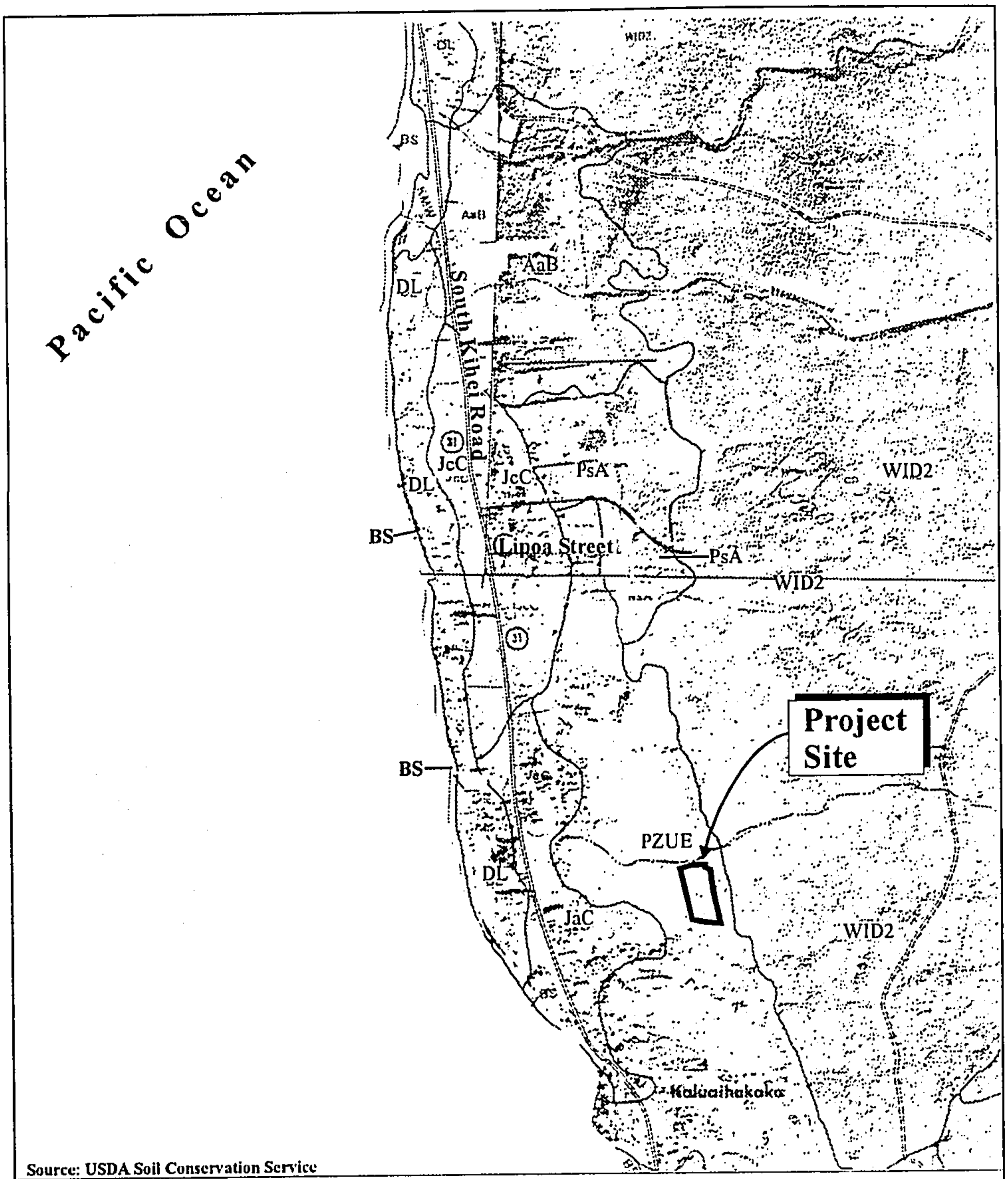
Figure 6

Hale Mahaolu Ehiku
Elderly Housing Project
Soil Association Map

NOT TO SCALE

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.



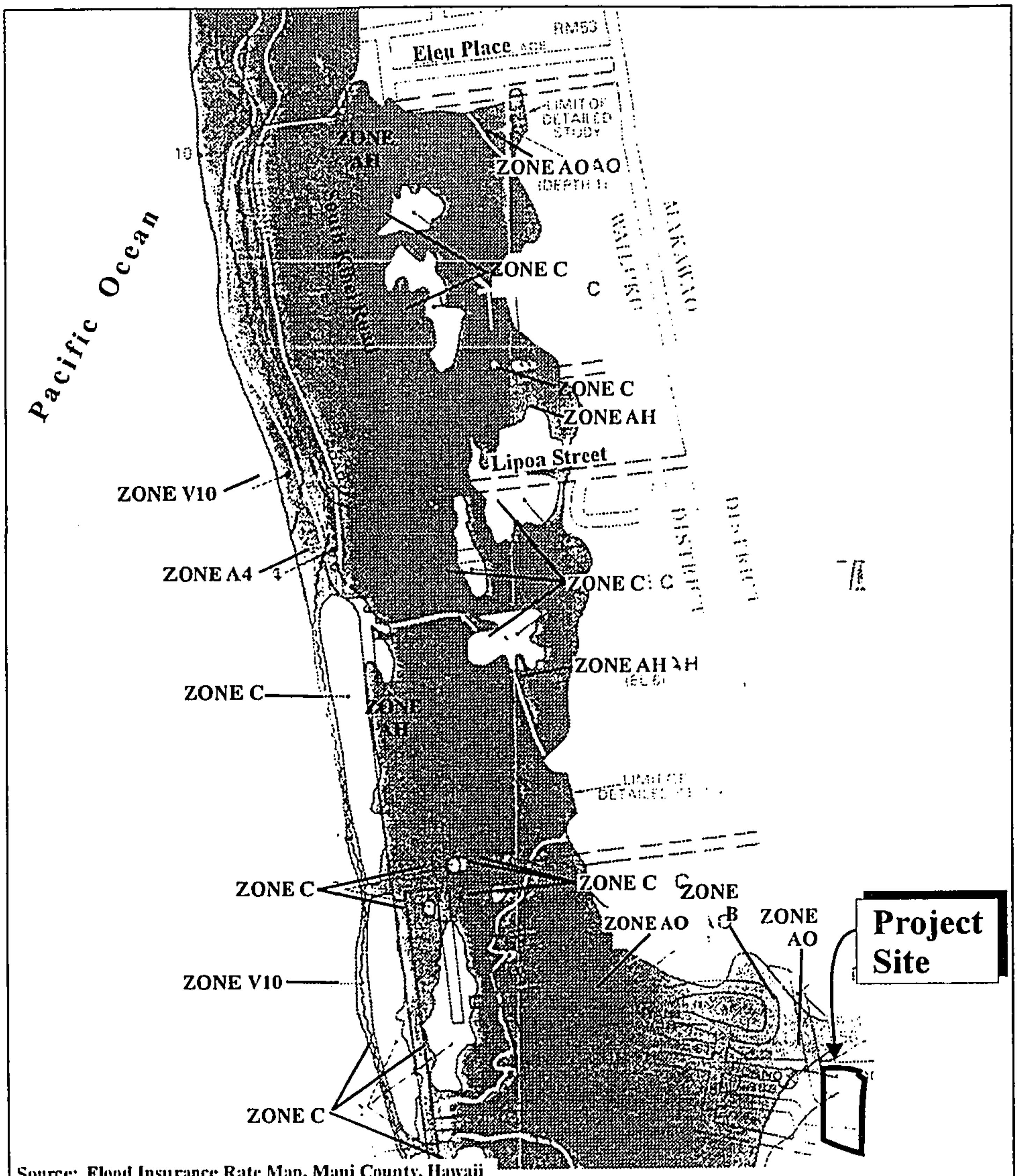
Source: USDA Soil Conservation Service

Figure 7

Hale Mahaolu Ehiku
Elderly Housing Project
Soil Classification Map

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.



Source: Flood Insurance Rate Map, Maui County, Hawaii

Figure 8

Hale Mahaolu Ehiku
Elderly Housing Project
Flood Insurance Rate Map

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.

by the County of Maui for the Kihei recycling drop off station. The remaining portion of land is vegetated with buffel grass, koa haole, bermuda grass, fingergrass and Australian saltbush.

Avifauna and mammals in the vicinity of the subject property and surrounding areas are typical of the species found in the urbanized Kihei area. Species of birds commonly found in the area include the Northern Cardinal, Common Mynah, Golden Plover, Spotted Dove, House Finch, and Grey and Black Francolin. Feral mammals typically found in the area include rats, mice, and mongoose. There are no known rare, threatened, or endangered wildlife species in the vicinity of the project site.

6. ***Air Quality and Noise Characteristics***

There are no point sources of airborne emissions in the immediate vicinity of the project site. The air quality of the Kihei area is considered good with existing airborne pollutants attributed primarily to automobile exhaust from the region's roadways. Another source of airborne emissions may include smoke from sugar cane burning which occurs in the Central Maui isthmus. This source is intermittent, however, and prevailing tradewinds quickly disperse particulates which are generated.

There are no adverse noise sources in the project area. Noise generated in the vicinity of the subject property can be attributed to traffic travelling along adjoining roadways, including the Piilani Highway.

7. ***Scenic and Open Space Resources***

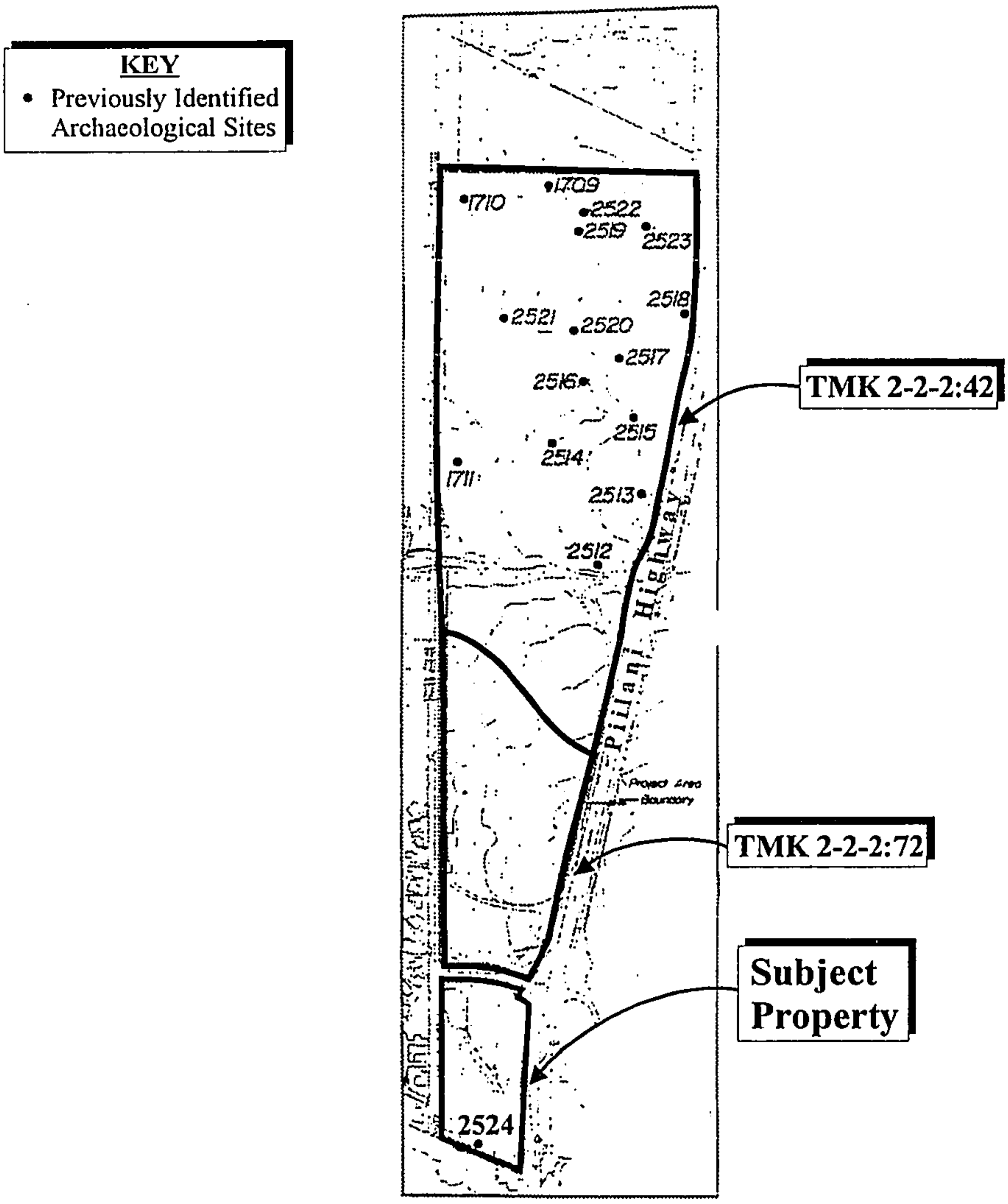
The Pacific Ocean and the off-shore islands of Molokini and

Kahoolawe define the scenic and open space resources to the south and west (makai) direction of the subject property. The West Maui Mountains constitute the primary visual feature to the north, while Haleakala is the dominant visual feature to the east of the subject property. The subject property is not part of significant scenic view corridors or open space resources.

8. ***Archaeological Resources***

In April 1990, Paul H. Rosendahl, Ph.D., Inc. completed an extensive archaeological inventory survey for the southern portion of the Kihei-Makena Project District 5 area. The survey area included the subject property, and the two (2) properties north of the subject parcel, identified by TMKs 2-2-02:42 and TMK 2-2-02:73. See Appendix "B". The survey indicated the presence of sixteen (16) sites with thirty (30) component features, most of which were located on TMK 2-2-02:42, north of the subject property. See Figure 9. Six (6) of the sites identified on Parcel 42 were assessed as archaeologically significant in terms informational value. The survey also indicated the presence of one (1) recorded site located in the southwest corner of the subject property identified as Site 2524. Refer to Figure 9. The site was identified as a prehistoric rock pile, consisting of pahoehoe cobbles. Necessary data collection and inventorying of the site was completed and no further data collection was recommended.

The report did note that previous archaeological sites had been identified on the subject property by the Environmental Impact Statement Corporation (EISC) during a 1982 survey. Rosendahl indicated that grubbing activities between 1982 and 1990 destroyed all of the sites identified by EISC. In addition to grubbing activities,



Source: Paul H. Rosendahl, Ph.D., Inc.

Figure 9

Hale Mahaolu Ehiku
Elderly Housing Project
Archaeological Sites

NOT TO SCALE

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.

the report also noted that erosion and cattle grazing combined to eliminate nearly all of the remnant archaeological resources of the subject property and Parcel 72 to the north.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Community Character

From a regional standpoint, the subject parcel is part of the Kihei-Makena Community Plan region which extends from Maalaea to La Perouse Bay. The region includes a diverse range of physical and socio-economic environments. With its dry and mild climate and proximity to recreation-oriented shoreline resources, the visitor-based economy has grown steadily over the past few years. The town of Kihei serves as the commercial and residential center of the region with the master-planned communities of Wailea and Makena serving as the focal point for visitor activities.

2. Population

The population of the County of Maui has exhibited a relatively strong growth over the past decade, with the 2000 census population of 128,094 reflecting a 27.6 percent increase over the 1990 population (U.S. Census). Growth in the County is expected to continue, with resident population projections to the year 2010 estimated to be 136,400 (Maui County Data Book, 2001).

Just as the County's population has grown, the resident population of the region surrounding the project site has increased in the last two (2) decades. Population gains were especially pronounced in the 1970's as the rapidly developing visitor industry attracted many new residents. The 1990 resident population of the Kihei-Makena region was approximately 15,365. The 2000 resident population was 22,420. This represents a 46 percent increase over the 1990 population (Maui County Data Book, 2001).

3. *Economy*

The economy of Maui is heavily dependent upon the visitor industry. The dependency on the visitor industry is especially evident in the Kihei-Makena region, which is one of the State's major resort destination areas. The foundation for the region's visitor strength lies in the availability of vacation rentals in Kihei and world-class resorts and recreational facilities located in Wailea and Makena. Support for the visitor industry is found in Kihei, where numerous retail commercial centers are found.

During recent years, however, much of the island's economic growth has been from businesses not directly affiliated with tourism. From May 1997 to May 2000, hotel jobs grew 8.9 percent. Meanwhile, construction jobs grew 41 percent; transportation, telecommunication and utility jobs grew 22.4 percent; agricultural jobs grew 17.5 percent; and federal government jobs grew 80 percent (Pacific Business News, July 28, 2000).

According to data from the State Department of Labor and Industrial Relations, about 71,550 individuals were employed on the island of Maui in September 2001. The island's growth rate remains high and unemployment continues to be relatively low. As of July 2004, the unemployment rate for Maui County and the island of Maui stood at 3.4 percent and 2.9 percent, respectively (State Department of Labor and Industrial Relations, August 2004).

C. *PUBLIC SERVICES*

1. *Police and Fire Protection*

The County of Maui's Police Department is headquartered in Wailuku. The Maui Police Department (MPD) consists of several patrol, investigative and administrative divisions. The MPD's Kihei Patrol covers the Kihei-Makena region. The department's Kihei Substation is located at the Kihei Town Center, about one-half mile to the south of the subject property.

Fire prevention, suppression and protection services are offered by the County's Department of Fire Control. The department's Kihei Station, which services the Kihei region is located on South Kihei Road approximately one-half mile to the west of the subject property. The department's Wailea station, which services the Makena-Wailea region, is approximately 2 miles south of the subject property.

2. *Medical Facilities*

Maui Memorial Medical Center in Wailuku, the only major medical facility on the island, services the Kihei-Makena region. Acute, general and emergency care services are provided by this facility, which is licensed for 196 beds and is situated in Wailuku. Privately operated medical/dental offices are located in the Kihei area to serve the region's residents and visitors.

3. *Recreational Facilities*

Diverse recreational opportunities are available in the Kihei-Makena region. Recreational facilities in proximity to the subject property include Kalama Park, Kamaole Beach Parks I, II and III, Kaleopolepo Park and the Elleair Golf Course. Shoreline recreation includes swimming, fishing, picnicking, snorkeling, and windsurfing. The 36.5-acre Kalama Park is located to the southwest of the subject property across South Kihei Road. In addition to shoreline activities, this park also has baseball and soccer fields, as well as tennis and basketball courts.

The Wailea and Makena resort areas to the south offer additional opportunities for golf, tennis and ocean-related activities.

In addition, the County's new Kihei Community Center complex, located approximately one-half mile to the north of the subject property, providing a community center, swimming pool, and athletic playfields.

4. *Schools*

The State Department of Education (DOE) operates three (3) schools in the Kihei area. Kihei Elementary School and Kamali'i Elementary School cover grades K to 5, with 2002-2003 enrollments of approximately 817 and 809 students, respectively. Lokelani Intermediate School includes grades 6 to 8, with a 2002-2003 enrollment of 773 students (Department of Education, June 4, 2003). Public school students in grades 9 through 12 attend Maui High School in Kahului.

5. *Solid Waste*

Single-family residential solid waste collection service is provided by the County of Maui on a once-a-week basis. Residential solid waste collected by County crews are disposed at the County's 55-acre Central Maui Landfill located 4.0 miles southeast of the Kahului Airport. In addition to County-collected refuse, the Central

Maui Landfill accepts commercial waste from private collection companies. Privately owned facilities, such as the Maui Demolition and Construction Landfill and the Pohakulepo Concrete Recycling Facility accept solid waste and concrete from demolition and construction activities. These facilities are located at Maalaea northwest of the subject property, near Honoapiilani Highway's junctions with North Kihei Road and Kuihelani Highway. A privately operated green waste recycling facility, Campaign Recycle Maui, is situated near Waikapu, while a County operated facility is located at the Central Maui Landfill.

The community drop off station currently located on the property receives residential recycling, including newspaper, glass, plastic bags and bottles, cardboard, aluminum and metal cans. No plans for facility relocation have been formulated at this time.

D. INFRASTRUCTURE

1. Roadway System

Access to the Kihei region from West Maui and the Wailuku area is provided by North Kihei Road, while access from the Kahului and "Upcountry" areas is provided by Mokulele Highway. These roadways are two-lane roadways which are under the control of the State Department of Transportation. North Kihei Road becomes South Kihei Road, near its junction with Mokulele Highway and continues southward through Kihei Town. South Kihei Road terminates at Okolani Drive in Wailea. South Kihei Road is a two-lane County collector roadway.

Piilani Highway, the primary arterial highway for South Maui, begins at the North Kihei Road-Mokulele Highway intersection and terminates at Wailea Ike Drive in the Wailea Resort. This two-lane State highway runs parallel to and east of South Kihei Road. Piilani Highway has paved shoulders with left- right-turn deceleration lanes at major intersections. The State of Hawaii Department of Transportation recently completed a project that restriped a 5.9 mile section of Piilani Highway, from the intersection of Mokulele Highway to the intersection of Kilohana Drive, to provide two (2) travel lanes in each direction. The project was completed in the Summer 2003.

Access to the subject property is provided by Old Welakahao Road, which runs parallel to Piilani Highway and is designated as the right-of-way for the County's proposed North-South Collector Road. The State of Hawaii recently closed the Old Welakahao Road access intersection to Piilani Highway as part of the Piilani Highway restriping project.

2. *Water System*

The Kihei-Makena region is served by the Central Maui Water System. The Central Maui Water System is serviced by the Mokuhau Wells and the Upper Waiehu Wells.

The water system in the area consists of a 2.0 million gallon (MG) reservoir located east of Ohukai Road, approximately 1.0 mile mauka of Piilani Highway. An 18-inch transmission line from the Central Maui source feeds the distribution system in the vicinity of the subject property, and will provide domestic water and fire protection for the proposed project.

The County's reclaimed waterline originating at the Kihei

Wastewater Reclamation Plant, runs through Old Welakahao Road. In accordance with County policy, reclaimed water shall be utilized for irrigation purposes.

3. ***Wastewater System***

The service area for the County's Kihei Wastewater Reclamation System extends from North Kihei to Wailea. The system consists of a number of pump stations and force mains which convey wastewater through the County's transmission lines. The combined flows are transported to the Kihei Wastewater Reclamation Facility, which is located approximately 600 feet to east of the project site. The existing design capacity of the Kihei Wastewater Reclamation Facility is 8.0 million gallons per day (MGD). There are no existing sewerlines within the roadways immediately adjacent to the project site.

4. ***Drainage***

The project site generally slopes at approximately 2 to 4 percent. Vegetative ground cover is approximately 60 percent.

Existing storm water runoff generated onsite generally sheet flows towards a low point near the west and southwest property lines of the project site and into the adjacent parcel (the future North-South Collector Road). Flows are diverted by an earth berm within the site, which divides the existing outfall locations of the existing flows. Some water is retained within this parcel and eventually percolates into the soil.

Piilani Highway borders the east side of the project site, where storm water runoff from this area shall be retained and diverted by curbs and landscaping. Additional runoff from this highway shall not enter the project site. Refer to Appendix "C" for a detailed analysis.

5. ***Electrical, Telephone and CATV Systems***

Electrical, telephone, and cable television (CATV) services are provided to properties in the vicinity of the proposed project by Maui Electric, Verizon Hawaii, and Time Warner Oceanic, respectively.

Chapter III

Potential Impacts and Mitigation Measures

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. IMPACTS TO THE PHYSICAL ENVIRONMENT

1. Land Use

The proposed elderly project is not anticipated to create any adverse impacts to surrounding land uses in the vicinity of the subject property. The housing facility has been designed in accordance with the Project District 5 objectives and design guidelines and is anticipated to compliment the surrounding land uses, which includes single-family residential and future church uses.

As a quasi-public use, the proposed improvements will provide a land use function integral to the livability and viability of the South Maui community.

2. Flood Impacts

The subject property is located within Zone "C" of the Flood Insurance Rate Maps. As such, flood parameters will not limit site development. No adverse impacts to adjoining or downstream properties are anticipated as a result of the proposed project.

3. Flora and Fauna

There are no identified habitats of rare, endangered, or threatened species of flora or fauna located within the vicinity of the subject project. The construction of the proposed project is not anticipated to adversely impact the surrounding flora and fauna environment.

4. Air Quality and Noise Characteristics

The proposed action will involve construction activity which may be a source of airborne emissions and noise. Construction noise is attributable to operation of onsite equipment during the project construction period. Dust generated from construction activities are generally attributed to clearing and grubbing activities. Construction equipment may also be a source of airborne emissions which would otherwise not be present at the project site. To mitigate the impacts of dust during construction, Best Management Practices (BMPs) shall be incorporated in site construction activities in accordance with Chapter 20.08 of the Maui County Code.

In addition, the contractor shall be responsible for properly maintaining vehicle and equipment engines to ensure their efficient operations. Finally, the contractor shall be required to comply with Hawaii Administrative Rules, Chapter 11-46 relating to "Community Noise Control". Construction will occur during daylight hours. In the long term, no adverse impacts to the ambient noise levels or air quality are anticipated as a result of project improvements.

5. *Scenic and Open Space Requirements*

The proposed project lies makai of Piilani Highway. To mitigate the effects of building massing along the highway, buildings are oriented in a north-south direction to provide open view corridors through the site. In addition, one-story buildings, approximately 14 feet in height are located along the highway to reduce the visual and scale effects of the project. Three-story buildings, approximately 34 feet in height are located along the lower-elevation western extent of the property to reduce the effects of building heights. The site will be fully landscaped to provide a well-maintained appearance to further reduce visual impacts.

6. ***Archaeological Resources***

According to a 1990 archaeological report by Paul H. Rosendahl, Ph.D., Inc., one (1) archeological site was identified on the subject property. Necessary data collection and inventorying was completed and no further data collection was recommended. No adverse impacts to archaeological resources in the vicinity of the subject project are anticipated. However, should any archaeological deposits be encountered during project construction, all work will be halted in the vicinity of the find. The staff of the State Historic Preservation Division (SHPD) will be notified accordingly in order to determine appropriate mitigation measures.

7. ***Cultural Impact Assessment***

a. ***Settlement Context***

Archaeological research establishes the earliest settlement on the island of Maui to have occurred between A.D. 300-600 along the windward regions. Settlement of the drier, leeward regions of Maui, such as Kihei, is postulated to have occurred between A.D. 1000-1200 (Kirch 1985, Cordy and Athens 1988). The latter settlements occurred in the upland area of Kula to exploit forest and agricultural resources where dryland taro was cultivated in moist pockets of soil (Handy 1940). As well, the areas along the coast near Kalepolepo in Kihei and Maluaka in Makena were settled to exploit available marine resources. Trails from the mountain (mauka) settlements to the coast (makai) settlements were established to link the settlements to one another. This settlement pattern is developed from archaeological surveys and inventories which have uncovered prehistoric evidence of more permanent habitation along the coast and upland areas. Sites uncovered between these areas, however, are fewer in numbers and more representative of temporary shelters. Ross Cordy (1977) postulated that this area between the inhabited coast and upland area is an intermediate or "barren" zone. Mainly due to the hot, dry and windswept conditions, the area was mainly used for trails and little human prehistoric activity was considered to have occurred in this area.

b. *Early Archaeology*

Cox (1976) and Cordy (1977) carried out archaeological surveys in association with the construction of the Piilani Highway. In the Cox survey, six (6) sites were located. The only possible prehistoric site was considered to be a boundary marker or a burial. Excavation yielded only a soil fill, but no burial or dates. In the Cordy survey, two (2) sites were uncovered along the roadway corridor. Both sites were considered to be prehistoric short-term shelters. Volcanic glass recovered from the site established a date of AD 1724 to 1784. Since these studies, a number of archaeological surveys have been conducted in the Kihei area near the project site. Kennedy (1986) conducted a surface reconnaissance survey of 125 acres for the Silversword Golf Course (now Elleair golf course, located 0.5 mile northeast of the project site) and reported that no archaeological features were found. Fredericksen (1995) conducted an archaeological inventory survey for the proposed Road "C" corridor (located makai of the Piilani Highway and Lipoa Street intersection, 0.75 mile north of the site). A low overhang shelter was identified during this survey. Donham (1989) carried out an archaeological survey of 114 acres for the Piilani residential Community Phase I (1.1 miles north of the project site). Five (5) sites were discovered during this survey. The most significant of the sites was recommended for data recovery. Subsurface test excavations did not produce human remains, or evidence of cultural deposits. However, further data recovery (Donham, 1990) indicated a more developed agricultural complex representing modification of natural slopes for cultivation. This has led Donham to suggest that a "coastal perimeter zone" may have occurred which could possibly have been of seasonal usage during periods of increased rainfall or in response to land pressures in the coastal zone (Fredericksen 1995). Sinoto (1992) carried out an archaeological survey for the Kihei Gateway Complex, covering an area of 29 acres located near the intersection with Mokulele Highway and South Kihei Road (2.5 miles north of the project site). No surface archaeological remains, nor evidence of any other significant cultural activities, were encountered during the survey. All the archaeological evidence corroborates the Cordy (1977) findings which postulates that there is very little prehistoric information of value within the vicinity of the project site due to its location in the "barren" zone between the coastal settlements and upland agricultural settlements.

c. ***Historical Documentary Research***

Within the historic cultural context, the project site is located within Keokea Ahupua'a, part of the Makawao District (modern era). Subsequent to the division of Hawaiian lands, known as the Mahele in the mid-19th century, indication of the historical settlement can be assessed from reviewing Land Commission Awards (LCAs). The LCAs were presented to tenants who could prove occupancy on the parcels before 1845. No LCAs or *kuleanas* (house and/or garden plots) were claimed within the vicinity of the project area. It is noted that a number of LCAs were awarded in the upland areas of Keokea, previously utilized for cultivation of Irish potatoes, sweet potatoes, bananas, taro, sugarcane and house lots (Rosendahl, 1990). The lack of LCAs within the vicinity of the project corridor supports the archaeological findings that the area would not likely be considered a traditional Hawaiian settlement area.

Documentary data indicates in the mid- to late-1800's, the lands in the vicinity of north Kihei, which included the Honuaula and Makawao Districts became more heavily used in association with sugar cane cultivation. Hawaii Commercial and Sugar Company had large acreages under cultivation in this area, with a narrow gauge railroad in place to transport sugar cane to the Puunene mill. M.J. Nowlein and S.D. Burrows leased lands from Kamehameha III at Ulupalakua to grow sugar cane and Irish potatoes. Linton L. Torber expanded sugar cane cultivation and also started cattle ranching. A severe drought in 1878 ended the production of sugar cane and cattle ranching became the dominant agricultural activity in the project vicinity (Fredericksen 1995). The importation of grasses (i.e., buffelgrass) for livestock feed has altered the natural flora and is still in evidence today.

d. ***Additional Informant Data***

In order to obtain a range of cultural resource perspectives in the vicinity of the project site, an interview was conducted with Mr. Kimokeo Kapahulehua and is summarized as follows.

(1) ***Kimokeo Kapahulehua***

Mr. Kapahulehua was born on Kauai in 1947. He graduated from Kauai High School in 1965 and studied business administration for three (3) years at Church College of Hawaii (now Bringham Young University). He moved to Maui in 1970 and has been living in Kihei since 1986. He is a member of the Kihei Canoe Club located in Waiakoa Ahupua'a and Halau Maui Nui-O-Kama, a native cultural organization. He is also president of Ke-ie-ie-loko-ia Fishpond in Kalepolepo. Halau Maui Nui-O-Kama is very active in teaching native cultural practices in hula, chants and dissemination of cultural information. It is presently working in partnership with the U.S. Fish and Wildlife Service identifying native plants, native birds and native insects in the Ma'alaea-Kihei area and with the National Oceanic Atmospheric Administration to identify the sea animals along the coast from Ma'alaea Bay to Makena. Halau Maui Nui-O-Kama teaches native culture at the Kihei Charter High School one (1) hour per week and canoeing and paddling three (3) days per week. In their native cultural studies, the organization actively walks, hikes and paddles the Kihei coastline. They are also active in the reforestation of native plants and sand dune restoration. The main area of their work is in the area makai of South Kihei Road and along the coast from Ma'alaea Bay to Makena.

Mr. Kapahulehua referred to the area mauka of the project site as pasture lands. He identified the Ualoa plant growing in the vicinity of the project site. This plant is used for medicinal purposes, such as a cure for a sore throat. However, he mentioned this plant is not harvested near the roadside due to dust and automobile exhaust. He stated that this plant is not endangered or an endemic plant which is specific to the State of Hawaii. He is not aware of any native cultural practices or harvesting of plants in the vicinity of the project site.

e. ***Cultural Impact Assessment***

The proposed project site is located in a dry arid region, recognized as the *"barren"* zone in between Kihei's inhabited coastal lands and the inhabited upland Kula areas. No significant archaeological evidence has been gathered to date that would suggest the barren zone contained any other land uses aside from access trails and temporary shelters. After 1850, lands in the vicinity of the project site were utilized primarily for cattle ranching. There are no known archaeological resources which will be adversely impacted by the proposed action. Based on informant information and the existing land use context, there is no evidence of current or recently occurring cultural practices along the project site. In this regard, the proposed improvements are not anticipated to adversely impact cultural resources.

B. ***IMPACTS TO THE SOCIO-ECONOMIC ENVIRONMENT AND PUBLIC SERVICES***

1. ***Economy and Population***

The proposed action is anticipated to have a positive economic impact to the local economy during the construction phase of the development as expenditures for construction and related support services are made. In the long term, no adverse impacts to the local economy are anticipated as a result of project implementation.

The proposed project is not anticipated to have an adverse impact on the existing regional or island population.

The Ehiku Elderly Housing Project is intended to meet a significant community need by addressing housing and support service requirements for the elderly. With a general trend of aging population cohorts, the need for affordable facilities as proposed, is expected to provide a long-term benefit to the Kihei-Makena community.

2. ***Police, Fire and Medical Services***

The proposed project is not anticipated to adversely impact the service capabilities of the police, fire and emergency medical operations in the Kihei area. The project is not anticipated to extend the existing service area limits for emergency services.

3. *Recreational and School Facilities*

The proposed project in not considered significant in terms of population generation. As such, the proposed improvements will not place any new demands on recreational activities. It is noted that the Ehiku project incorporates a Senior Center/Community Building which will be used for resident group functions and activities. Programs conducted in this facility for the senior residents are intended to provide social, cultural and recreational opportunities for a balanced and enhanced community lifestyle.

School enrollments or locations are not anticipated to be affected by the proposed action. As a result, no impacts to educational services are anticipated.

4. *Solid Waste*

Cleared and grubbed materials resulting from construction activities will be disposed or recycled at an acceptable construction waste disposal site. As appropriate, a solid waste management plan will be developed in coordination with the Solid Waste Division of the County of Maui, Department of Public Works and Environmental Management (DPWEM).

5. *Traditional Beach and Mountain Access*

The proposed project will not adversely impact traditional beach or mountain access.

C. *IMPACTS TO THE INFRASTRUCTURE*

1. *Roadway System*

In order to assess the proposed project's traffic related impacts, a traffic impact study was completed in November 2002 by the applicant's traffic engineering consultant, Julian Ng, Incorporated. See Appendix "D".

The report determined that the anticipated impact of the proposed development would be minimal. Based on traffic projections for total build out, the new facility would result in a morning peak hour trip generation rate of 17 and an afternoon peak hour trip generation rate of 35. The relatively low trip rates are attributed to less active driving requirements for the elderly residents. Based on recent traffic counts in the area completed by the State Department of Transportation (DOT), increases from project-related traffic would represent less than one percent of existing traffic on South Kihei Road and Piilani Highway.

The traffic study also considered the project's potential impact on the Old Welakahao Road-Welakahao Street (future North-South Collector Road) intersection. The study found that the aforementioned intersection is anticipated to operate at a Level of Service of A (minimal delay, very good conditions) without the project and with the project.

The proposed elderly housing facility is anticipated to have a minor impact to traffic conditions along Welakahao Road and the larger Kihei area. An evaluation of the potential increase in traffic caused by the project showed an impact that would be much less than the threshold suggested by the Institute of Transportation Engineers for conducting a site access or traffic impact study. Further, an unsignalized intersection analysis on the nearest intersection showed very little impact with the addition of project traffic to future baseline traffic volumes.

2. ***Water System***

Domestic water and fire protection for the proposed project will be provided by the County's potable water system. The applicant met with Maui County Mayor Alan Arakawa to discuss water allocation for the project. With the recent designation of the Iao Aquifer, the Department of Water Supply (DWS) has stopped taking reservations for meters. In the meeting with Mayor Arakawa, he indicated that the County of Maui has approximately 2 million gallons per day (MGD) that has been set aside for affordable housing projects and that water meters would continue to be issued for these types of projects. Refer to Appendix "C".

Once completed, the project will use an average of approximately 69,740 gallons of water per day, with a maximum daily demand of 104,610 gallons per day. This does not include water for irrigation purposes as reclaimed water will be used, as previously noted. Based on preliminary water calculations, the project would require two (2) 2-inch water meters once full build out is completed. The DWS has stated that they will not allow the project to be serviced by the existing 18-inch waterline in Liloa Drive since it is considered to be a transmission line. Therefore, in order to bring water to the site, a new 12-inch waterline will be constructed from the existing 12-inch waterline in Kapuna Street. Domestic water service requirements will be coordinated with the Engineering Division of the Department of Water Supply during the building permit review and approval process. The proposed fire protection improvements to the property will meet or exceed the fire flow requirements of the County of Maui.

3. ***Wastewater System***

Preliminary project plans call for a connection to an existing sewerline located at the Kupuna/Mahina Street intersection in the Wai Mahaihai Subdivision, just south of the project site. Approximately 200 linear feet of 8-inch sewerline will be required along portions of Liloa Drive and Kapuna Street to bring sewer service to the project. Refer to Appendix "C". Connection to the County sewer system and the installation of onsite sewer system improvements will be coordinated with the DPWEM's Wastewater Reclamation Division. The proposed action is not anticipated to place operational constraints on wastewater facilities. The availability of Kihei's wastewater treatment capacity will be coordinated with the Wastewater Reclamation Division during the building permit review and approval process.

4. ***Drainage and Erosion Control***

There is an existing 24-inch drain stubout in Liloa Drive, near the property's southwest boundary corner. According to the Drainage and Soil Erosion Report for Keala Hills Subdivision, prepared by Warren S. Unemori Engineering, Inc., the stubout and the associated Keala Hills drainage system has the capacity for an additional 16.6 cubic feet per second (cfs). This additional capacity was set aside for this site when it was previously referred to as "Piilani Project District," since the developer at that time participated in the cost of the Keala Hills subdivision drainage system.

Given the above, it is proposed to drain the site by three (3) different methods. The first method consists of using swales and drain inlets to intercept the runoff and convey it to the existing 24-

inch drainline stubout. As stated earlier, this system has the capacity for an additional 16.6 cfs. Thus, this method for draining the site would be limited to that amount.

The second method will be to intercept and convey the runoff to retention areas planned throughout the site. To reduce the required depth of these retention areas, perforated subdrain may also be used. This would allow the retention areas to also serve as open lawn space for the project.

The third method will be to connect to the County's drainage system for Liloa Drive. The applicant has stated that they would be willing to contribute to the cost of up sizing the roadway's drainage system to insure available capacity. It is important to note that the proposed project can comply with County drainage standards without this third method. Refer to Appendix "C", Preliminary Drainage Report.

Based on County Erosion Control Standards and Guidelines, the proposed project is well below the allowable erosion rate. Nevertheless, the applicant will adhere to an erosion control plan that will utilize Best Management Practices (BMPs) in order to minimize erosion during the project construction. Refer to Appendix "C". As such, the proposed improvements are not anticipated to cause adverse impacts to downstream or adjoining properties.

5. ***Electrical, Telephone and CATV Systems***

Electrical, telephone and CATV services for the proposed project will be coordinated with Maui Electric Company, Verizon Hawaii, and Time Warner Oceanic Cable, respectively. In addition, Hale Mahaolu will coordinate with Maui Electric Company and Verizon Hawaii in an effort to reinstall existing overhead electrical and telephone lines underground, if feasible.

Chapter IV

Relationship to Land Use Plans, Policies and Controls

IV. RELATIONSHIP TO LAND USE PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission (LUC), establishes the four (4) major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural, "Agricultural", and "Conservation".

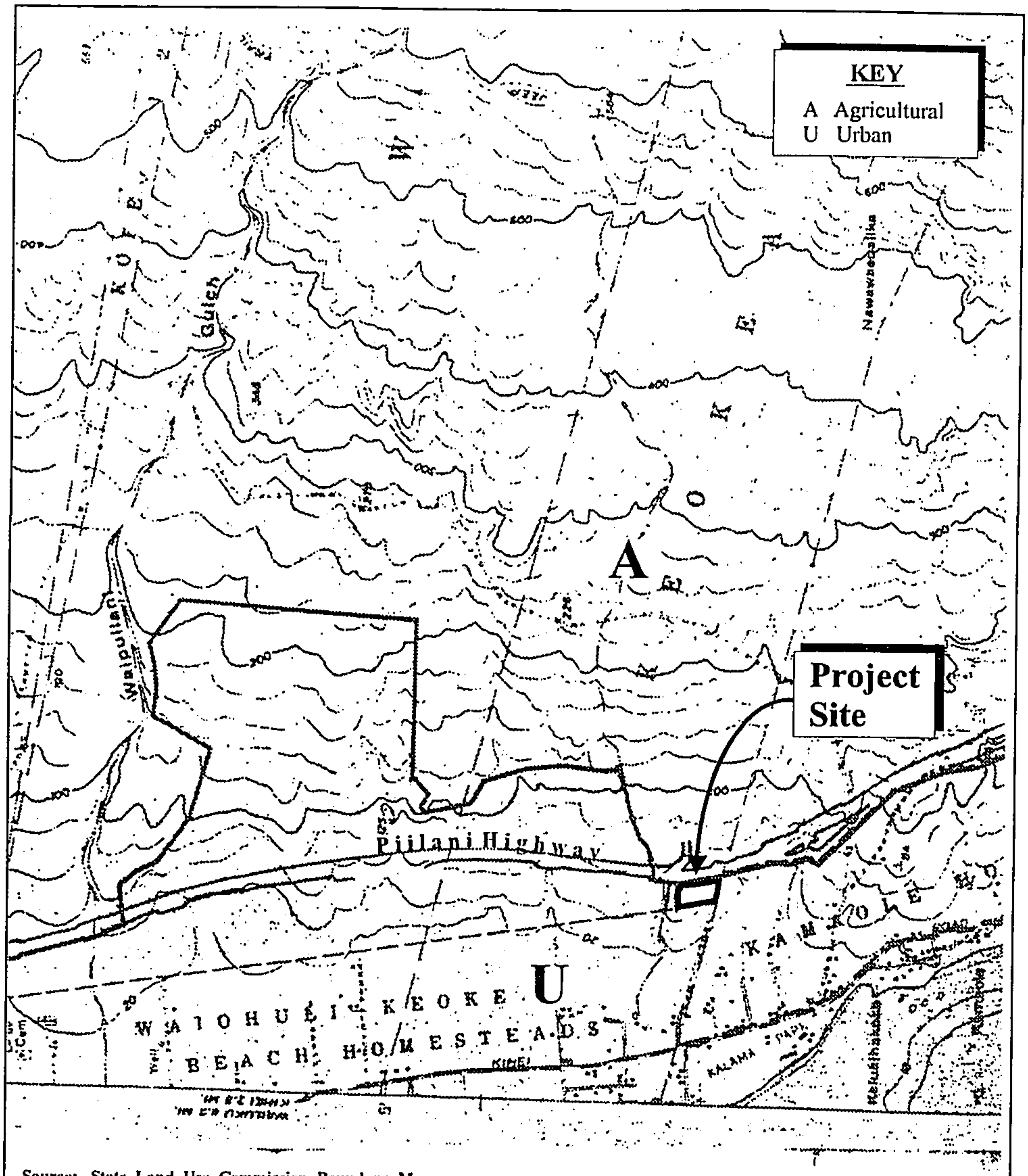
The site for the proposed Ehiku project is located within the "Urban" District. See Figure 10. The proposed land use represents a land use which is compatible under the "Urban" designation.

B. MAUI COUNTY GENERAL PLAN

The Maui County General Plan (1990 Update) sets forth broad objectives and policies to help guide the long-range development of the County. As stated in the Maui County Charter:

> *". . . indicate desired population and physical development patterns for each island within the county; shall address the unique problems and needs of each island and region within the county; shall explain the opportunities and the social, economic, and environmental consequences related to potential developments; and shall set forth the desired sequence, patterns, and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies and implementing actions to be pursued with respect to population density, land use maps, land use regulations, transportation systems, public and community facility locations, waster and sewage systems, visitor destinations, urban design and other matters related to development."*

The Maui County General Plan advances five (5) major themes that focus on the overall goals of the plan. The proposed project responds to the following General Plan theme:



Source: State Land Use Commission Boundary Maps

Figure 10

Hale Mahaolu Ehiku
Elderly Housing Project
State Land Use Classifications

0 500 1000 2000 Feet

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.

* * *

Theme Number 5

Provide for needed resident housing

- Amendments to the General Plan address the development of resident housing as a major social need in our community.

The proposed action is in keeping with the following General Plan objectives relating to land use, housing, urban design, health and family and special programs.

LAND USE

Objective:

- To use the land within the County for the social and economic benefit of all the County's residents.

Policy:

- Encourage land use methods that will provide a continuous balanced inventory of housing types in all price ranges.

HOUSING

Objectives:

- To provide a choice of attractive, sanitary and affordable homes for all our residents.
- Provide affordable housing to be fulfilled by a broad cross-section of housing types.

Policies:

- Provide or require adequate physical infrastructure to meet the demands of present and planned future affordable housing needs.
- Encourage the construction of housing in a variety of price ranges and geographic locations.
- Streamline or "fast-track" the governmental review process for affordable single-family and multi-family housing projects.
- Ensure that each community plan region contains its fair

share of affordable housing.

- Encourage the establishment of additional senior citizen housing in various locations.

URBAN DESIGN

Objective:

- To encourage developments which reflect the character and the culture of Maui County's people.

Policy:

- Encourage community design which establishes a cohesive identity.

HEALTH AND FAMILY

Objective:

- To focus on the quality of family life including the young, the elderly, and the handicapped as the basic building block of community well-being.

Policy:

- Support an expanded role for community churches and voluntarism in family support and delivery of services.

SPECIAL PROGRAMS

Objective:

- To create a community in which the needs of all segments of the population will be recognized and met.

Policy:

- Provide a variety of services and programs that meet the special needs of recent immigrants, and of the young, the elderly and the handicapped.

C. ***KIHEI-MAKENA COMMUNITY PLAN***

The subject parcel is located in the Kihei-Makena Community Plan region which is one (1) of nine (9) Community Plan regions established in the County of Maui. Planning for each region is guided by the respective Community Plans, which are designed to implement the Maui County General Plan. Each Community Plan contains recommendations and standards which guide the sequencing, patterns and characteristics of future development in the region.

The Kihei-Makena Community Plan sets forth detailed land uses for the region. The subject property is located within the Kihei-Makena Project District 5 area. See Figure 11. The proposed elderly housing facility is in consonance with the following goals and objectives delineated in the Kihei-Makena Community Plan:

1. ***Land Use***

Goal

A well-planned community with land use and development patterns designed to achieve the efficient and timely provisions of infrastructural and community needs while preserving and enhancing the unique character of Maalaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.

Objectives and Policies:

b. Identify priority growth areas to focus public and private efforts on the provision of infrastructure and amenities to serve existing residents and to accommodate new growth.

g. Establish a distribution of land uses which provides housing, jobs, shopping, open space and recreational areas in close proximity to each other in order to enhance Kihei's neighborhoods and to minimize dependence on automobiles.

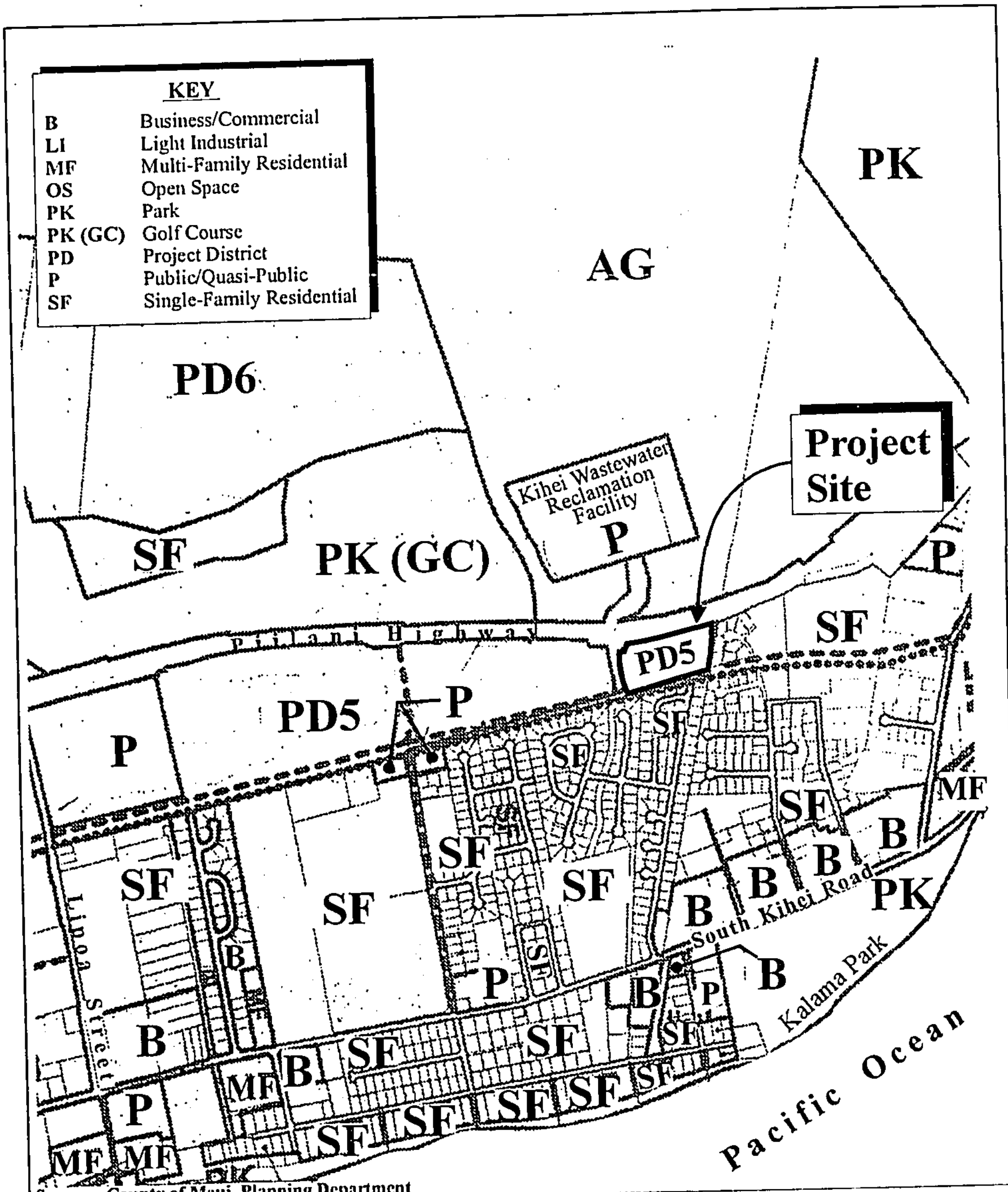


Figure 11

Hale Mahaolu Ehiku
Elderly Housing Project
Kihei-Makena Community
Plan Land Use Designations

NOT TO SCALE

Prepared for: Hale Mahaolu

MUNEKIYO & HIRAGA, INC.

2. *Housing and Urban Design*

Goal

A variety of attractive, sanitary, safe and affordable homes for Kihei's residents, especially for families earning less than the median income for families with the County. Also, a built environment which provides complementary and aesthetically pleasing and physical and visual linkages with the natural environment.

Objectives and Policies:

a. Provide an adequate variety of housing choices and range of prices for the needs of Kihei's residents, especially for families earning less than the median income for families within the County, through the project district approach and other related programs. Choices can be increased through public/private sector cooperation and coordinated development of necessary support facilities and services.

b. Require a mix of affordable and market-priced housing in all major residential projects, unless the project is to be developed exclusively as an affordable housing project.

3. *Physical and Social Infastructure*

Goal

Provision of facility systems, public services and capital improvement projects in an efficient, reliable, cost effective and environmentally sensitive manner which accommodates the needs of the Kihei-Makena community, and fully support present and planned land uses, especially in the case of project district implementation.

Health and Public Safety

Objectives and Policies

a. Improve and expand the delivery of health and public safety services to Kihei-Makena residents and visitors.

D. *SECTION 201G APPLICATION*

Section 201G-118 of the Hawaii Revised Statutes allows eligible developers/housing projects to be exempt *"from all statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, development and improvement of land, and the construction of units thereon..."* in order to facilitate the timely and cost effective implementation of proposed affordable housing projects. In coordination with the County of Maui's Department of Housing and Human Concerns (DHHC), the Ehiku Elderly Housing Project has been determined an eligible project. Accordingly, a Section 201G application will be submitted to the DHHC for review and transmittal to the Maui County Council. Upon receipt of the 201G request, the County Council shall have 45 days to render its decision on the request for exemptions.

The list of exemptions sought for the Ehiku project is presented in Appendix "A" of this document. The proposed exemptions are intended to support the timely implementation of the project without compromising public health, safety and welfare considerations.

E. *ZONING AND PROJECT DISTRICT CONSIDERATIONS*

The Kihei-Makena Project District 5 designates the subject property for Multi-Family use, which permits *"nursing or convalescent homes and domiciliary facilities operated and maintained to provide nursing or supporting care"* subject to approval of a Special Use Permit. However, pursuant to Section 201G-118, HRS, an exemption from this section of the Maui County Code is being requested to allow the project to be developed without the processing of a SUP. In addition, since the project is zoned Kihei-Makena Project District 5, an exemption from the Project District Phase II approval requirements (pursuant to Chapter 19.45, Maui County Code) will be sought under the 201G application.

F. *COUNTY OF MAUI SPECIAL MANAGEMENT AREA*

The subject property is located within the County of Maui's Special Management Area (SMA). Pursuant to Chapter 205A, Hawaii Revised Statutes, and the Rules and Regulations of the Maui Planning Commission, projects located within the SMA are evaluated with respect to SMA objectives, policies and guidelines. Project consistency with coastal zone management objectives and policies is required. Accordingly, this section addresses the proposed action's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Maui Planning Commission.

1. *Recreational Resources*

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

(A) Improve coordination and funding of coastal recreational planning and management; and

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

- (i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
- (ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;
- (iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6, HRS.

Response: The subject property is located immediately makai of the Piilani Highway and is not anticipated to affect coastal recreational resources. Access to the shoreline environment will not be affected by the subject project.

2. ***Historical Resources***

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: An archaeological inventory survey completed on the subject property indicated the presence of one (1) recorded archaeological site. Necessary data collection and inventorying were completed, with no need for further data collection. Adverse impacts to historic resources are not anticipated as a result of the project implementation. However, should any subsurface archaeological resources be encountered during project construction, SHPD will be contacted immediately to determine appropriate mitigative measures.

3. ***Scenic and Open Space Resources***

Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;
(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and
(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Response: The proposed project design has been prepared to ensure visual compatibility with the surrounding environs. No significant coastal views will be impacted by the proposed project. Further, the project will have no impacts on coastal and open space resources. Finally, the proposed project is not considered to be coastal dependent.

4. ***Coastal Ecosystems***

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
(B) Improve the technical basis for natural resource management;
(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Response: Proposed improvements are not anticipated to adversely impact coastal ecosystems. Drainage improvements will be engineered to ensure coastal water impacts are mitigated. In addition, mitigative measures for soil erosion control will be implemented during project construction.

5. ***Economic Uses***

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;
(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor

facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
    (i) Use of presently designated locations is not feasible;
    (ii) Adverse environmental effects are minimized; and
    (iii) The development is important to the State's economy.

Response: The proposed project will provide short-term stimulus to the economy by providing construction-related jobs. The proposed project is in consonance with land use patterns established by the Kihei-Makena Community Plan. This action does not conflict with objectives and policies for economic uses.

6. *Coastal Hazards*

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Response: The proposed improvements are located beyond the reach of dangerous storm wave action. In addition, the property is located in Zone "C", an area of minimal flooding. No changes in drainage patterns are anticipated. Adverse impacts to downstream properties are not anticipated as a result of project implementation.

7. ***Managing Development***

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response: In compliance with Title 19 of the Maui County Code, the Rules and Procedures for the Maui Planning Commission and the Special Management Area Rules for the Maui Planning Commission, required documentation for the project will be filed with the County Department of Planning and will undergo public review, public hearing, and decision by the Maui Planning Commission.

Applicable State and County requirements will be adhered to in the design and construction of the proposed improvements.

8. ***Public Participation***

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes;

(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts

Response: Opportunity for public awareness, education and participation pertaining to significant resource attributes in the coastal zone is provided through the SMA, Project District, and Special Use Permitting procedures. Public hearings are an integral component of the project review process. Additionally, the project was presented and reviewed by the Kihei Community Association.

9. Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: Based on the distance between the project site and the shoreline environment, the proposed project is not anticipated to have any adverse impacts on beach processes.

10. *Marine Resources*

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Response: Proposed improvements to the subject property are not anticipated to adversely impact ocean resources.

Chapter V

Adverse Environmental Effects Which Cannot Be Avoided

V. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Construction activities associated with the proposed elderly housing project will result in various construction-related impacts, as described in Chapter III, Potential Impacts and Mitigation Measures.

In summary, potential adverse effects include noise-generated impacts from construction activities, temporary air quality impacts associated with fugitive dust and emissions discharged by construction equipment. The degree of these impacts will be moderated as the applicant and contractor will adhere to a regimented system of Best Management Practices (BMPs).

The proposed project is not anticipated to create any significant, long-term adverse environmental effects.

A. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed action involves the commitment of existing vacant lands for a new elderly facility. This commitment, however, is consistent with land use recommendations set forth in the Kihei-Makena Community Plan. The implementation of the Ehiku project is considered beneficial in terms of establishing land use allocations which address the needs of the senior community.

Additionally, the applicant is considering the implementation of various "sustainable building design" techniques for the project including the use of solar water heaters, retention of topsoil and maintaining soil health by clearing only areas reserved for construction, minimization of the disruption of site drainage patterns, inclusion of erosion and dust controls, the separation and diversion of all unused or waste cardboard, ferrous scrap, construction materials and fixtures for recycling and/or forwarding to a salvage exchange facility, use or diversion of green waste and the installation of water conserving low flow fixtures.

Chapter VI

Alternatives to the Proposed Action

VI. ALTERNATIVES TO THE PROPOSED ACTION

A. SITE PLAN ALTERNATIVES

During the conceptual planning stage, several site plans were considered. However, these preliminary plans were discounted due to design, functional and operational constraints and considerations, including access, living area requirements, building design, parking requirements and costs. The proposed site plan best accommodates the applicant's needs and objectives.

B. NO ACTION ALTERNATIVE

The "no action" alternative will result in the subject property remaining in its current vacant and undeveloped condition. This alternative does not possess beneficial community value, particularly since no other affordable housing alternatives are available in the Kihei area and the community's need for senior housing facilities in the South Maui area will remain unfilled.

C. OTHER LAND USE ALTERNATIVES

Land use alternatives permitted under the Kihei-Makena Project District 5 ordinance (Chapter 19.74) include apartment houses, duplexes, townhouses and single-family uses. However, given the community's need for affordable senior housing, other land use alternatives were not considered by the applicant.

Chapter VII

Anticipated Determination and Findings and Reasons Supporting the Determination

VII. ANTICIPATED DETERMINATION AND FINDINGS AND REASONS SUPPORTING THE DETERMINATION

The significance criteria of Section 12, of the Administrative Rules of Title 11, Chapter 200, "Environmental Impact Statement Rules", were reviewed and analyzed to determine whether the completed action will have adverse impacts to the environment.

1. ***No Irrevocable Commitment to Loss or Destruction of any Natural or Cultural Resources Would Occur as a Result of the Project***

   The project will not result in any adverse environmental impacts. There are no known, rare threatened, or endangered species of flora, fauna or avifauna located within the project site.

   An archaeological inventory survey of the project area indicated the presence of one (1) archaeological site. Necessary data collection and inventorying was completed, with no need for additional data collection. The development of the property is not expected to result in any adverse impacts to archaeological resources. Should any artifacts or human remains be encountered during construction, work will stop in the immediate vicinity of the find and the State Historic Preservation Division will be immediately notified to establish an appropriate mitigation strategy.

2. ***The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment***

   The proposed project and the commitment of land resources would not curtail the range of beneficial uses of the environment.

3. ***The Proposed Action Does Not Conflict with the State's Long-Term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, Hawaii Revised Statutes***

   The State's Environmental Policy and Guidelines are set forth in Chapter

344, Hawaii Revised Statutes. The proposed action does not contravene provisions of Chapter 344, Hawaii Revised Statutes.

4. ***The Economic or Social Welfare of the Community or State Would Not Be Substantially Affected***

The proposed project will have a beneficial impact on the local economy during construction. In the long term, the proposed project will support the local economy through the contribution of taxes, salaries, wages, and benefits. The primary social welfare benefit, however, is the addition of senior services and facilities in the South Maui area.

5. ***The Proposed Action Does Not Affect Public Health***

No adverse impacts to the public's health and welfare are anticipated as a result of the proposed project. The proposed action will benefit public welfare by enhancing senior services and facilities in the South Maui area. The proposed 201G exemptions will not compromise public health or safety.

6. ***No Substantial Secondary Impacts, Such as Population Changes or Effects on Public Facilities are Anticipated***

No significant population changes are anticipated as a result of the proposed project.

From a land use standpoint, the proposed project is in keeping with the objectives, policies, and implementing actions of the Kihei-Makena Community Plan. The proposed project complements and is compatible with surrounding land uses.

No adverse impacts to water and wastewater capacities and facilities are anticipated.

7. ***No Substantial Degradation of Environmental Quality is Anticipated***

During the construction phase of the project, there will be short-term air quality and noise impacts as a result of the project. In the long term, effects upon air quality and ambient noise levels should be minimal. The project is not anticipated to significantly affect the open space and scenic character of the area.

No substantial degradation of environmental quality resulting from the project is anticipated.

8. ***The Proposed Action Does Not Involve a Commitment to Larger Actions, Nor Would Cumulative Impacts Result in Considerable Effects on the Environment***

The proposed action does not represent a commitment to larger actions. In addition, the proposed action is not expected to result in cumulative impacts that would adversely affect the environment.

9. ***No Rare, Threatened or Endangered Species or Their Habitats Would Be Adversely Affected By the Proposed Action***

There are no rare, threatened or endangered species of flora, fauna or avifauna that will be adversely affected by the proposed action.

10. ***Air Quality, Water Quality or Ambient Noise Levels Would Not Be Detrimentally Affected by the Action***

Construction activities will result in short-term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction-related activities. It is anticipated that construction will be limited to daylight working hours. Water quality is not expected to be affected.

In the long term, the project is not anticipated to have a significant impact on air and water quality.

11. ***The Proposed Project Would Not Affect Environmentally Sensitive Areas, Such as Flood Plains, Tsunami Zones, Erosion-prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters***

The project is not located within and would not affect environmentally sensitive areas. The project site is not subject to flooding or tsunami inundation. Soils underlying the project site are not considered to be erosion-prone. There are no geologically hazardous lands, estuaries, or coastal waters within or adjacent to the project site.

12. ***The Proposed Action Would Not Substantially Affect Scenic Views and Viewplanes Identified in County Plans or Studies***

The project site is not identified as a scenic vista or viewplane. The proposed project will not affect scenic corridors and coastal scenic and open space resources.

13. ***The Proposed Action Would Not Require Substantial Energy Consumption***

The proposed project will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this use is not anticipated to result in a substantial consumption of energy resources. In the long term, the project will create an additional demand for electricity. However, this demand is not deemed substantial or excessive within the context of the region's overall energy consumption.

Based on the foregoing findings, it is anticipated that the proposed action will not result in significant adverse impacts.

Chapter VIII

List of Permits and Approvals

VIII. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the project.

State of Hawaii

1. NPDES permit (for stormwater discharge associated with construction activities)

County of Maui

1. County Special Management Area Use Permit
2. County 201G-118, Hawaii Revised Statutes
3. Subdivision approval
4. Grading permit
5. Building permit

Chapter IX

Agencies Consulted During the Preparation of the Draft Environmental Assessment

IX. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

The following agencies were consulted during the preparation of the Draft Environmental Assessment. Agency comments and responses to substantive comments are also included in this section.

1. Neal Fujiwara, Soil Conservationist
   Natural Resources Conservation Service
   U.S. Department of Agriculture
   210 Imi Kala Street, Suite 209
   Wailuku, Hawaii 96793-2100

2. George Young
   Department of the Army
   U.S. Army Engineer District, Hnl.
   Building 230
   Fort Shafter, Hawaii 96858-5440

3. Robert P. Smith
   Pacific Islands Manager
   U. S. Fish and Wildlife Service
   P.O. Box 50167
   Honolulu, Hawaii 96850

4. Ted Liu, Director
   State of Hawaii
   Office of Planning
   Department of Business, Economic Development and Tourism
   P.O. Box 2359
   Honolulu, Hawaii 96804

5. Patricia Hamamoto, Superintendent
   State of Hawaii
   Department of Education
   P.O. Box 2360
   Honolulu, Hawaii 96804

6. Denis Lau, Chief
   Clean Water Branch
   State of Hawaii
   Department of Health
   919 Ala Moana Blvd., Room 300
   Honolulu, Hawaii 96814

7. Herbert Matsubayashi
   District Environmental Health Program Chief
   State of Hawaii
   Department of Health
   54 High Street
   Wailuku, Hawaii 96793

8. Peter Young, Chairperson
   State of Hawaii
   Department of Land and Natural Resources
   P. O. Box 621
   Honolulu, Hawaii 96809

9. Holly Mc Eldowney, Acting Administrator
   State of Hawaii
   Department of Land and Natural Resources
   State Historic Preservation Division
   601 Kamokila Blvd., Room 555
   Kapolei, Hawaii 96707

10. Fred Cajigal, Maui District Engineer
    State of Hawaii
    Department of Transportation
    Highways Division
    650 Palapala Drive
    Kahului, Hawaii 96732

11. Colin Kippen, Deputy Administrator
    Office of Hawaiian Affairs
    711 Kapiolani Boulevard, Suite 500
    Honolulu, Hawaii 96813

12. Carl Kaupalolo, Chief
    County of Maui
    Department of Fire Control
    200 Dairy Road
    Kahului, Hawaii 96732

13. Alice Lee, Director
County of Maui
Department of Housing and Human Concerns
200 S. High Street
Wailuku, Hawaii 96793

14. Michael W. Foley, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

15. Glenn Correa, Director
County of Maui
Department of Parks and Recreation
700 Hali'a Nakoa Street, Unit 2
Wailuku, Hawaii 96793

16. Tom Phillips, Chief
County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

17. Gilbert Coloma-Agaran, Director
County of Maui
Department of Public Works and Environmental Management
200 South High Street
Wailuku, Hawaii 96793

18. George Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

19. **Maui Electric Company, Ltd.**
P. O. Box 398
Kahului, Hawaii 96732

20. Barney Eiting
Kihei Community Association
P.O. Box 662
Kihei, Hawaii 96753

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

MAY 13 2003

REPLY TO
ATTENTION OF

May 12, 2003

Regulatory Branch

Mr. Dean K. Frampton, Planner
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Frampton:

This responds to your letter dated May 9, 2003 requesting comments on plans for the proposed Hale Mahaolu Elderly Housing Project. Based on the information you provided it appears that a Department of the Army permit will not be required for the project. Please place this office on the mailing list for the draft Environmental Assessment.

If you have any questions concerning this determination please contact Mr. William Lennan of my staff at 438-6986 or FAX 438-4060 and mention File Number 200300411.

Sincerely

George P. Young, P.E.
Chief, Regulatory Branch

JUN 02 2003

[redacted]

LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

May 23, 2003

Mr. Dean Frampton, Planner
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Frampton:

Subject: Hale Mahaolu Ehiku Elderly Housing Project
Early Consultation Request
Kihei, Maui, Hawai`i, TMK: 2-2-2: 73

The Department of Education (DOE) is responding to your request for early consultation comments on the Hale Mahaolu senior residential project.

The DOE has no comment at this preliminary stage and looks forward to the opportunity to review the environmental assessment and the special management area application.

Should you have any questions, please call Ms. Rae M. Loui of the Office of Administrative Services at 586-3444 or Mr. Raynor M. Minami of the Facilities and Support Services Branch at 733-4860.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:hy

cc: Rae M. Loui, OAS

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

MAY 28 2003

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EMD / CWB

05069PKP.03

May 27, 2003

Mr. Dean Frampton
Planner
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Frampton:

Subject: Early Consultation Request for Preparation of an Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing Project Kihei, Maui, Hawaii

The Department of Health, Clean Water Branch (CWB) has reviewed the subject document and offers the following comments:

1. The Army Corps of Engineers should be contacted at (808) 438-9258 to identify whether a Federal license or permit (including a Department of Army permit) is required for this project. Pursuant to Section 401(a)(1) of the Federal Water Pollution Act (commonly known as the "Clean Water Act"), a Section 401 Water Quality Certification is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters...."

2. A National Pollutant Discharge Elimination System (NPDES) general permit coverage is required for the following activities:

   a. Storm water associated with industrial activities, as defined in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi).

   b. Construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the commencement of the construction activities.**

   c. Discharge of treated effluent from leaking underground storage tank remedial activities.

d. Discharge of once through cooling water less than one (1) million gallons per day;

e. Discharge of hydrotesting water.

f. Discharge of construction dewatering effluent.

g. Discharge of treated effluent from petroleum bulk stations and terminals.

h. Discharge of treated effluent from well drilling activities.

i. Discharges of treated effluent from recycled water distribution systems.

j. Discharges of storm water from a small municipal separate storm sewer system.

k. Discharge of circulation water from decorative ponds or tanks.

The CWB requires that a Notice of Intent (NOI) to be covered by a NPDES general permit for any of the above activities be submitted at least 30 days before the commencement of the respective activities. The NOI forms may be picked up at our office or downloaded from our website at http://www.state.hi.us/doh/eh/cwb/forms/genl-index.html.

3. The applicant may be required to apply for an individual NPDES permit if there is any type of activity in which wastewater is discharged from the project into State waters and/or coverage of the discharge(s) under the NPDES general permit(s) is not permissible (i.e. discharges into Class 1 or Class AA waters). An application for the NPDES permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at http://www.state.hi.us/doh/eh/cwb/forms/indiv-index.html.

4. Hawaii Administrative Rules, Section 11-55-38, also requires the owner to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD) or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD. Please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.

If you have any questions, please contact the CWB at (808) 586-4309.

Sincerely,

Alec Wong

for DENIS R. LAU, P.E., CHIEF
Clean Water Branch

KP:

MUNEKIYO & HIRAGA, INC.

July 24, 2003

Mr. Denis Lau, P.E., Chief
Clean Water Branch
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project
Kihei, Maui, Hawaii

Dear Mr. Lau:

Thank you for your letter dated May 27, 2003, providing us with your comments on the proposed project. Our client, Hale Mahaolu (HM) requested early review of the project by the Army Corps of Engineers. Their response indicated that no Department of Army (DOA) permit would be required for the project. Please see attached response letter from the DOA.

Secondly, HM will work with the contractor to insure that all applicable permits are obtained before the commencement of any construction activities.

Third, an early consultation request was submitted to the Department of Land and Natural Resources, State Historic Preservation Division (SHPD). They have determined that *"no historic properties will be affected"* by the project. Please see attached response letter from SHPD.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karly Kawahara

Karlynn Kawahara, Planner

Enclosures
KK:yp
cc: Roy Katsuda, Hale Mahaolu (w/out enclosures)
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc. (w/out enclosures)
hha\hmehiku\dohcwb.res

MAY 29 2003

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M.D., M.P.H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, HAWAII 96793-2198

May 28, 2003

Mr. Dean Frampton
Munekiyo & Hiraga, Inc.
305 South High Street, Suite 104
Wailuku, Hawai'i 96793

Dear Mr. Frampton:

Subject: **Early Consultation Request for the Preparation of an Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing Project, Kihei, Maui**
TMK: (2) 2-2-02: 073

Thank you for the opportunity to participate in the early consultation process for the environmental assessment. The following comments are offered:

1. National Pollutant Discharge Elimination System (NPDES) permit coverage is required for this project. The Clean Water Branch should be contacted at 808 586-4309 regarding NPDES coverage.

2. The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules (HAR), Chapter 11-46 "Community Noise Control". A noise permit may be required and should be obtained before the commencement of work.

3. HAR, Chapter 11-46 sets maximum allowable sound levels from stationary equipment such as compressors and HVAC equipment. The attenuation of noise from these sources may depend on the location and placement of these types of equipment. This should be taken into consideration during the planning, design, and construction of the building and installation of these types of equipment.

4. Due to the nature and location of the project, there is a significant potential for fugitive dust emissions during site work preparations. It is recommended that a dust control management plan be developed. Implementation of adequate dust control measures during all phases of the project is warranted. Construction activities must comply with the provisions of HAR, Chapter 11-60.

5. The property may be harboring rodents that will be dispersed to the surrounding areas when any buildings are demolished or the site is cleared. The applicant is required by HAR, Chapter 11-26, "Vector Control" to eradicate any rodents prior to demolition or site clearing activities and to notify the Department of Health by submitting Form VC-12 to the Maui Vector Control program when such action is taken. Rodent traps and/or rodenticides should be set out on the project site for at least a week or until the rodent activity ceases. The Maui Vector Control program phone number is 873-3560.

Should you have any questions, please call me at 984-8230.

Sincerely,

Herbert S. Matsubayashi
District Environmental Health Program Chief

MUNEKIYO & HIRAGA, INC.

July 24, 2003

Mr. Herbert Matsubayashi
District Environmental Health Program Chief
Maui District Health Office
54 High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project

Dear Mr. Matsubayashi:

Thank you for your letter dated May 28, 2003, providing us with your comments on the proposed project.

With regards to your first concern, our client, Hale Mahaolu (HM), has sought early consultation with the State Department of Health's Clean Water Branch and will implement their requirements accordingly. Secondly, HM will work with the contractor, to insure that all necessary permits are obtained prior to the start of construction. Third, we have forwarded your comments on the potential noise issues with stationary equipment to the architect for his review and consideration. Fourth, HM will work with the contractor to insure that adequate measures are in place such as dust fences or water trucks, to control fugitive dust during construction. Additionally, HM will work with the contractor to insure that vector control measures for the project site are implemented, as appropriate, before the start of construction.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc.
hha\hmehiku\dohmaui.res

environment
planning
government

LINDA LINGLE
GOVERNOR

JUN 20 2003

RODNEY K. HARAGA
DIRECTOR

Acting Deputy Director
GLENN M. OKIMOTO

IN REPLY REFER TO:

HWY-M2.259-03

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MAUI DISTRICT
650 PALAPALA DRIVE
KAHULUI, HAWAII 96732

June 18, 2003

MEMORANDUM

TO: **Dean Frampton**
Munekiyo & Hiraga, Inc.

FROM: **Paul M. Chung**
State Highways

SUBJECT: **Proposed Hale Mahaolu Ehiku Elderly Housing**
ME 03-38

Thank you for the opportunity to review and comment on the proposed elderly housing development. Based upon our review of the submittal, we offer the following comments:

1. All vehicle access shall be from Old Welakahao Road or the North-South Collector.
2. Submit a Traffic Impact Analysis Report.

If there are any questions or concerns, please call me at 873-3535.

/pmc

MUNEKIYO & HIRAGA, INC.

July 24, 2003

Mr. Paul Chung
Highways Division
Department of Transportation
650 Palapala Drive
Kahului, Hawaii 96732

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project

Dear Mr. Chung:

Thank you for your memorandum dated June 18, 2003, providing us with your comments on the proposed project. Our client, Hale Mahaolu (HM) is planning to have access to the site through the Old Welakahao Road and Liloa Drive (a.k.a. North-South Collector Road). We are currently in discussions with the County of Maui's Department of Public Works and Environmental Management to ensure that access provisions for the project are properly located and designed.

Further, we will be submitting a traffic impact analysis report with our Draft Environmental Assessment.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc.
hha\hmehiku\dot.res

4548

JUL 08 2003

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

HAWAI'I HISTORIC PRESERVATION
DIVISION REVIEW

Log #: 2003.0831
Doc #: 0306CD22

Applicant/Agency:	Dean Frampton
Address:	Munekiyo & Hiraga, Inc. 305 South High Street, Suite 104 Wailuku, Hawaii 96793
SUBJECT:	National Historic Preservation Act Section 106 Review – Early Consultation Request for Preparation of an Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing Project
Ahupua'a:	Keokea
District, Island:	Makawao, Maui
TMK:	(2) 2-2-002:073

1. We believe there are no historic properties present, because:

____ a) intensive cultivation has altered the land
____ b) residential development/urbanization has altered the land
____ c) previous grubbing/grading has altered the land
____ d) an acceptable archaeological assessment or inventory survey found no historic properties
✓ e) other: PHRI conducted an archaeological inventory survey in 1989, which included the subject property. During the inventory survey, sixteen historic habitation and agricultural sites were identified, and only one site (Site 50-50-10-4503 --previously designated 2524 -- a rock pile) was located on the subject property, on the southern part. This site, of undetermined function, was subsequently determined significant only for information content, with no further archaeological work recommended. (See SHPD DOC NO.: 0206CD02/LOG NO.: 30032)

2. This project has already gone through the historic preservation review process, and mitigation has been completed ___.

✓ Thus, we believe that "no historic properties will be affected" by this undertaking.

If you have any questions, please call Cathleen Dagher at (808) 692-8023).

Staff: ______________________ Date: 06/25/03
Peter T. Young, State Historic Preservation Officer

c: Michael Foley, Director, Dept of Planning, County of Maui, 250 South High Street, Wailuku, HI 96793
Cultural Resources Commission, Planning Dept, County of Maui, 250 S. High Street, Wailuku, HI 96793

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
HOUSING DIVISION
COUNTY OF MAUI

MAY 19 2003

ALAN M. ARAKAWA
Mayor

ALICE L. LEE
Director

HERMAN T. ANDAYA
Deputy Director

86 W. KAMEHAMEHA AVENUE • KAHULUI, HAWAII 96732-2259 • PHONE (808) 270-7351 • FAX (808) 270-6284

May 13, 2003

Mr. Dean K. Frampton, Planner
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Frampton:

Subject: Hale Mahaolu Ehiku Elderly
Housing Project, Kihei, Maui,
TMK: (2)2-2-02:73

Thank you for your May 9, 2003 letter and enclosures regarding the subject project.

We fully support the development of the Hale Mahaolu Ehiku Elderly Housing Project and will be assisting Hale Mahaolu in securing the approvals that are needed to develop the project.

Thank you for the opportunity to comment.

Very truly yours,

ALICE L. LEE
Director

ETO:df

c: Housing Administrator

JUN 0 9 2003

POLICE DEPARTMENT
COUNTY OF MAUI

ALAN M. ARAKAWA
MAYOR

OUR REFERENCE
tj
YOUR REFERENCE

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

THOMAS M. PHILLIPS
CHIEF OF POLICE

KEKUHAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

June 4, 2003

Mr. Dean Frampton, Planner
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Frampton:

SUBJECT: Early Consultation Request for Preparation of an Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing Project, Kihei, Maui, TMK (2) 2-2-02: 73

Thank you for your letter of May 9, 2003, requesting comments on the above subject.

We have reviewed the proposed summary and have enclosed our comments and recommendations. Thank you for giving us the opportunity to comment on this project.

Very truly yours,

Assistant Chief Sydney Kikuchi
for: Thomas M. Phillips
Chief of Police

Enclosure

c: Michael W. Foley, Dept. of Planning

COPY

Valid concerns raised by Off. H. should be taken into consideration
[illegible] 6/4/03

TO	: THOMAS PHILLIPS, CHIEF OF POLICE, COUNTY OF MAUI
VIA	: CHANNELS [illegible] 6/03/03
FROM	: BRAD HICKLE, POLICE OFFICER III, DISTRICT VI KIHEI
SUBJECT	: EARLY CONSULTATION REQUEST RE; TMK (2) 2-2-02: 73 PROPOSED HALE MAHAOLU EHIKU HOUSING PROJECT

Sirs, on 05/16/03 this Officer received a copy of the Early Consultation Request for Preparation of an Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing Project.

Upon reviewing the information provided and the proposed location I am very concerned for the welfare of the future tenants. The proposed location is in very close proximity to the County Reclamation Center which uses and stores large amounts of chlorine which is poisonous to humans.

In the event of an accidental spill of the chlorine at the County Reclamation Center initial evacuation would be from 300 ft. in every direction to 1.5 miles in a downwind direction. It is my belief that future tenants would be at risk especially non-ambulatory tenants who may need to be assisted by emergency services personnel. This would undoubtedly place emergency services personnel at risk as well.

Respectfully Submitted,

Officer Brad Hickle E-9966
05/28/03 1945 hours

I concur with Officer Hickle's assesment. Serious consideration should be given to the potentially high risk of 111 elderly people (full occupancy) should a toxic chemical spill from the Wastewater Reclamation Facility occur. Evacuation of these people would be a monumental challenge.

Lt. Hamilton RODRIGUES E-7442
05-29-03 @ 1600 hours

MUNEKIYO & HIRAGA, INC.

April 12, 2004

Police Chief Tom Phillips
Maui Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project

Dear Chief Phillips:

Thank you for your letter dated June 4, 2003, providing us with your comments on the proposed project. Our client, Hale Mahaolu (HM), understands your department's concern for the future residents of this proposed independent living facility.

We contacted the Kihei Wastewater Treatment facility to inquire about the handling of chlorine used at their facility. It is our understanding that there are safety measures in place to control the chlorine. The product is mixed with water and is in liquid form, as opposed to gaseous. The chlorine is handled in one building and there is an automatic scrubber system in place that automatically neutralizes the air before it leaves the building. HM appreciates and is satisfied with the safeguards put in place by the County. HM recognizes that the safety of their clients is important.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto+Higuchi Architects, Inc.
hha\hmehiku\mpd.res.ltr

environment
planning

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

JUN 10 2003

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone (808) 270-7816 • Fax (808) 270-7833

June 6, 2003

Munekiyo & Hiraga, Inc.
Attention: Dean Frampton, Planner
305 High Street, Suite 104
Wailuku HI 96793

Dear Mr. Frampton:

SUBJECT: Early Consultation in Preparation of an Environmental Assessment for the Proposed Hale Mahaolu Ehiku Housing Project, Kihei - Two (2) phase construction of 112 housing units, 2 senior center buildings and an Adult Residential Care Home TMK: (2) 2-2-002:073

Thank you for the opportunity to comment on this project proposal.

Source Availability and Consumption
The project area is served by the Central Maui System with the Iao and Waihee aquifers as its major sources of water. Sustainable yield of Iao Aquifer is 20 MGD. Rolling annual average groundwater withdrawals as of April, 2003 were 17.564 MGD. Sustainable yield of Waihee Aquifer is 8 MGD. Rolling annual average groundwater withdrawals for the same period were 5.156 MGD. The Commission on Water Resource Management has determined that Iao aquifer will be automatically designated should: 1) Pumpage exceed 18 MGD, and 2) Midpoint of the transition zone rise above 680 feet as measured in the Waiehu deep monitor well. Waihee aquifer will be automatically designated if water level elevation drops below 6 feet at the Kanoa test hole. As of May, 2003 update, anticipated demand for open projects with discretionary approvals on this system was over 8 MGD. Of these, 3.7 MGD were large projects and were informed that they may have to develop source. Water availability is reviewed at the time of application for meter.

The EA should include the source as well as expected potable and non-potable water usage. Estimated consumption for the proposed project is about 64,000 gpd absent more detailed information.

System Infrastructure
The parcel is within the proposed Liloa Drive extension project of the Department of Public Works and Environmental Management (DPWEM) which will extend the roadway from the vicinity of Lokelani Intermediate School to Kanani Road. There are two waterlines along the west side of the property. DPWEM was advised to relocate these waterlines. The applicant should submit project design to our Engineering Division for review and discuss water pressure problem in the area as well as other system improvements.

The applicant will be required to provide domestic, fire, and irrigation services in accordance with standards. Fire, domestic, and irrigation calculations will be required during the building permit process to determine meter capacity and adequate fire protection. Actual fire demand for structures is determined by fire flow calculations prepared, signed and stamped by a certified engineer or architect. The approved fire flow calculation methods for use include Guidance for Determination of Fire Flow- Insurance Service Office, 1974 and Fire Flow- Hawaii Insurance Bureau, 1991. Installation of reduced pressure back-flow prevention approved by the Department will likewise be required.

Conservation

In order to conserve water, we encourage the applicant to consider the following water conservation measures and integrate them in the project design and construction:

Use brackish and /or reclaimed water sources for dust control during construction, if such alternatives are available.

Eliminate Single-Pass Cooling: Single-pass, water-cooled systems should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air conditioners, freezers, and commercial refrigerators.

Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20A.680 requires the use of low-flow water fixtures and devices in faucets, showerheads, urinals, water closets, and hose bibs. Water conserving washing machines, ice-makers and other units are also available.

Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.

Use Climate -adapted Plants: The project is located in the Maui County Planting Plan - Plant Zones 3 & 5. We encourage the applicant to utilize appropriate native and non invasive species and avoid the use of potentially invasive plants. Native plants adapted to the area, conserve water and protect the watershed from degradation due to invasive alien species. Attached is a list of appropriate plants for the zones as well as potentially invasive plants to avoid.

Limit Irrigated Turf: Limit irrigated turf to 25% or less of total landscaped area. Low-water use shrubs and ground covers can be equally attractive and require substantially less water that turf.

Look for Opportunities to Conserve Water: A few examples of these are as follows: When clearing driveways, etc. of debris, use a broom instead of a hose. When washing cars, use a hand-operated spray nozzle instead of an open hose. Additionally, check for leaks in faucets and toilet tanks.

Pollution Prevention

The project overlies the Kamaole aquifer which has a sustainable yield of 11 MGD. In order to protect surface and groundwater resources, we encourage the applicant to adopt Best Management Practices (BMPs) designed to minimize infiltration and runoff from construction and vehicle operations. We have attached sample BMPs for principle operations for reference. Additional mitigation measures are enumerated below and should be implemented during construction:

1. Prevent cement products, oil, fuel and other toxic substances from falling or leaching into the water.
2. Properly and promptly dispose of all loosened and excavated soil and debris material from drainage structure work.
3. Retain ground cover until the last possible date.
4. Stabilize denuded areas by sodding or planting as soon as possible. Replanting should include soil amendments, fertilizers and temporary irrigation. Use high seeding rates to ensure rapid stand establishment.
5. Avoid fertilizers and biocides, or apply only during periods of low rainfall to minimize chemical run-off.
6. Keep run-off on site.
7. Construct drainage control features, such as berms
8. Install silting basins where warranted
9. Maintain drainage structures, detention, silting and debris basins
10. Control dust by proper stockpiling and use non-potable water for dust control

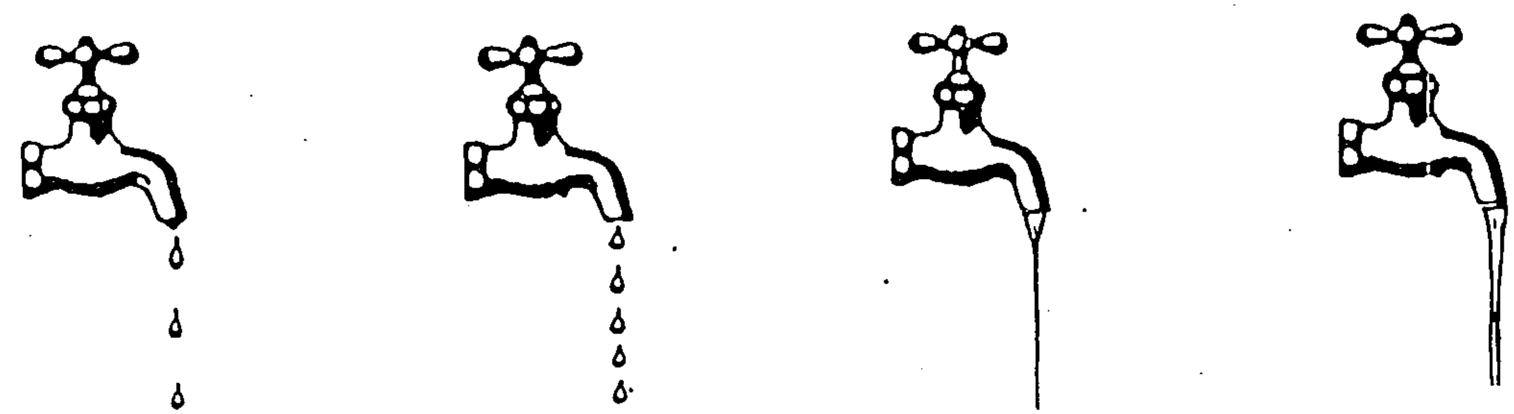
Should you have any questions regarding system infrastructure and requirements, please call our Engineering Division at 270-7835 and any questions on source availability or conservation and resource matters, please contact our Water Resources and Planning Division at 270-7199.

Sincerely,

George Y. Tengan
Director

eam
c: engineering division
applicant, with attachments
The Costly Drip
Maui County Planting Plan - Plant Zones 3 & 5 - Saving Water in the Yard - What and How to Plant in your Area
Ordinance No. 2108 - A Bill for an Ordinance Amending Chapter 16.20 of the Maui County Code, Pertaining to the Plumbing Code
Selected BMP's from "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters"-EPA

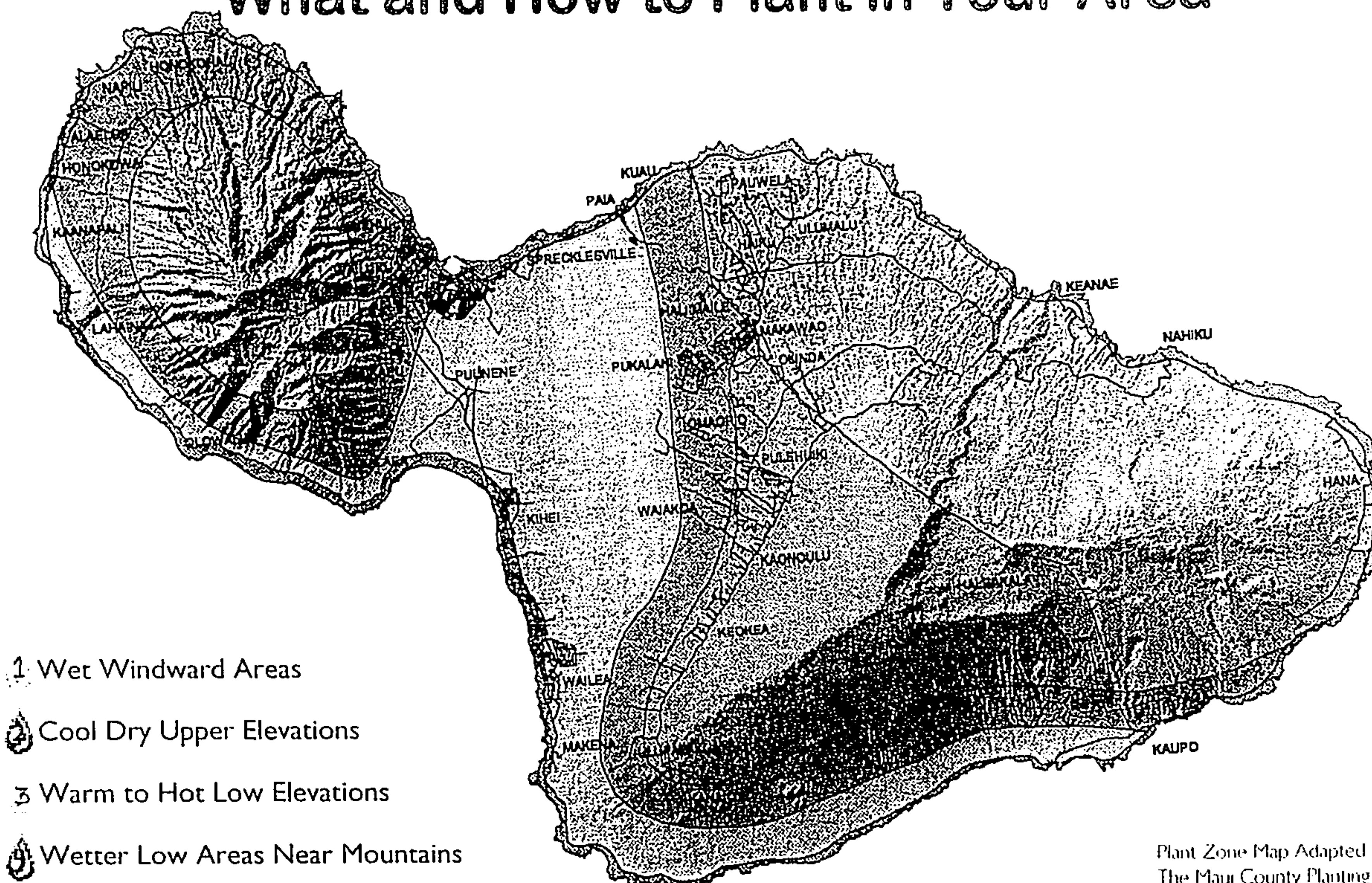
"THE COSTLY DRIP"



Slowly Dripping Spigot Wastes 15 Gallons a day.	1/32" Leak Wastes 25 Gallons a day.	1/16" Stream Wastes 100 Gallons a Day.	1/8" Stream Wastes 400 Gallons a day.

Saving Water in The Yard

What and How to Plant in Your Area



1 Wet Windward Areas

2 Cool Dry Upper Elevations

3 Warm to Hot Low Elevations

4 Wetter Low Areas Near Mountains

5 Windward Coastal Salt Spray Zones

Plant Zone Map Adapted From
The Maui County Planting Plan

Tips From The Maui County Department of Water Supply

By Water All Things Find Life

Yellow

Zone 3

Zone-specific Native and Polynesian plants for Maui County

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	1'	2'	sea to 1,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'			
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium

Yellow

Zone 3

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Bidens mauiensis	ko'oko'olau	1'	3'	sea to 1,000'	Dry to Medium
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3'		
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tameiameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kauaiensis kauaiensis	'akia, Molokai osmanthus				
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000'	Dry to Medium
Tr	Erythrina sandwicensis	wiliwili	20'	20'	sea to 1,000'	Dry
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet

Yellow

Zone 3

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Nesoluma polynesicum	keahi	15'	15'	sea to 3,00'	Dry
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Reynoldsia sandwicensis	'ohe makai	20'	20'	1,000' to 3,000'	Dry
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet

Purple

Zone 5

Zone-specific Native and Polynesian plants for Maui County

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	1'	2'	sea to 1,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens mauiensis	ko'oko'olau	1'	3'	sea to 1,000'	Dry to Medium
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium

Purple

Zone 5

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Hedyotis spp.	'au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kaualensis kaualensis	'akia, Molokai osmanthus				
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr.	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Ipomoea pes-caprae	beach morning glory, pohuehue	1'			

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
black wattle	Acacia mearnsii	Mimosaceae
blackberry	Rubus argutus	Rosaceae
blue gum	Eucalyptus globulus	Myrtaceae
bocconia	Bocconia frutescens	Papaveraceae
broad-leaved cordia	Cordia glabra	Boraginaceae
broomsedge, yellow bluestem	Andropogon virginicus	Poaceae
buffelgrass	Cenchrus ciliaris	Poaceae
butterfly bush, smoke bush	Buddleja madagascariensis	Buddlejaceae
cats claw, Mysore thorn, wait-a-bit	Caesalpinia decapetala	Caesalpiniaceae
common ironwood	Casuarina equisetifolia	Casuarinaceae
common velvet grass, Yorkshire fog	Holcus lanatus	Poaceae
fiddlewood	Citharexylum spinosum	Verbenaceae
fire tree, faya tree	Myrica faya	Myricaceae
glorybower	Clerodendrum japonicum	Verbenaceae
hairy cat's ear, gosmore	Hypochoeris radicata	Asteraceae
haole koa	Leucaena leucocephala	Fabaceae
ivy gourd, scarlet-fruited gourd	Coccinia grandis	Cucurbitaceae
juniper berry	Citharexylum caudatum	Verbenaceae
kahili flower	Grevillea banksii	Proteaceae
klu, popinac	Acacia farnesiana	Mimosaceae
logwood, bloodwood tree	Haematoxylon campechianum	Caesalpiniaceae
loquat	Eriobotrya japonica	Rosaceae
meadow ricegrass	Ehrharta stipoides	Poaceae
melaleuca	Melaleuca quinquenervia	Myrtaceae
miconia, velvet leaf	Miconia calvescens	Melastomataceae
narrow-leaved carpetgrass	Axonopus fissifolius	Poaceae
oleaster	Elaeagnus umbellata	Elaeagnaceae
oriental mangrove	Bruguiera gymnorrhiza	Rhizophoraceae
padang cassia	Cinnamomum burmanii	Lauraceae
palmgrass	Setaria palmifolia	Poaceae
pearl flower	Heterocentron subtriplinervium	Melastomataceae
quinine tree	Cinchona pubesens	Rubiaceae
satin leaf, caimitillo	Chrysophyllum oliviforme	Sapotaceae
silkwood, Queensland maple	Flindersia brayleyana	Rutaceae
silky oak, silver oak	Grevillea robusta	Proteaceae
strawberry guava	Psidium cattleianum	Myrtaceae
swamp oak, saltmarsh, longleaf ironwood	Casuarina glauca	Casuarinaceae
sweet vernalgrass	Anthoxanthum odoratum	Poaceae
tree of heaven	Ailanthus altissima	Simaroubaceae
trumpet tree, guarumo	Cecropia obtusifolia	Cecropiaceae
white ginger	Hedychium coronarium	Zingiberaceae
white moho	Heliocarpus popayanensis	Tiliaceae
yellow ginger	Hedychium flavescens	Zingiberaceae

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
	Jasminum fluminense	Oleaceae
	Arthrostema ciliatum	Melastomataceae
	Dissotis rotundifolia	Melastomataceae
	Erigeron karvinskianus	Asteraceae
	Eucalyptus robusta	Myrtaceae
	Hedychium gardnerianum	Zingiberaceae
	Juncus planifolius	Juncaceae
	Lophostemon confertus	Myrtaceae
	Medinilla cumingii	Melastomataceae
	Medinilla magnifica	Melastomataceae
	Medinilla venosa	Melastomataceae
	Melastoma candidum	Melastomataceae
	Melinis minutiflora	Poaceae
	Olea europaea	
	Oxyspora paniculata	Melastomataceae
	Panicum maximum	Poaceae
	Paspalum urvillei	Poaceae
	Passiflora edulis	Passifloraceae
	Phormium tenax	Agavaceae
	Pinus taeda	Pinaceae
	Prosopis pallida	Fabaceae
	Pterolepis glomerata	Melastomataceae
	Rhodomyrtus tomentosa	Myrtaceae
	Schefflera actinophylla	Araliaceae
	Syzygium jambos	Myrtaceae
Australian blackwood	Acacia melanoxylon	Mimosaceae
Australian tree fern	Cyathea cooperi	Cyatheaceae
Australian tree fern	Sphaeropteris cooperi	Cyatheaceae
Beggar's tick, Spanish needle	Bidens pilosa	Asteraceae
California grass	Brachiaria mutica	Poaceae
Chinese banyon, Maylayan banyon	Ficus mirocarpa	Moraceae
Chinese violet	Asystasia gangetica	Acanthaceae
Christmasberry, Brazilian pepper	Schinus terebinthifolius	Anacardiaceae
Formosan koa	Acacia confusa	Mimosaceae
German ivy	Senecio mikanioides	Asteraceae
Japanese honeysuckle	Lonicera japonica	Caprifoliaceae
Koster's curse	Clidemia hirta	Melastomataceae
Lantana	Lantana camara	Verbenaceae
Mauritius hemp	Furcraea foetida	Agavaceae
Mexican ash, tropical ash	Fraxinus uhdei	Oleaceae
Mexican tulip poppy	Hunnemannia fumariifolia	Papaveraceae
Mules foot, Madagascar tree fern	Angiopteris evecta	Marattiaceae
New Zealand laurel, karakaranut	Corynocarpus laevigatus	Corynocarpaceae
New Zealand tea	Leptospermum scoparium	Myrtaceae
Pampas grass	Cortaderia jubata	Poaceae
Panama rubber tree, Mexican rubber tree	Castilloa elastica	Moraceae
Shoebutton ardisia	Ardisia elliptica	Myrsinaceae
banana poka	Passiflora mollissima	Passifloraceae

Selection

As a general rule, it is best to select the largest and healthiest specimens. However, be sure to note that they are not pot-bound. Smaller, younger plants may result in a low rate of plant survival.[1] When selecting native species, consider the site they are to be planted in, and the space that you have to plant. For example: Mountain species such as koa and maile will not grow well in hot coastal areas exposed to strong ocean breezes. Lowland and coastal species such as wiliwili and Kou require abundant sunshine and porus soil. They will not grow well with frequent cloud cover, high rainfall and heavy soil.

Consider too, the size that the species will grow to be. It is not wise to plant trees that will grow too large.[2] Overplanting tends to be a big problem in the landscape due to the underestimation of a species' height, width or spread.

A large, dense canopied tree such as the kukui is a good shade tree for a lawn. However, it's canopy size and density of shade will limit what can be planted in the surrounding area. Shade cast by a koa and ohia lehua is relatively light and will not inhibit growth beneath it.

Keep seasons in mind when you are selecting your plants. Not all plants look good year round, some plants such as ilima will look scraggly after they have flowered and formed seeds. Avoid planting large areas with only one native plant. Mixing plants which naturally grow together will ensure the garden will look good all year round.[3] Looking at natural habitats helps to show how plants grow naturally in the landscape.

When planting an area with a mixed-ecosystem, keep in mind the size and ecological requirements of each plant. Start with the hardiest and most easily grown species, but allow space for fragile ones in subsequent plantings.

Acquiring natives

Plants in their wild habitat must be protected and maintained. It is best and easiest to get your plants from nurseries (see list), or friend's gardens. Obtain proper permits from landowners and make sure you follow a few common sense rules:

- collect sparingly from each plant or area.
- some plants are on the state or Federal Endangered Species list. Make sure you get permits (see app. A,B)

---

[1] K. Nagata, P.6

[2] K. Nagata, P.9

[3] Nagata, P.9

Soil

Once you have selected your site and the plants you wish to establish there, you must look at the soil conditions on the site. Proper soil is necessary for the successful growth of most native plants, which preform poorly in hard pan, clay or adobe soils. If natives are to be planted in these types of soil, it would be wise to dig planting holes several times the size of the rootball and backfill with 50-75% compost.[4] A large planting hole ensures the development of a strong root system. The plant will have a headstart before the roots penetrate the surrounding poor soil.[5]

It is recommended that native plants not be planted in ground that is more dense than potting soil. If there is no alternative, dig a hole in a mound of soil mixed with volcanic cinder which encourages maximum root development. Fill the hole with water, if the water tends to puddle or drain too slowly, dig a deeper hole until the water does not puddle longer than 1 or 2 minutes.[6] Well-drained soil is one of the most important things when planting natives as you will see in the next section.

Irrigation

Most natives do very poorly in waterlogged conditions. Do not water if the soil is damp. Water when the soil is dry and the plants are wilting. Once established, a good soaking twice a week should suffice. Deep soaking encourages the development of stronger, and deeper root systems. This is better than frequent and shallow watering which encourage weaker, more shallow root systems.

The following is a watering schedule from Kenneth Nagata's Booklet, *How To Plant A Native Hawaiian Garden*:

WATER REQUIREMENT	WATERING FREQUENCY
Heavy	3x / week
Moderate	2x / week
Light	1x / week

Red clay soils hold more water for a longer period of time than sandy soils do. If your area is very sunny or near a beach, things will dry out faster. Even in the area of one garden, there are parts that will need more or less water. Soils can vary and amount of shade and wind differ. After plants are established (a month or two for most plants, up to a year for some trees), you can back off watering.

---

[4] Nagata, p. 6

[5] Nagata, p. 8

[6] Nagata, p. 8

Automatic sprinkler systems are expensive to install and must be checked and adjusted regularly. Above-ground systems allow you to monitor how much water is being put out, but you lose a lot due to malfunctioning of sprinkler heads and wind. The most efficient way to save water and make sure your plants get enough water, is to hand-water. This way you are getting our precious water to the right places in the right amounts.[7]

Fertilizer

An all-purpose fertilizer 10-10-10 is adequate for most species. They should be applied at planting time, 3 months later, and 6 months thereafter. Use half the dosage recommended for ornamentals and pay special attention to native ferns which are sensitive to strong fertilizers. Use of organic composts and aged animal manures is suggested instead of chemical fertilizers. In addition, use of cinders for providing trace minerals is strongly recommended.[8]

Natives are plants which were here hundreds of years before the polynesians inhabited the Hawaiian Islands. They were brought here by birds, or survived the harsh ocean conditions to float here. They are well-adapted to Hawaii's varying soil and environmental conditions. This is why they make prime specimens for a xeriscape garden. However, natives will not thrive on their own, especially under harsh conditions. On the other hand, like any other plant, if you over-water and over-fertilize them, they will die. Follow the instructions given to you by the nursery you buy the plant from, or from this booklet. Better yet, buy a book (suggested readings can be found in the bibliography in the back of this pamphlet), read it, and learn more about native plants. I guarantee that you will be pleased with the results.

---

[7] Bornhorst, p. 19-20

[8] Nagata, p. 6

Propagation

There are many ways to propagate and plant-out native Hawaiian species. One of the most thourough and helpful book is Heidi Bornhorst's book, *Growing Native Hawaiian Plants.* The easiest, and best way to obtain natives for the novice gardener is to get them from a reputable nursery (see appendix c). That way all you will have to do is know how to transplant (if necessary) and plant-out when you are ready. These are the two methods I have listed here.

Transplanting

1. Use pots that are one size bigger than the potted plant is in
2. Get your potting medium ready

Good potting medium is a ½, ½ mixture of peat moss and perlite. If the plant is from a dry or coastal area, add chunks of cinder or extra perlite. If it is a wet forest species, add more peat moss or compost. Be aware that peat moss is very acidic and certain plants react severely to acidity.

If the plant is to eventually be planted into the ground, make a mix of equal parts peat moss, perlite, and soil from the area in which the plant is to be planted. Slow-release fertilizer can be mixed into the potting medium.

3. Once pots, potting medium, fertilizer and water are ready, you can begin re-potting. Keep the plant stem at the same depth it was in the original pot. Avoid putting the plant in too large a pot, as the plant may not be able to soak up all the water in the soil and the roots may drown and rot.

Mix potting medium and add slow-release fertilizer at this time. Pre-wet the medium to keep dust down and lessen shock to the plant. Put medium in bottom of pot. Measure for the correct depth in the new pot. Make sure there is from ½ to 2 inches from the top of the pot so the plant can get adequate water. Try to stand the plant upright and center the stem in the middle of the pot.

Water the plant thoroughly after transplanting. A vitamin B-1 transplanting solution can help to lessen the transplant shock. Keep the plant in the same type of environment as it was before, sun or shade. If roots were broken, trimm off some of the leaves to compensate for the loss.[9]

Planting out

1. Plant most native Hawaiian plants in a sunny location in soil that is well-drained.
2. Make the planting hole twice as wide as the root ball or present pot, and just as deep. If the soil is clay-like, and drains slowly, mix in some coarse red or bland cinder, coarse perlite or

---

[9] Bornhorst, p.20-21

coarse compost. Place some slow-release fertilizer at the bottom of the hole.

3. Carefully remove the plant from the container and place it in the hole. The top of the soil should be at the same level as the top of the hole, if it is too high or too low, adjust the soil level so that the plant is at the right depth.

4. Water thoroughly after you transplant.

Mulch

Most natives cannot compete with weeds, and therefore must be weeded around constantly in order to thrive. Mulch is a practical alternative, which discourages and prevents weeds from growing.

Hawaii's hot, humid climate leads to the breaking down of organic mulches. Thick organic mulches such as wood chips and leaves, may also be hiding places for pests.

Stone mulches are attractive, permanent and can help to improve soil quality. Red or black cinder, blue rock chips, smooth river rocks and coral chips are some natural choices.[10] Macadamia nut hulls are also easy to find and can make a nice mulch.[11]

Never pile up mulch right next to the stem or trunk of a plant, keep it a few inches away.

---

[10] Bornhorst, p. 24

[11] Nagata, p. 7

PLACES TO SEE NATIVES ON:

The following places propagate native Hawaiian plants from seeds and/or cuttings. Their purpose is to protect and preserve these native plants. Please contact them before going to view the sites, they can provide valuable information and referral to other sources.

Maui:

1. Hoolawa Farms, P.O. Box 731, Haiku, Hawaii, 96708	572-4835
2. The Hawaiian Collection, 1127 Manu St., Kula, Hawaii, 96790	878-1701
3. Kula Botanical Gardens, RR 4, Box 228, Kula, Hawaii, 96790	878-1715
4. Maui Botanical Gardens, Kanaloa Avenue across from stadium	243-7337
5. Kula Forest Reserve, access road at the end of Waipouli Rd. Call the Maui District Forester	984-8100
6. Wailea Point, Private Condominium residence, 4000 Wailea Alanui, public access points at Four Seasons Resort or Polo Beach	875-9557
7. Kahanu Gardens, National Tropical Botanical Garden, Alau Pl, Hana, Hawaii, 96713	248-8912
9. Kahului Library Courtyard, 20 School Street, Kahului, Hawaii	873-3097

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.

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

ORDINANCE NO. 2108

BILL NO. 6 (1992)

Draft 1

A BILL FOR AN ORDINANCE AMENDING CHAPTER 16.20 OF THE MAUI COUNTY CODE, PERTAINING TO THE PLUMBING CODE

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Title 16 of the Maui County Code is amended by adding a new section to Chapter 10 of the Uniform Plumbing Code to be designated and to read as follows:

"16.20.675 Section 1050 added. Chapter 10 of the Uniform Plumbing Code is amended by adding a new section, pertaining to low-flow water fixtures and devices, to be designated and to read as follows:

Sec. 1050 Low-flow water fixtures and devices. (a) This section establishes maximum rates of water flow or discharge for plumbing fixtures and devices in order to promote water conservation.

(b) For the plumbing fixtures and devices covered in this section, manufacturers or their local distributors shall provide proof of compliance with the performance requirements established by the American National Standards Institute (ANSI) and such other proof as may be required by the director of public works. There shall be no charge for this registration process.

(c) Effective December 31, 1992, only plumbing fixtures and devices specified in this section shall be offered for sale or installed in the County of Maui, unless otherwise indicated in this section. All plumbing fixtures and devices which were installed before December 31, 1992, shall be allowed to be used, repaired or replaced after December 31, 1992.

(1) Faucets (kitchen): All kitchen and bar sink faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two-tenths gallons per minute at sixty pounds per square inch of water pressure.

(2) Faucets (lavatory): All lavatory faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two tenths gallons per minute at sixty pounds per square inch of water

pressure.

(3) Faucets (public rest rooms): In addition to the lavatory requirements set forth in paragraph (2), lavatory faucets located in rest rooms intended for use by the general public shall be of the metering or self-closing types.

(4) Hose bibbs: Water supply faucets or valves shall be provided with approved flow control devices which limit flow to a maximum three gallons per minute.

EXCEPTIONS: (A) Hose bibbs or valves not used for fixtures or equipment designated by the director of public works.

(B) Hose bibbs, faucets, or valves serving fixed demand, timing, or water level control appliances, and equipment or holding structures such as water closets, pools, automatic washers, and other similar equipment.

(5) Showerheads: Showerheads, except where provided for safety or emergency reasons, shall be designed, manufactured, or installed with a flow limitation device which will prevent a water flow rate in excess of two and one-half gallons per minute at eighty pounds per square inch of water pressure. The flow limitation device must be a permanent and integral part of the showerhead and must not be removable to allow flow rates in excess of two and one-half gallons per minute or must be mechanically retained requiring force in excess of eight pounds to remove.

(6) Urinals: Urinals shall be designed, manufactured, or installed so that the maximum flush will not exceed one gallon of water. Adjustable type flushometer valves may be used provided they are adjusted so the maximum flush will not exceed one and six tenths gallons of water.

(7) Water closets (toilets): Water closets shall be designed, manufactured, or installed so that the maximum flush will not exceed one and six tenths gallons of water.

(d) Beginning December 31, 1992, it is unlawful to sell or install any plumbing fixtures or devices not specified in this section, except as permitted under this section.

(e) The director of public works may exempt the use of low-flow water fixtures and devices if there is a finding that the use of such fixtures and devices would not be consistent with accepted engineering practices and would be detrimental to the public health, safety and welfare.

(f) Any person violating this section shall be fined $250 for each violation and shall correct all instances of non-compliance for which a citation is issued. Violation of this section shall constitute a violation as defined in section 701-107 Hawaii Revised Statutes and shall be enforceable by employees of the department of public works. The foregoing fine may also be imposed in a civil, administrative proceeding pursuant to Rules and Regulations adopted by the department of public works in accordance with chapter 91 Hawaii Revised Statutes."

SECTION 2. New material is underscored. In printing this bill, the County Clerk need not include the underscoring.

SECTION 3. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:

HOWARD M. FUKUSHIMA
Deputy Corporation Counsel
County of Maui
c:\wp51\ords\flows4\pk

WE HEREBY CERTIFY that the foregoing BILL NO. 6 (19 92), Draft 1

1. Passed FINAL READING at the meeting of the Council of the County of Maui, State of Hawaii, held on the 1st day of May, 1992, by the following votes:

Howard S. KIHUNE Chair	Patrick S. KAWANO Vice-Chair	Vince G. BAGOYO, Jr.	Goro HOKAMA	Alice L. LEE	Ricardo MEDINA	Wayne K. NISHIKI	Joe S. TANAKA	Leinaala TERUYA DRUMMOND
Aye	Aye	Excused	Excused	Aye	Aye	Aye	Aye	Aye

2. Was transmitted to the Mayor of the County of Maui, State of Hawaii, on the 1st day of May, 1992.

DATED AT WAILUKU, MAUI, HAWAII, this 1st day of May, 19 92.

HOWARD S. KIHUNE, CHAIR
Council of the County of Maui

DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

THE FOREGOING BILL IS HEREBY APPROVED THIS 5th DAY OF MAY, 1992.

LINDA CROCKETT LINGLE, MAYOR
County of Maui

I HEREBY CERTIFY that upon approval of the foregoing BILL by the Mayor of the County of Maui, the said BILL was designated as ORDINANCE NO. 2108 of the County of Maui, State of Hawaii.

DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

Passed First Reading on January 17, 1992.
Effective date of Ordinance May 5, 1992.

I HEREBY CERTIFY that the foregoing is a true and correct copy of Ordinance No. 2108, the original of which is on file in the Office of the County Clerk, County of Maui, State of Hawaii.

Dated at Wailuku, Hawaii, on

County Clerk, County of Maui

United States
Environmental Protection
Agency

Office of Water
Washington, DC 20460

840-B-92-002
January 1993

EPA

Guidance Specifying Management Measures For Sources Of Nonpoint Pollution In Coastal Waters

Issued Under the Authority of
Section 6217(g) of the Coastal Zone Act
Reauthorization Amendments of 1990

III. CONSTRUCTION ACTIVITIES

A. Construction Site Erosion and Sediment Control Management Measure

(1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, and

(2) Prior to land disturbance, prepare and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

1. Applicability

This management measure is intended to be applied by States to all construction activities on sites less than 5 acres in areas that do not have an NPDES permit[3] in order to control erosion and sediment loss from those sites. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The goal of this management measure is to reduce the sediment loadings from construction sites in coastal areas that enter surface waterbodies. This measure requires that coastal States establish new or enhance existing State erosion and sediment control (ESC) programs and/or require ESC programs at the local level. It is intended to be part of a comprehensive land use or watershed management program, as previously detailed in the Watershed and Site Development Management Measures. It is expected that State and local programs will establish criteria determined by local conditions (e.g., soil types, climate, meteorology) that reduce erosion and sediment transport from construction sites.

Runoff from construction sites is by far the largest source of sediment in urban areas under development (York County Soil and Water Conservation District, 1990). Soil erosion removes over 90 percent of sediment by tonnage in urbanizing areas where most construction activities occur (Canning, 1988). Table 4-14 illustrates some of the

[3] On May 27, 1992, the United States Court of Appeals for the Ninth Circuit invalidated EPA's exemption of construction sites smaller than 5 acres from the storm water permit program in *Natural Resources Defense Council* v. *EPA*, 965 F.2d 759 (9th Cir. 1992). EPA is conducting further rulemaking proceedings on this issue and will not require permit applications for construction activities under 5 acres until further rulemaking has been completed.

measured sediment loading rates associated with construction activities found across the United States. As seen in Table 4-14, erosion rates from natural areas such as undisturbed forested lands are typically less than one ton/acre/year, while erosion from construction sites ranges from 7.2 to over 1,000 tons/acre/year.

Table 4-14. Erosion and Sediment Problems Associated With Construction

Location	Problem	Reference
United States	Sediment loading rates vary from 36.5 to 1,000 ton/ac/yr. These are 5 to 500 times greater than those from undeveloped land. Approximately 600 million tons of soil erodes from developed sites each year. Construction site sediment in runoff can be 10 to 20 times greater than that from agricultural lands.	York County Soil and Water Conservation District, 1990
Franklin County, FL	Sediment yield (ton/ac/yr): forest < 0.5 rangeland < 0.5 tilled 1.4 construction site 30 established urban < 0.5	Franklin County, FL
Wisconsin	Erosion rates range from 30 to 200 ton/ac/yr (10 to 20 times those of cropland).	Wisconsin Legislative Council, 1991
Washington, DC	Erosion rates range from 35 to 45 ton/ac/yr (10 to 100 times greater than agriculture and stabilized urban land uses).	MWCOG, 1987
Anacostia River Basin, VA, MD, DC	Sediment yields from portions of the Anacostia Basin have been estimated at 75,000 to 132,000 ton/yr.	U.S. Army Corps of Engineers, 1990
Washington	Erosion rates range from 50 to 500 ton/ac/yr. Natural erosion rates from forests or well-sodded prairies are 0.01 to 1.0 ton/ac/yr.	Washington Department of Ecology, 1989
Anacostia River Basin, VA, MD, DC	Erosion rates range from 7.2 to 100.8 ton/ac/yr.	USGS, 1978
Alabama	1.4 million tons eroded per year.	Woodward-Clyde, 1991
North Carolina	6.7 million tons eroded per year.	
Louisiana	5.1 million tons eroded per year.	
Oklahoma	4.2 million tons eroded per year.	
Georgia	3.8 million tons eroded per year.	
Texas	3.5 million tons eroded per year.	
Tennessee	3.3 million tons eroded per year.	
Pennsylvania	3.1 million tons eroded per year.	
Ohio	3.0 million tons eroded per year.	
Kentucky	3.0 million tons eroded per year.	

Eroded sediment from construction sites creates many problems in coastal areas including adverse impacts on water quality, critical habitats, submerged aquatic vegetation (SAV) beds, recreational activities, and navigation (APWA, 1991). For example, the Miami River in Florida has been severely affected by pollution associated with upland erosion. This watershed has undergone extensive urbanization, which has included the construction of many commercial and residential buildings over the past 50 years. Sediment deposited in the Miami River channel contributes to the severe water quality and navigation problems of this once-thriving waterway, as well as Biscayne Bay (SFWMD, 1988).

ESC plans are important for controlling the adverse impacts of construction and land development and have been required by many State and local governments, as shown in Table 4-13 (in the Site Development section of this chapter). An ESC plan is a document that explains and illustrates the measures to be taken to control erosion and sediment problems on construction sites (Connecticut Council on Soil and Water Conservation, 1988). It is intended that existing State and local erosion and sediment control plans may be used to fulfill the requirements of this management measure. Where existing ESC plans do not meet the management measure criteria, inadequate plans may be enhanced to meet the management measure guidelines.

Typically, an ESC plan is part of a larger site plan and includes the following elements:

- Description of predominant soil types;
- Details of site grading including existing and proposed contours;
- Design details and locations for structural controls;
- Provisions to preserve topsoil and limit disturbance;
- Details of temporary and permanent stabilization measures; and
- Description of the sequence of construction.

ESC plans ensure that provisions for control measures are incorporated into the site planning stage of development and provide for the reduction of erosion and sediment problems and accountability if a problem occurs (York County Soil and Water Conservation District, 1990). An effective plan for urban runoff management on construction sites will control erosion, retain sediments on site, to the extent practicable, and reduce the adverse effects of runoff. Climate, topography, soils, drainage patterns, and vegetation will affect how erosion and sediment should be controlled on a site (Washington State Department of Ecology, 1989). An effective ESC plan includes both structural and nonstructural controls. Nonstructural controls address erosion control by decreasing erosion potential, whereas structural controls are both preventive and mitigative because they control both erosion and sediment movement.

Typical nonstructural erosion controls include (APWA, 1991; York County Soil and Water Conservation District, 1990):

- Planning and designing the development within the natural constraints of the site;
- Minimizing the area of bare soil exposed at one time (phased grading);
- Providing for stream crossing areas for natural and man-made areas; and
- Stabilizing cut-and-fill slopes caused by construction activities.

Structural controls include:

- Perimeter controls;
- Mulching and seeding exposed areas;
- Sediment basins and traps; and
- Filter fabric, or silt fences.

Some erosion and soil loss are unavoidable during land-disturbing activities. While proper siting and design will help prevent areas prone to erosion from being developed, construction activities will invariably produce conditions where erosion may occur. To reduce the adverse impacts associated with construction, the construction management measure suggests a system of nonstructural and structural erosion and sediment controls for incorporation into an

ESC plan. Erosion controls have distinct advantages over sediment controls. Erosion controls reduce the amount of sediment transported off-site, thereby reducing the need for sediment controls. When erosion controls are used in conjunction with sediment controls, the size of the sediment control structures and associated maintenance may be reduced, decreasing the overall treatment costs (SWRPC, 1991).

3. Management Measure Selection

This management measure was selected to minimize sediment being transported outside the perimeter of a construction site through two broad performance goals: (1) reduce erosion and (2) retain sediment onsite, to the extent practicable. These performance goals were chosen to allow States and local governments flexibility in specifying practices appropriate for local conditions.

While several commentors responding to the draft (May 1991) guidance expressed the need to define "more measurable, enforceable ways" to control sediment loadings, other commentors stressed the need to draft management measures that do not conflict with existing State programs and allow States and local governments to determine appropriate practices and design standards for their communities. These management measures were selected because virtually all coastal States control construction activities to prevent erosion and sediment loss.

The measures were specifically written for the following reasons:

(1) Predevelopment loadings may vary greatly, and some sediment loss is usually inevitable;

(2) Current practice is built on the use of systems of practices selected based on site-specific conditions; and

(3) The combined effectiveness of erosion and sediment controls in systems is not easily quantified.

4. Erosion Control Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Erosion controls are used to reduce the amount of sediment that is detached during construction and to prevent sediment from entering runoff. Erosion control is based on two main concepts: (1) disturb the smallest area of land possible for the shortest period of time, and (2) stabilize disturbed soils to prevent erosion from occurring.

■ *a. Schedule projects so clearing and grading are done during the time of minimum erosion potential.*

Often a project can be scheduled during the time of year that the erosion potential of the site is relatively low. In many parts of the country, there is a certain period of the year when erosion potential is relatively low and construction scheduling could be very effective. For example, in the Pacific region if construction can be completed during the 6-month dry season (May 1 - October 31), temporary erosion and sediment controls may not be needed. In addition, in some parts of the country erosion potential is very high during certain parts of the year such as the spring thaw in northern areas. During this time of year, melting snowfall generates a constant runoff that can erode soil. In addition, construction vehicles can easily turn the soft, wet ground into mud, which is more easily washed offsite. Therefore, in the north, limitations should be placed on grading during the spring thaw (Goldman et al., 1986).

b. Stage construction.

void areawide clearance of construction sites. Plan and stage land disturbance activities so that only the area ırrently under construction is exposed. As soon as the grading and construction in an area are complete, the area ıould be stabilized.

ıy clearing only those areas immediately essential for completing site construction, buffer zones are preserved and oil remains undisturbed until construction begins. Physical markers, such as tape, signs, or barriers, indicating the ımits of land disturbance, can ensure that equipment operators know the proposed limits of clearing. The area of he watershed that is exposed to construction is important for determining the net amount of erosion. Reducing the xtent of the disturbed area will ultimately reduce sediment loads to surface waters. Existing or newly planted egetation that has been planted to stabilize disturbed areas should be protected by routing construction traffic around nd protecting natural vegetation with fencing, tree armoring, retaining walls, or tree wells.

c. Clear only areas essential for construction.

Often areas of a construction site are unnecessarily cleared. Only those areas essential for completing construction ıctivities should be cleared, and other areas should remain undisturbed. Additionally, the proposed limits of land listurbance should be physically marked off to ensure that only the required land area is cleared. Avoid disturbing vegetation on steep slopes or other critical areas.

d. Locate potential nonpoint pollutant sources away from steep slopes, waterbodies, and critical areas.

Material stockpiles, borrow areas, access roads, and other land-disturbing activities can often be located away from critical areas such as steep slopes, highly erodible soils, and areas that drain directly into sensitive waterbodies.

e. Route construction traffic to avoid existing or newly planted vegetation.

Where possible, construction traffic should travel over areas that must be disturbed for other construction activity. This practice will reduce the area that is cleared and susceptible to erosion.

f. Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells.

Tree armoring protects tree trunks from being damaged by construction equipment. Fencing can also protect tree trunks, but should be placed at the tree's drip line so that construction equipment is kept away from the tree. The tree drip line is the minimum area around a tree in which the tree's root system should not be disturbed by cut, fill, or soil compaction caused by heavy equipment. When cutting or filling must be done near a tree, a retaining wall or tree well should be used to minimize the cutting of the tree's roots or the quantity of fill placed over the tree's roots.

g. Stockpile topsoil and reapply to revegetate site.

Because of the high organic content of topsoil, it cannot be used as fill material or under pavement. After a site is cleared, the topsoil is typically removed. Since topsoil is essential to establish new vegetation, it should be stockpiled and then reapplied to the site for revegetation, if appropriate. Although topsoil salvaged from the existing site can often be used, it must meet certain standards and topsoil may need to be imported onto the site if the existing topsoil is not adequate for establishing new vegetation.

h. Cover or stabilize topsoil stockpiles.

Unprotected stockpiles are very prone to erosion and therefore stockpiles must be protected. Small stockpiles can be covered with a tarp to prevent erosion. Large stockpiles should be stabilized by erosion blankets, seeding, and/or mulching.

i. Use wind erosion controls.

Wind erosion controls limit the movement of dust from disturbed soil surfaces and include many different practices. Wind barriers block air currents and are effective in controlling soil blowing. Many different materials can be used as wind barriers, including solid board fence, snow fences, and bales of hay. Sprinkling moistens the soil surface with water and must be repeated as needed to be effective for preventing wind erosion (Delaware DNREC, 1989); however, applications must be monitored to prevent excessive runoff and erosion.

j. Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain.

Earth dikes, perimeter dikes or swales, or diversions can be used to intercept and convey runoff above disturbed areas. An earth dike is a temporary berm or ridge of compacted soil that channels water to a desired location. A perimeter dike/swale or diversion is a swale with a supporting ridge on the lower side that is constructed from the soil excavated from the adjoining swale (Delaware DNREC, 1989). These practices should be used to intercept flow from denuded areas or newly seeded areas to keep the disturbed areas from being eroded from the uphill runoff. The structures should be stabilized within 14 days of installation. A pipe slope drain, also known as a pipe drop structure, is a temporary pipe placed from the top of a slope to the bottom of the slope to convey concentrated runoff down the slope without causing erosion (Delaware DNREC, 1989).

k. On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.

Benches, terraces, or ditches break up a slope by providing areas of low slope in the reverse direction. This keeps water from proceeding down the slope at increasing volume and velocity. Instead, the flow is directed to a suitable outlet, such as a sediment basin or trap. The frequency of benches, terraces, or ditches will depend on the erodibility of the soils, steepness and length of the slope, and rock outcrops. This practice should be used if there is a potential for erosion along the slope.

l. Use retaining walls.

Often retaining walls can be used to decrease the steepness of a slope. If the steepness of a slope is reduced, the runoff velocity is decreased and, therefore, the erosion potential is decreased.

m. Provide linings for urban runoff conveyance channels.

Often construction increases the velocity and volume of runoff, which causes erosion in newly constructed or existing urban runoff conveyance channels. If the runoff during or after construction will cause erosion in a channel, the channel should be lined or flow control BMPs installed. The first choice of lining should be grass or sod since this reduces runoff velocities and provides water quality benefits through filtration and infiltration. If the velocity in the channel would erode the grass or sod, then riprap, concrete, or gabions can be used.

n. Use check dams.

Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce the erosion in swale or channel. Check dams should be used when a swale or channel will be used for a short time and therefore t is not feasible or practical to line the channel or implement flow control BMPs (Delaware DNREC, 1989).

o. *Seed and fertilize.*

Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once a dense vegetative cover has been established. However, often seeding and fertilizing do not produce as thick a vegetative cover as do seed and mulch or netting. Newly established vegetation does not have as extensive a root system as existing vegetation and therefore is more prone to erosion, especially on steep slopes. Care should be taken when fertilizing to avoid untimely or excessive application. Since the practice of seeding and fertilizing does not provide any protection during the time of vegetative establishment, it should be used only on favorable soils in very flat areas and not in sensitive areas.

p. *Use seeding and mulch/mats.*

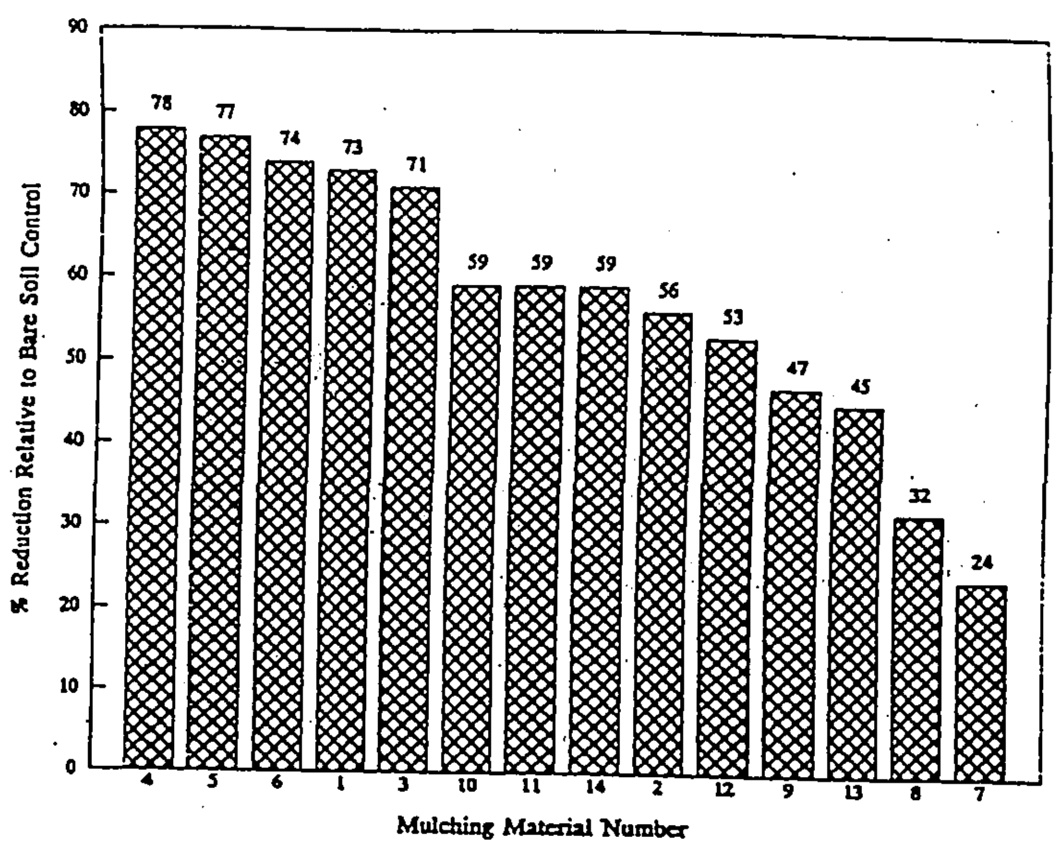
Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once the vegetative cover has been established. The mulching/mats protect the disturbed area while the vegetation becomes established.

The management of land by using ground cover reduces erosion by reducing the flow rate of runoff and the raindrop impact. Bare soils should be seeded or otherwise stabilized within 15 calendar days after final grading. Denuded areas that are inactive and will be exposed to rain for 30 days or more should also be temporarily stabilized, usually by planting seeds and establishing vegetation during favorable seasons in areas where vegetation can be established. In very flat, non-sensitive areas with favorable soils, stabilization may involve simply seeding and fertilizing. Mulching and/or sodding may be necessary as slopes become moderate to steep, as soils become more erosive, and as areas become more sensitive.

q. *Use mulch/mats.*

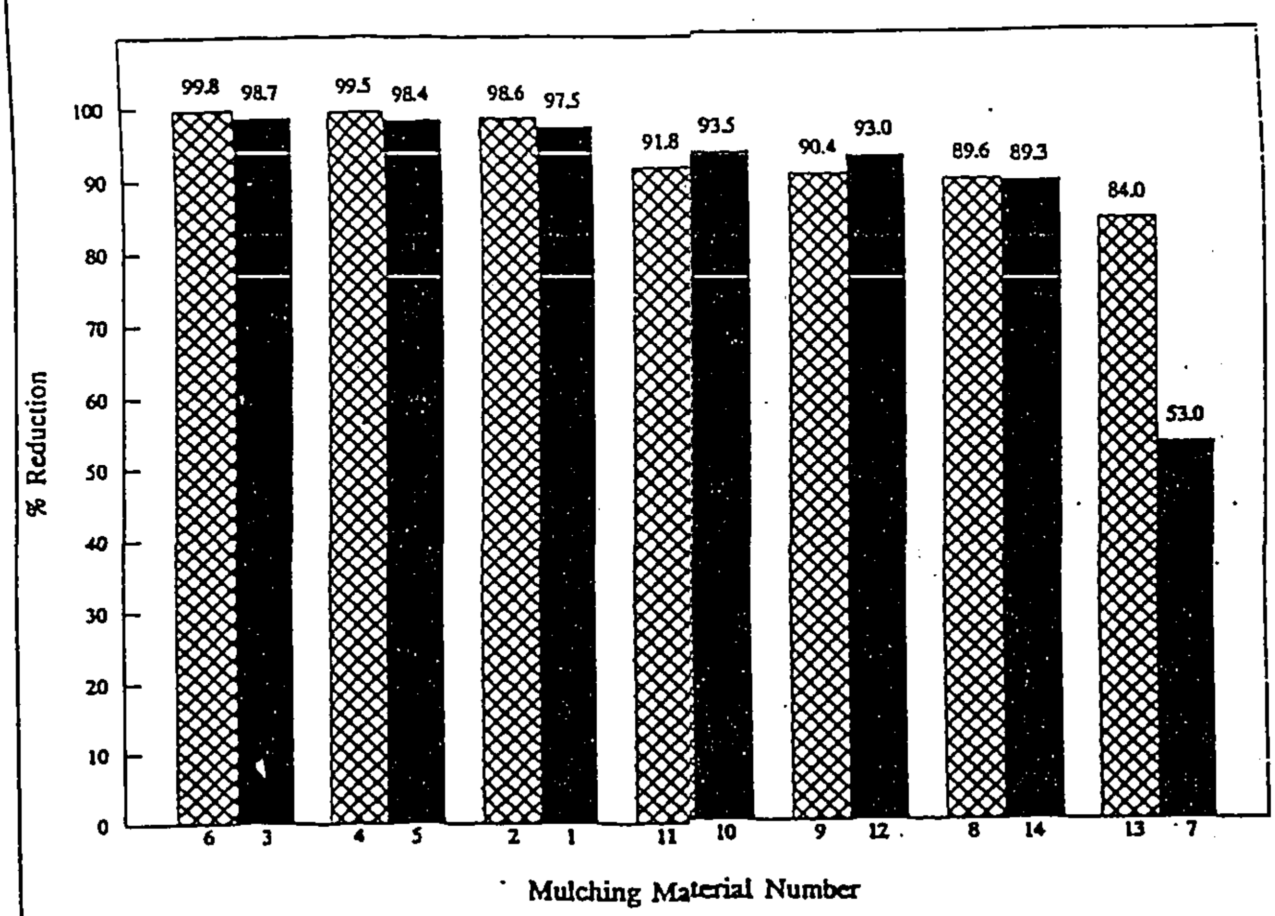
Mulching involves applying plant residues or other suitable materials on disturbed soil surfaces. Mulchs/mats used include tacked straw, wood chips, and jute netting and are often covered by blankets or netting. Mulching alone should be used only for temporary protection of the soil surface or when permanent seeding is not feasible. The useful life of mulch varies with the material used and the amount of precipitation, but is approximately 2 to 6 months. Figure 4-5 shows water velocity reductions that could be expected using various mulching techniques. Similarly, Figure 4-6 shows reductions in soil loss achievable using various mulching techniques. During times of year when vegetation cannot be established, soil mulching should be applied to moderate slopes and soils that are not highly erodible. On steep slopes or highly erodible soils, multiple mulching treatments should be used. On a high-elevation or desert site where grasses cannot survive the harsh environment, native shrubs may be planted. Interlocking ceramic materials, filter fabric, and netting are available for this purpose. Before stabilizing an area, it is important to have installed all sediment controls and diverted runoff away from the area to be planted. Runoff may be diverted away from denuded areas or newly planted areas using dikes, swales, or pipe slope drains to intercept runoff and convey it to a permanent channel or storm drain. Reserved topsoil may be used to revegetate a site if the stockpile has been covered and stabilized.

Consideration should be given to maintenance when designing mulching and matting schemes. Plastic nets are often used to cover the mulch or mats; however, they can foul lawn mower blades if the area requires mowing.



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw — 2,242 kg/ha
14	Uncrimped wheat straw — 4,484 kg/ha

Figure 4-5. Water velocity reductions for different mulch treatments (adapted from Harding, 1990).



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw – 2,242 kg/ha
14	Uncrimped wheat straw – 4,484 kg/ha

Figure 4-6. Actual soil loss reductions for different mulch treatments (adapted from Harding, 1990).

r. *Use sodding.*

Sodding permanently stabilizes an area. Sodding provides immediate stabilization of an area and should be used in critical areas or where establishment of permanent vegetation by seeding and mulching would be difficult. Sodding is also a preferred option when there is a high erosion potential during the period of vegetative establishment from seeding.

s. *Use wildflower cover.*

Because of the hardy drought-resistant nature of wildflowers, they may be more beneficial as an erosion control practice than turf grass. While not as dense as turfgrass, wildflower thatches and associated grasses are expected to be as effective in erosion control and contaminant absorption. Because thatches of wildflowers do not need fertilizers, pesticides, or herbicides, and watering is minimal, implementation of this practice may result in a cost savings (Brash et al., undated). In 1987, Howard County, Maryland, spent $690.00 per acre to maintain turfgrass areas, compared to only $31.00 per acre for wildflower meadows (Wilson, 1990).

A wildflower stand requires several years to become established; maintenance requirements are minimal once the area is established (Brash et al., undated).

5. Sediment Control Practices[4]

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Sediment controls capture sediment that is transported in runoff. Filtration and detention (gravitational settling) are the main processes used to remove sediment from urban runoff.

a. *Sediment Basins*

Sediment basins, also known as silt basins, are engineered impoundment structures that allow sediment to settle out of the urban runoff. They are installed prior to full-scale grading and remain in place until the disturbed portions of the drainage area are fully stabilized. They are generally located at the low point of sites, away from construction traffic, where they will be able to trap sediment-laden runoff.

Sediment basins are typically used for drainage areas between 5 and 100 acres. They can be classified as either temporary or permanent structures, depending on the length of service of the structure. If they are designed to function for less than 36 months, they are classified as "temporary"; otherwise, they are considered permanent structures. Temporary sediment basins can also be converted into permanent urban runoff management ponds. When sediment basins are designed as permanent structures, they must meet all standards for wet ponds.

b. *Sediment Trap*

Sediment traps are small impoundments that allow sediment to settle out of runoff water. Sediment traps are typically installed in a drainageway or other point of discharge from a disturbed area. Temporary diversions can be

[4] Adapted from Goldman (1986).

used to direct runoff to the sediment trap. Sediment traps should not be used for drainage areas greater than 5 acres and typically have a useful life of approximately 18 to 24 months.

c. *Filter Fabric Fence*

Filter fabric fence is available from many manufacturers and in several mesh sizes. Sediment is filtered out as urban runoff flows through the fabric. Such fences should be used only where there is sheet flow (i.e., no concentrated flow), and the maximum drainage area to the fence should be 0.5 acre or less per 100 feet of fence. Filter fabric fences have a useful life of approximately 6 to 12 months.

d. *Straw Bale Barrier*

A straw bale barrier is a row of anchored straw bales that detain and filter urban runoff. Straw bales are less effective than filter fabric, which can usually be used in place of straw bales. However, straw bales have been effectively used as temporary check dams in channels. As with filter fabric fences, straw bale barriers should be used only where there is sheet flow. The maximum drainage area to the barrier should be 0.25 acre or less per 100 feet of barrier. The useful life of straw bales is approximately 3 months.

e. *Inlet Protection*

Inlet protection consists of a barrier placed around a storm drain drop inlet, which traps sediment before it enters the storm sewer system. Filter fabric, straw bales, gravel, or sand bags are often used for inlet protection.

f. *Construction Entrance*

A construction entrance is a pad of gravel over filter cloth located where traffic leaves a construction site. As vehicles drive over the gravel, mud, and sediment are collected from the vehicles' wheels and offsite transport of sediment is reduced.

g. *Vegetated Filter Strips*

Vegetated filter strips are low-gradient vegetated areas that filter overland sheet flow. Runoff must be evenly distributed across the filter strip. Channelized flows decrease the effectiveness of filter strips. Level spreading devices are often used to distribute the runoff evenly across the strip (Dillaha et al., 1989).

Vegetated filter strips should have relatively low slopes and adequate length and should be planted with erosion-resistant plant species. The main factors that influence the removal efficiency are the vegetation type, soil infiltration rate, and flow depth and travel time. These factors are dependent on the contributing drainage area, slope of strip, degree and type of vegetative cover, and strip length. Maintenance requirements for vegetated filter strips include sediment removal and inspections to ensure that dense, vigorous vegetation is established and concentrated flows do not occur. Maintenance of these structures is discussed in Section II.A of this chapter.

6. Effectiveness and Cost Information

a. *Erosion Control Practices*

The effectiveness of erosion control practices can vary based on land slope, the size of the disturbed area, rainfall frequency and intensity, wind conditions, soil type, use of heavy machinery, length of time soils are exposed and unprotected, and other factors. In general, a system of erosion and sediment control practices can more effectively reduce offsite sediment transport than can a single system. Numerous nonstructural measures such as protecting natural or newly planted vegetation, minimizing the disturbance of vegetation on steep slopes and other highly erodible areas, maximizing the distance eroded material must travel before reaching the drainage system, and locating roads away from sensitive areas may be used to reduce erosion.

Table 4-15 contains the available cost and effectiveness data for some of the erosion controls listed above. Information on the effectiveness of individual nonstructural controls was not available. All reported effectiveness data assume that controls are properly designed, constructed, and maintained. Costs have been broken down into annual capital costs, annual maintenance costs, and total annual costs (including annualization of the capital costs).

b. *Sediment Control Practices*

Regular inspection and maintenance are needed for most erosion control practices to remain effective. The effectiveness of sediment controls will depend on the size of the construction site and the nature of the runoff flows. Sediment basins are most appropriate for drainage areas of 5 acres or greater. In smaller areas with concentrated flows, silt traps may suffice. Where concentrated flow leaves the site and the drainage area is less than 0.5 ac/100 ft of flow, filter fabric fences may be effective. In areas where sheet flow leaves the site and the drainage area is greater than 0.5 acre/100 ft of flow, perimeter dikes may be used to divert the flow to a sediment trap or sediment basin. Urban runoff inlets may be protected using straw bales or diversions to filter or route runoff away from the inlets.

Table 4-16 describes the general cost and effectiveness of some common sediment control practices.

c. *Comparisons*

Figure 4-7 illustrates the estimated TSS loading reductions from Maryland construction sites possible using a combination of erosion and sediment controls in contrast to using only sediment controls. Figure 4-8 shows a comparison of the cost and effectiveness of various erosion control practices. As can be seen in Figure 4-8, seeding or seeding and mulching provide the highest levels of control at the lowest cost.

Table 4-15. ESC Quantitative Effectiveness and Cost Summary

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sod	Immediate erosion protection where there is high erosion potential during vegetative establishment.	Average: 99% Observed range: 98% - 99% References: Minnesota Pollution Control Agency, 1989; Pennsylvania, 1983 cited in USEPA, 1991	2	Average: $0.2 per ft^2 [$11,300 per acre] Range: $0.1 - $1.1 References: SWRPC, 1991; Schueler, 1987; Virginia, 1980	Average: 5% Range: 5% Reference: SWRPC, 1991	$0.20 per ft^2 $7,500 per acre
Seed	Establish vegetation on disturbed area.	After vegetation established- Average: 90% Observed range: 50% - 100% References: SCS, 1985 cited in EPA, 1991; Minnesota Pollution Control Agency, 1989; Oberts, 1984 cited in City of Austin, 1988; Delaware Department of Natural Resources, 1989	2	Average: $400 per acre Range: $200 - $1000 per acre References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1980	Average: 20% Range: 15% - 25% References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991	$300 per acre
Seed and Mulch	Establish vegetation on disturbed area.	After vegetation established- Average: 90% Observed range: 50% - 100% References: SCS, 1985 cited in EPA, 1991; Minnesota Pollution Control Agency, 1989; Oberts, 1984 cited in City of Austin, 1988; Delaware Department of Natural Resources, 1989	2	Average: $1,500 per acre Range: $800 - $3,500 per acre References: Goldman, 1986; Washington DOT, 1990; NC State, 1990; Schueler, 1987; Virginia, 1980; SWRPC, 1991	Average: NA[b] Range: NA References: None	$1,100 per acre

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS			Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Mulch	Temporary stabilization of disturbed area.	Observed range:			Straw mulch: 0.25	Straw mulch: Average: $1,700 per acre Range: $500 - $5,000 per acre References: Wisconsin DOT cited in SWRPC, 1991; Washington DOT, 1990; Virginia, 1980	Average: NA[b] Range: NA References: None	Straw mulch: $7,500 per acre
		sand:	20% slope	50% slope				
		wood fiber @ 1500 lb/ac	50-60%	0-20%				
		wood fiber @ 3000 lb/ac	50-85%	50-70%				
		straw @ 3000 lb/ac	90-100%	95%				
		Silt-loam:	20% slope	50% slope	Wood fiber mulch: 0.33	Wood fiber mulch: Average: $1,000 per acre Range: $100 - $2,300 per acre References: Washington DOT, 1990; Virginia, 1980		Wood fiber mulch: $3,500 per acre
		wood fiber @ 1500 lb/ac	20-60%	40-60%				
		wood fiber @ 3000 lb/ac	60-90%	60-70%				
		straw @ 3000 lb/ac	80-95%	70-90%				
		Silt-clay-loam:	10-30% slope	30-50% slope	Jute netting: 0.33	Jute netting: Average: $3,700 per acre Range: $3,500-$4,100 per acre References: Washington DOT, 1990; Virginia, 1980		Jute netting: $12,500 per acre
		wood fiber @ 1500 lb/ac	5%	--				
		wood fiber @ 3000 lb/ac	40%	--				
		jute netting	30-60%	30%				
		straw @ 3000 lb/ac	40-70%	20-40%		Straw and jute: Average: $5,400 per acre Range: $4,000-$9,100 per acre References: Washington DOT, 1990; Virginia, 1980		Straw and jute: $18,000 per acre
		wood chips @ 10,000 lb/ac	60-80%	50-60%				
		mulch blanket	60-80%	50-60%	Straw and jute: 0.33			
		excelsior blanket	60-80%	50-60%				
		multiple treatment (straw and jute)	90%	90%				
		References: Minnesota Pollution Control Agency, 1989; Kay, 1983 cited in Goldman, 1986						

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Terraces	Break up long or steep slopes.	Observed range: Land Slope — Reduction in Erosion 1-12% — 70% 12-18% — 60% 18-24% — 55% Additionally, if the slope steepness is halved, while other factors are held constant, the soil loss potential decreases 2-1/2 times. If both the slope and length are halved, the soil loss potential is decreased 4 times. References: Goldman, 1986; Beasley, 1972	2	Average: $5 per lin ft Range: $1 - $12 References: SWRPC, 1991; Goldman, 1986; Virginia, 1991	Average: 20% Range: 20% Reference: SWRPC, 1991	$4 per lin ft
All Erosion Controls	Reduce amount of sediment entering runoff.	Average: 85% Observed range: 85% Reference: Schueler, 1990	--	Varies but typically low	Varies but typically low	Varies but typically low

NA - Not available.
a Useful life estimated as length of construction project (assumed to be 2 years).
b For Total Annual Cost, assume Annual Maintenance Cost = 2% of construction cost.

Table 4-16. ESC Quantitative Effectiveness and Cost Summary for Sediment Control Practices

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sediment basin	Minimum drainage area = 5 acres, maximum drainage area = 100 acres	Average: 70% Observed range: 55% - 100% References: Schueler, 1990; Engle, BW and Jarrett, AR, 1990; Baumann, 1990	2	Less than 50,000 ft^3 storage Average: $0.60 per ft^3 storage ($1,100 per drainage acre[c]) Range: $0.20 - $1.30 per ft^3 Greater than 50,000 ft^3 storage Average: $0.3 per ft^3 storage ($550 per drainage acre[c]) Range: $0.10 - $0.40 per ft^3 References: SWRPC, 1991	Average: 25% Range: 25% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	Less than 50,000 ft^3 storage $0.40 per ft^3 storage $700 per drainage acre[b] Greater than 50,000 ft^3 storage $0.20 per ft^3 storage $900 per drainage acre[c]
Sediment trap	Maximum drainage area = 5 acres	Average: 60% Observed range: (-7%) - 100% References: Schueler, et al., 1990; Tahoe Regional Planning Agency, 1989; Baumann, 1990	1.5	Average: $0.60 per ft^3 storage ($1,100 per drainage acre[c]) Range: $0.20 - $2.00 per ft^3 References: Denver COG cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986	Average: 20% Range: 20% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	$0.70 per ft^3 storage $1,300 per drainage acre[c]
Filter Fabric Fence	Maximum drainage area = 0.5 acre per 100 feet of fence. Not to be used in concentrated flow areas.	Average: 70% Observed range: 0% - 100% sand: 80% - 99% silt-loam: 50% - 80% silt-clay-loam: 0% - 20% References: Munson, 1991; Fisher et al., 1984; Minnesota Pollution Control Agency, 1989	0.5	Average: $3 per lin ft ($700 per drainage acre[c] Range: $1 - $8 per lin ft References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1991; NC State, 1990	Average: 100% Range: 100% References: SWRPC, 1991	$7 per lin ft $850 per drainage acre[c]

Table 4-16. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Straw Bale Barrier	Maximum drainage area = 0.25 acre per 100 feet of barrier. Not to be used in concentrated flow areas.	Average: 70% Observed Range: 70% References: Virginia, 1980 cited in EPA, 1991	0.25	Average: $4 per lin ft ($1,600 per drainage acre[d] Range: $2 - $6 per lin ft References: Goldman, 1986; Virginia, 1991	Average: 100% Range: 100% References: SWRPC, 1991	$17 per lin ft $6,800 per drainage acre[d]
Inlet Protection	Protect storm drain inlet.	Average: NA Observed Range: NA References: None	1	Average: $100 per inlet Range: $50 - $150 References: SWRPC, 1991; Denver COG cited in SWRPC, 1991; Virginia, 1991; EPA cited in SWRPC, 1991	Average: 60% Range: 20% - 100% References: SWRPC, 1991; Denver COG cited in SWRPC, 1991	$150 per inlet
Construction Entrance	Removes sediment from vehicles wheels.	Average: NA Observed Range: NA References: None	2	Average: $2,000 each Range: $1,000 - $4,000 References: Goldman, 1986; NC State, 1990	Average: NA[e] Range: NA References: None	$1,500 each
				With washrack: Average: $3,000 each Range: $1,000 - $5,000 References: Virginia, 1991		$2,200 each

Table 4-16. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Vegetative Filter Strip	Must have sheet flow.	Average: 70% Observed Range: 20% - 80% References: Hayes and Hairston, 1983 cited in Casman, 1990; Dillaha et al., 1989, cited in Glick et al., 1991; Virginia Department of Conservation, 1987; Nonpoint Source Control Task Force, 1983 cited in Minnesota PCA, 1989; Schueler, 1987	2	Established from existing vegetation- Average: $0 Range: $0 References: Schueler, 1987 Established from sod- Average: $11,300 per acre Range: $4,500 - $48,000 per acre References: Schueler, 1987; SWRPC, 1991	Average: NA Range: NA References: None	NA

NA - Not available.
[a] Useful life estimated as length of construction project (assumed to be 2 years)
[*] For Total Annual Cost, assume Annual Maintenance Cost=20% of construction cost.
[b] Assumes trap volume = 1800 cf/ac (0.5 inches runoff per acre).
[c] Assumes drainage area of 0.5 acre per 100 feet of fence (maximum allowed).
[d] Assumes drainage area of 0.25 acre per 100 feet of barrier (maximum allowed).

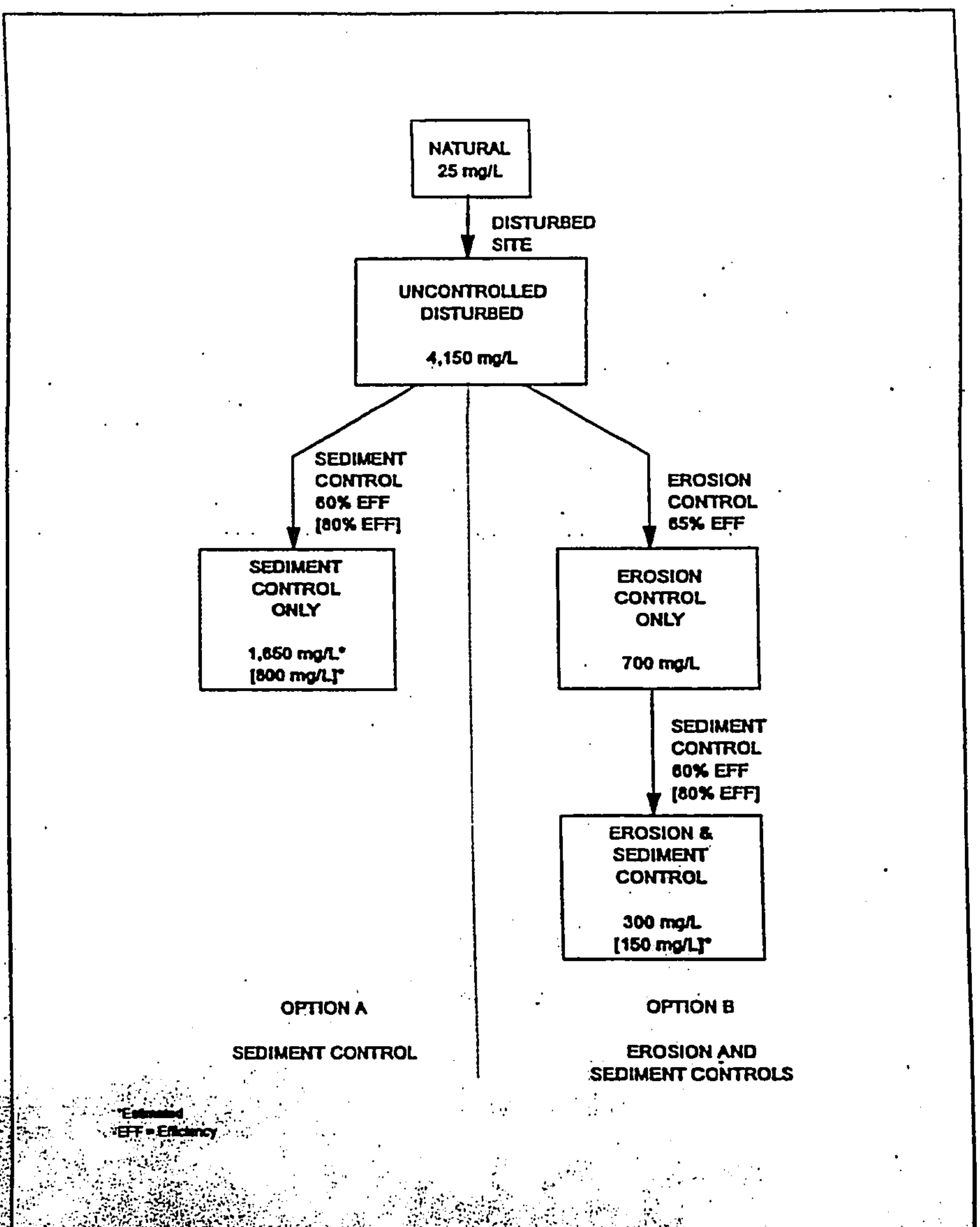


Figure 4-7. TSS concentrations from Maryland construction sites (Schueler, 1987).

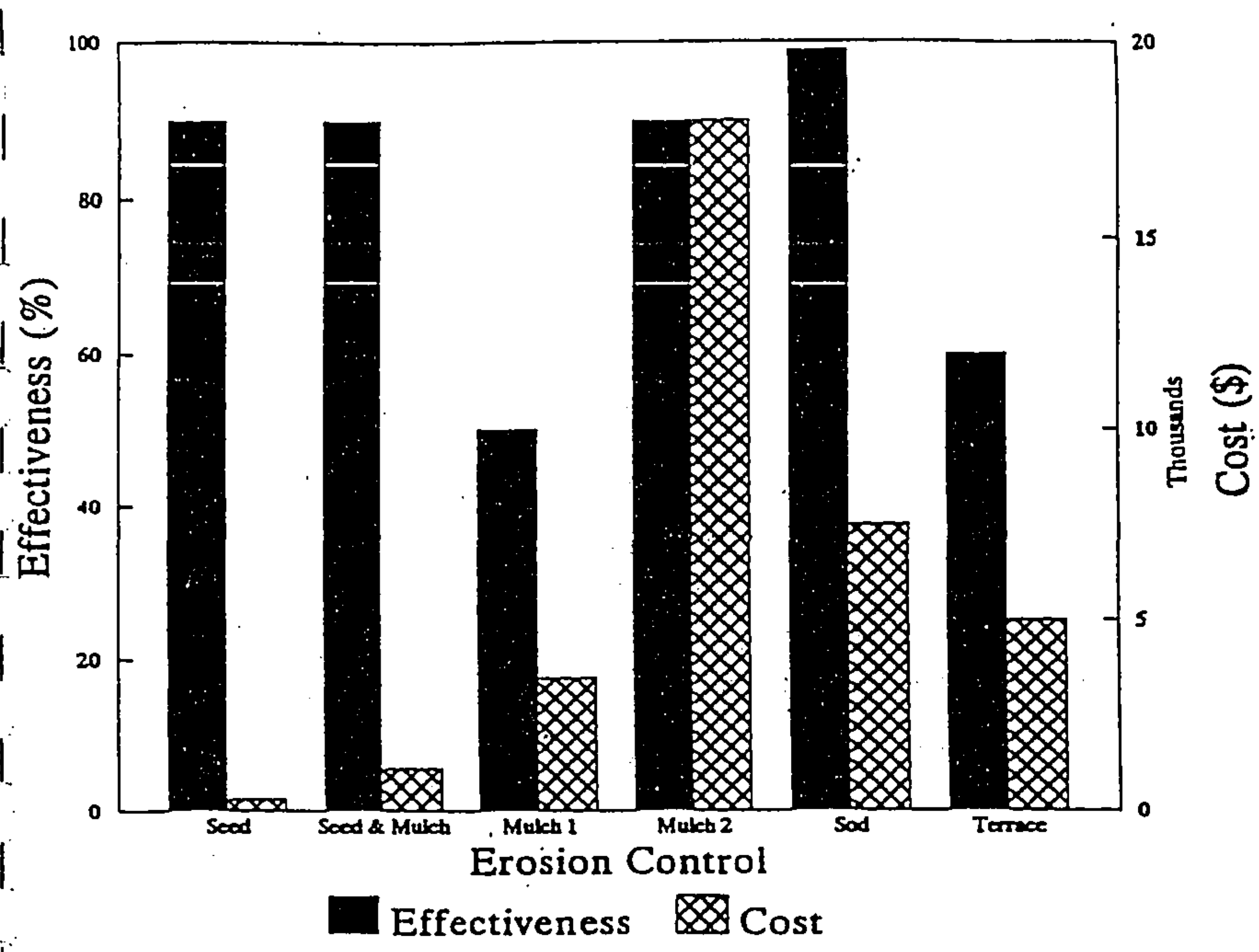


Figure 4-8. Comparison of cost and effectiveness for erosion control practices (based on information in Tables 4-15 and 4-16).

B. Construction Site Chemical Control Management Measure

(1) Limit application, generation, and migration of toxic substances;

(2) Ensure the proper storage and disposal of toxic materials; and

(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

1. Applicability

This management measure is intended to be applied by States to all construction sites less than 5 acres in area and to new, resurfaced, restored, and reconstructed road, highway, and bridge construction projects. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformance with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides (insecticides, fungicides, herbicides, and rodenticides); fertilizers used for vegetative stabilization; petrochemicals (oils, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary wastes (Washington State Department of Ecology, 1991).

The variety of pollutants present and the severity of their effects are dependent on a number of factors:

(1) **The nature of the construction activity.** For example, potential pollution associated with fertilizer usage may be greater along a highway or at a housing development than it would be at a shopping center development because highways and housing developments usually have greater landscaping requirements.

(2) **The physical characteristics of the construction site.** The majority of all pollutants generated at construction sites are carried to surface waters via runoff. Therefore, the factors affecting runoff volume,

such as the amount, intensity, and frequency of rainfall; soil infiltration rates; surface roughness; slope length and steepness; and area denuded, all contribute to pollutant loadings.

(3) **The proximity of surface waters to the nonpoint pollutant source.** As the distance separating pollutant-generating activities from surface waters decreases, the likelihood of water quality impacts increases.

a. Pesticides

Insecticides, rodenticides, and herbicides are used on construction sites to provide safe and healthy conditions, reduce maintenance and fire hazards, and curb weeds and woody plants. Rodenticides are also used to control rodents attracted to construction sites. Common insecticides employed include synthetic, relatively water-insoluble chlorinated hydrocarbons, organophosphates, carbamates, and pyrethrins.

b. Petroleum Products

Petroleum products used during construction include fuels and lubricants for vehicles, for power tools, and for general equipment maintenance. Specific petroleum pollutants include gasoline, diesel oil, kerosene, lubricating oils, and grease. Asphalt paving also can be particularly harmful since it releases various oils for a considerable time period after application. Asphalt overloads might be dumped and covered without inspection. However, many of these pollutants adhere to soil particles and other surfaces and can therefore be more easily controlled.

c. Nutrients

Fertilizers are used on construction sites when revegetating graded or disturbed areas. Fertilizers contain nitrogen and phosphorus, which in large doses can adversely affect surface waters, causing eutrophication.

d. Solid Wastes

Solid wastes on construction sites are generated from trees and shrubs removed during land clearing and structure installation. Other wastes include wood and paper from packaging and building materials, scrap metals, sanitary wastes, rubber, plastic and glass, and masonry and asphalt products. Food containers, cigarette packages, leftover food, and aluminum foil also contribute solid wastes to the construction site.

e. Construction Chemicals

Chemical pollutants, such as paints, acids for cleaning masonry surfaces, cleaning solvents, asphalt products, soil additives used for stabilization, and concrete-curing compounds, may also be used on construction sites and carried runoff.

f. Other Pollutants

Other pollutants, such as wash water from concrete mixers, acid and alkaline solutions from exposed soil or rock, and alkaline-forming natural elements, may also be present and contribute to nonpoint source pollution.

Revegetation of disturbed areas may require the use of fertilizers and pesticides, which, if not applied properly, may become nonpoint source pollutants. Many pesticides are restricted by Federal and/or State regulations.

Hydroseeding operations, in which seed, fertilizers, and lime are applied to the ground surface in a one-step operation, are more conducive to nutrient pollution than are the conventional seedbed-preparation operations, in which fertilizers and lime are tilled into the soil. Use of fertilizers containing little or no phosphorus may be required by local authorities if the development is near sensitive waterbodies. The addition of lime can also affect the pH of sensitive waters, making them more alkaline.

Improper fueling and servicing of vehicles can lead to significant quantities of petroleum products being dumped onto the ground. These pollutants can then be washed off site in urban runoff, even when proper erosion and sediment controls are in place. Pollutants carried in solution in runoff water, or fixed with sediment crystalline structures, may not be adequately controlled by erosion and sediment control practices (Washington Department of Ecology, 1991). Oils, waxes, and water-insoluble pesticides can form surface films on water and solid particles. Oil films can also concentrate water-soluble insecticides. These pollutants can be nearly impossible to control once present in runoff other than by the use of very costly water-treatment facilities (Washington Department of Ecology, 1991).

After spill prevention, one of the best methods to control petroleum pollutants is to retain sediments containing oil on the construction site through use of erosion and sediment control practices. Improved maintenance and safe storage facilities will reduce the chance of contaminating a construction site. One of the greatest concerns related to use of petroleum products is the method for waste disposal. The dumping of petroleum product wastes into sewers and other drainage channels is illegal and could result in fines or job shutdown.

The primary control method for solid wastes is to provide adequate disposal facilities. Erosion and sediment control structures usually capture much of the solid waste from construction sites. Periodic removal of litter from these structures will reduce solid waste accumulations. Collected solid waste should be removed and disposed of at authorized disposal areas.

Improperly stored construction materials, such as pressure-treated lumber or solvents, may lead to leaching of toxics to surface water and ground water. Disposal of construction chemicals should follow all applicable State and local laws that may require disposal by a licensed waste management firm.

3. Management Measure Selection

This management measure was selected based on the potential for many construction activities to contribute to nutrient and toxic NPS pollution.

This management measure was selected because (1) construction activities have the potential to contribute to increased loadings of toxic substances and nutrients to waterbodies; (2) various States and local governments regulate the control of chemicals on construction sites through spill prevention plans, erosion and sediment control plans, or other administrative devices; (3) the practices described are commonly used and presented in a number of best management practice handbooks and guidance manuals for construction sites; and (4) the practices selected are the most economical and effective.

4. Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

■ a. *Properly store, handle, apply, and dispose of pesticides.*

Pesticide storage areas on construction sites should be protected from the elements. Warning signs should be placed in areas recently sprayed or treated. Persons mixing and applying these chemicals should wear suitable protective clothing, in accordance with the law.

Application rates should conform to registered label directions. Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in applicable Federal, State, and local regulations that govern their usage, handling, storage, and disposal. Pesticides and herbicides should be used only in conjunction with Integrated Pest Management (IPM) (see Chapter 2). Pesticides should be the tool of last resort; methods that are the least disruptive to the environment and human health should be used first.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage, and disposal (TSD) facility. Containers should be triple-rinsed before disposal, and rinse waters should be reused as product.

Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage area, and notifying neighboring property owners prior to spraying.

■ *b. Properly store, handle, use, and dispose of petroleum products.*

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped into oils and lubricants should be disposed of in proper receptacles or recycled. Waste oil for recycling should not be mixed with degreasers, solvents, antifreeze, or brake fluid.

■ *c. Establish fuel and vehicle maintenance staging areas located away from all drainage courses, and design these areas to control runoff.*

Proper maintenance of equipment and installation of proper stream crossings will further reduce pollution of water by these sources. Stream crossings should be minimized through proper planning of access roads. Refer to Chapter 3 for additional information on stream crossings.

■ *d. Provide sanitary facilities for constructions workers.*

■ *e. Store, cover, and isolate construction materials, including topsoil and chemicals, to prevent runoff of pollutants and contamination of ground water.*

■ *f. Develop and implement a spill prevention and control plan. Agencies, contractors, and other commercial entities that store, handle, or transport fuel, oil, or hazardous materials should develop a spill response plan.*

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Spill control plan components should include:

- Stop the source of the spill.
- Contain any liquid.
- Cover the spill with absorbent material such as kitty litter or sawdust, but do not use straw. Dispose of the used absorbent properly.

g. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm sewer systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled. Do not discharge any solvents into sewers.

Washout from concrete trucks should be disposed of into:

- A designated area that will later be backfilled;
- An area where the concrete wash can harden, can be broken up, and then can be placed in a dumpster; or
- A location not subject to urban runoff and more than 50 feet away from a storm drain, open ditch, or surface water.

Never dump washout into a sanitary sewer or storm drain, or onto soil or pavement that carries urban runoff.

h. Develop and implement nutrient management plans.

Properly time applications, and work fertilizers and liming materials into the soil to depths of 4 to 6 inches. Using soil tests to determine specific nutrient needs at the site can greatly decrease the amount of nutrients applied.

i. Provide adequate disposal facilities for solid waste, including excess asphalt, produced during construction.

j. Educate construction workers about proper materials handling and spill response procedures. Distribute or post informational material regarding chemical control.

MUNEKIYO & HIRAGA, INC.

July 24, 2003

Mr. George Tengan, Director
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Hale Mahalolu Ehiku Elderly Housing Project

Dear Mr. Tengan:

Thank you for your letter dated June 6, 2003, providing us with your comments on the proposed project. We have forwarded your comments to the civil engineering consultant for review and inclusion to the project as applicable.

Please note that the civil engineering consultant has calculated a total average daily consumption of 69,740 gallons per day (GPD) for the entire project and a maximum daily demand of 104,610 GPD. This information will be included in the Draft Environmental Assessment.

Further, our client, Hale Mahaolu (HM), will review your water conservation suggestions and will work with the architect to implement these suggestion, as appropriate.

Finally, we note your concern for the Kamaole aquifer and will work with the contractor to insure that best management practices (BMPs) are implemented during construction to minimize infiltration and runoff from construction and vehicle operations.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc.
Michael Ishikawa, Sato & Associates, Inc.
hha\hmehiku\dws.res

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

environment planning government

JUN 2 0 2003

ALAN M. ARAKAWA
Mayor

MICHAEL W. FOLEY
Director

WAYNE A. BOTEILHO
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

June 17, 2003

Mr. Dean Frampton
Munekiyo and Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Frampton:

RE: **Pre-EA for HALE MAHAOLU EHIKU ELDERLY**
TMK: 2-2-002:073
I. D. No.: LTR 2003/1900

Thank you for the opportunity to comment on the above project. The project is located within the Kihei-Makena Project District 5 (PiilaniVillage). The last Phase II amendment to the land use map for the project designates the area for multi-family and Open Space. The project is also located within the Special Management Area. As such a Project District Phase II approval and Special Management Area permit will be required for the project.

Thank you for your cooperation. If additional clarification is required, please contact Mr. Joseph Alueta, Staff Planner of this office at 270-7735.

Sincerely,

Michael W. Foley
Planning Director

JWA:jmu
c: Wayne A. Boteilho, Deputy Planning Director
Clayton I. Yoshida, AICP, Planning Program Administrator
Joseph Alueta, Staff Planner
General File K:\WP_DOCS\PLANNING\LETTERS\ltr2003\1900_hale_mahaolu.wpd

MUNEKIYO & HIRAGA, INC.

July 24, 2003

Mr. Michael Foley, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project

Dear Mr. Foley:

Thank you for your letter dated June 17, 2003, providing us with your comments on the above project. Pursuant to our meeting with you on July 10, 2003, we will be filing an Environmental Assessment (EA), Special Management Area (SMA) Use Permit application, Project District Phase II application, a 201G-118 application as well as a County Special Use Permit for the Adult Day Care facility and the Adult Residential Care Home. We look forward to working with you and your Department on this project.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc.
hha\hmehiku\dop.res

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

environment
planning
government

JUL 18 2003

ALAN M. ARAKAWA
Mayor

GILBERT S. COLOMA-AGARAN
Director

MILTON M. ARAKAWA, A.I.C.P.
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND ENVIRONMENTAL MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Development Services Administration

TRACY TAKAMINE, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

JOHN D. HARDER
Solid Waste Division

July 15, 2003

Mr. Dean Frampton, Planner
MUNEKIYO & HIRAGA, INC.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Dear Mr. Frampton:

SUBJECT: EARLY CONSULTATION FOR AN ENVIRONMENTAL ASSESSMENT
HALE MAHAOLU ELDERLY HOUSING PROJECT
TMK: (2) 2-2-002:073

We reviewed the subject early consultation and have the following comments:

1. Currently the Solid Waste Division operates a community recycling center located on the northwest corner of the property. The existing facility comprises approximately 15,000 square feet of paved and unpaved area. The facility serves the entire Kihei community, diverting nearly 500 tons of material a year. In the future, with the implementation of the "bottle bill", we anticipate a significant growth in diversion. In order to continue to provide this necessary community service, the provision of a recycling site should be considered within the development.

2. Include a solid waste management plan for recycling and disposal of construction waste and cleared and grubbed material.

3. Although wastewater capacity is available as of June 12, 2003, the developer should be informed that wastewater capacity cannot be ensured until the issuance of the building permit.

4. The developer shall pay assessment fees for treatment plant expansion costs and is required to fund any necessary off-site improvements to collection system and wastewater pump stations.

5. Wastewater contribution calculations are required before a building permit is issued. Indicate on the plans the ownership of each easement (in favor of each party). The County will not accept sewer easements which traverse private property. Plans should show the installation of a service manhole near the property line prior connection to County facilities.

6. Kitchen facilities within the proposed project shall comply with pre-treatment requirements (including grease interceptors, sample boxes, screens, etc.).

7. Non-contact cooling water and condensate cannot drain to the wastewater system.

8. Recycled water lines exist adjacent to the site. Recycled water must be utilized for landscaping irrigation and/or other approved uses.

9. The proposed project may create major impacts to drainage and roadway infrastructure. Detailed drainage and traffic impact reports are necessary.

10. The grading for the project shall comply with the provisions of the grading ordinance. Best management practices shall be implemented to the maximum extent practicable to prevent pollutants including dust and sediment from discharging off the project site.

11. The drainage system design by a licensed engineer shall comply with the provisions of the drainage rules and shall create no additional adverse effects to adjacent and downstream properties.

12. Required road improvements shall comply with the provisions of the subdivision ordinance.

13. The development of the project shall comply with the provisions of the subdivision ordinance.

Mr. Dean Frampton, Planner
July 15, 2003
Page 3

If you have any questions regarding this letter, please call Milton Arakawa at 270-7845.

Very truly yours,

Milton Arakawa

for GILBERT S. COLOMA-AGARAN
Director

GSCA:RMN:msc
S:\LUCA\CZM\halemahaoluehiku_ec_22002073_msc.03.wpd

MUNEKIYO & HIRAGA, INC.

April 21, 2004

Mr. Gilbert Coloma-Agaran, Director
Department of Public Works and Environmental Management
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Hale Mahaolu Ehiku Elderly Housing Project at TMK 2-2-002:073 in Kihei, Maui, Hawaii

Dear Mr. Coloma-Agaran:

Thank you for your comments dated July 15, 2003, regarding the proposed Hale Mahaolu Ehiku elderly housing project. On behalf of our client, Hale Mahaolu, (HM), we would like to offer the following responses to your questions:

1. It is our understanding that the Department of Public Works and Environmental Management is currently searching for alternate sites for the recycling facility currently located on the subject property. We have held discussions with staff member from the Solid Waste Division and have suggested that the remnant piece of the Old Welakahao Road may also be an option for the County's recycling center.

2. A solid waste management plan for recycling and disposal of construction waste and grubbed material will be submitted to the department for review prior to construction.

3. We understand your comment with regards to wastewater capacity at the Kihei Wastewater Treatment Facility.

4. The project has been approved as an affordable housing project by the Department of Housing and Human Concerns (DHHC). As such, we have filed a 201G-118 application with DHHC and are requesting an exemption from the sewer assessment fees.

5. As previously noted, the project has been approved as an affordable housing project by the DHHC. Exemption from the wastewater contribution is being sought. Please

also note that this project is being constructed on County property. Hale Mahaolu is leasing the land. Plans will show the installation of sewer lines and a service manhole.

6. We concur with your comment on the compliance of kitchen facilities and pre-treatment requirements.

7. We acknowledge your comment with regards to non-contact cooling water and condensate draining into the wastewater system.

8. We concur with your comment with regards to utilizing recycled water for landscaping irrigation, if available, and will be in contact with the Wastewater Reclamation Division for further information.

9. A drainage report and traffic impact assessment report will be submitted with the Draft Environmental Assessment.

10. We acknowledge the comment regarding the use of BMPs for the project grading.

11. We acknowledge your comment with regards to the design and function of the final drainage system.

12. The project is seeking exemption from any roadway improvement requirements through its 201G-118, HRS application. This would include exemption from Section 16.26.3304 and Chapter 18.20.040 of the Maui County Code (MCC) with regards to Improvement to Public Streets and Improvement to Existing Streets.

13. As previously noted, the project will seek exemption from the subdivision requirements through its 201G-118, HRS application.

Should you have any further comments or questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp

cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Michael Ishikawa, Sato & Associates
Michael Foley, Department of Planning

hha\hmehiku\dpwem.res

MAY 15 2003

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96733-6898 • (808) 871-8461

May 13, 2003

Mr. Dean Frampton
Planner
Munekiyo & Hiraga, Inc.
305 S. High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Frampton:

Subject: Early Consultation Request for Preparation of a Draft Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing Project, Kihei, Maui, TMK (2) 2-2-02:73

Thank you for allowing us to comment on the subject project.

In reviewing the information transmitted and our records, we have no objection to the subject project. We encourage the developer's electrical consultant to meet with us as soon as practical to verify the project's electrical requirements so that service can be provided on a timely basis

If you have any questions or concerns, please call Dan Takahata at 871-2385.

Sincerely,

Neal Shinyama

Neal Shinyama
Manager, Energy Delivery

NS/dt:lkh

Chapter X

Letters Received During the Draft Environmental Assessment Public Comment Period and Responses to Substantive Comments

X. LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT PUBLIC COMMENT PERIOD AND RESPONSES TO SUBSTANTIVE COMMENTS

A Draft Environmental Assessment for the subject project was filed and published in the Office of Environmental Quality Control's The Environmental Notice on July 23, 2004. During the 30-day public comment period, agencies were provided the opportunity to comment on the proposed action. This section incorporates the comments received during the 30-day comment period between July 23, 2004 and August 23, 2004. Responses to the substantive comments are also incorporated herein.

United States Department of Agriculture

USDA

NRCS Natural Resources Conservation Service

Our People...Our Islands...In Harmony

210 Imi Kala Street, Suite #209, Wailuku, HI 96793-2100

July 19, 2004

'04 JUL 20 P1:13

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Mr. Joseph Alueta, Staff Planner
County of Maui
Department of Planning
250 S. High Street
Wailuku, Hawaii 96793

Subject: I.D.: SM1 2004/0013
TMK: 2-2-002:073
Project Name: Elderly Housing Project
Applicant: Hale Mahaolu

Dear Mr. Alueta,

I have no comments at this time.

Thank you for the opportunity to comment.

Sincerely,

Ranae Ganske-Cerizo

Ranae Ganske–Cerizo
Acting District Conservationist

The Natural Resources Conservation Service works in partnership with the American people to conserve and sustain natural resources on private lands.

An Equal Opportunity Employer

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 223
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF: CEPOH-EC-T

'04 JUL 20 P1 :16

July 19, 2004

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Civil Works Technical Branch

Mr. Paul Fasi, Staff Planner
Department of Planning
County of Maui
250 South High Street
Wailuku, Maui 96793

Dear Mr. Fasi:

Thank you for the opportunity to review and comment on the Special Management Area Use Application and Draft Environmental Assessment (DEA) for the Mahaolu Ehiku Elderly Housing Project, Wailuku, Maui (TMK 2-2-2: 73). We do not have any additional comments to offer beyond those previously provided in our letter dated May 12, 2003.

Sincerely,

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

MUNEKIYO & HIRAGA, INC.

September 9, 2004

Mr. George P. Young, P.E.,
Chief, Regulatory Branch
U.S. Army Engineer District, Honolulu
Building 230
Fort Shafter, Hawaii 96858-5440

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Mr. Young:

Thank you for your letter dated July 19, 2004, providing us with your comments on the proposed project. On behalf of our client, Hale Mahaolu (HM), we note that the Department of Army, in their May 12, 2003 letter stated that it *"..appears that a Department of Army permit will not be required for the project."*

Should you have any questions, please feel free to contact me at (808)244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda and Robyne Nishida Nakao, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Alice Lee, Department of Housing and Human Concerns
Michael Foley, Department of Planning

hha\mehiku\army.deares

environment planning government

305 High Street, Suite 104 • Wailuku, Hawaii 96793 • ph: (808)244-2015 • fax: (808)244-8729 • planning@mhinconline.com

JA

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

July 29, 2004

SM1 2004-0013.RCM
Hale Mahaolu

LD-NAV

'04 AUG -2 P1:22
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Honorable Michael W. Foley
Planning Director
County of Maui
Planning Department
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Foley:

Subject: I.D. No.: SM1 2004-0013
Applicant: Hale Mahaolu
Project: Elderly Housing Project
Authority: County of Maui Department of Planning
TMK: (2) 2-2-002: 073

Thank you for the opportunity to review and comment on the subject matter.

The Department of Land and Natural Resources' (DLNR) Land Division made available or distributed a copy of the document pertaining to the subject matter to the following DLNR Divisions for their review and comment:

- Division of Forestry and Wildlife
- Na Ala Hele Trails
- Division of State Parks
- Engineering Division
- Commission on Water Resource Management
- Office of Conservation and Coastal Lands
- Land-Maui District Land Office
- Land Planning and Development
- Land-Land Development

Enclosed please find a copy of the Engineering Division comment.

Based on the attached responses, the Department of Land and Natural Resources has no other comment to offer on the subject matter.

If you have any questions, please feel free to contact Nicholas A. Vaccaro of the Land Division Support Services Branch at 1-808-587-0384.

Very truly yours,

DIERDRE S. MAMIYA
Administrator

C: MDLO

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

JUL 12 11 26 AM '04

July 9, 2004
SM1 2004-0013.CMT

LD/NAV
Suspense Date: 7/21/04

MEMORANDUM:

TO:
*XXX Division of Forestry & Wildlife
*XXX Na Ala Hele Trails
XXX Engineering Division
*XXX Division of State Parks
*XXX Commission on Water Resource Management
*XXX Office of Conservation and Coastal Lands
XXX Land-Maui District Land Office (RD)
*XXX Land-Planning and Development
*XXX Land Development

TO:
___ ADMINISTRATOR
___ ASST ADMIN
___ DEV BR
✓ PLAN BR
___ RES MGT BR
___ CLERICAL
___ ADMIN ASST
___ INTERP BR

FOR:
___ CIRC/POST/STAFF RM
___ COMMENTS & REC
___ DRAFT REPLY
___ FILE
✓ FOLLOW UP
___ INFO
___ RUN COPIES ______
___ RUSH DUE ______
___ SEE ME
___ FAX/SEND COPY TO ___

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: I. D. No.: SM1 2004/0013
Applicant: Hale Mahaolu
Project: Elderly Housing Project
TMK: 2nd/ 2-2-002: 073
Authority: County of Maui Department of Planning

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

***Note: One copy of the document is available for your review in the Land Division Office, Room 220.**

Should you have any questions, please contact Nicholas A. Vaccaro at ext.: 7-0384. If this office does not receive your comments by the suspense date, we will assume there are no comments.

(X) We have no comments.

( ) Comments attached.

Division: State Parks

Signed:

Date: July 14, 2004

Print Name: Daniel S. Quinn

LINDA LINGLE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION

2004 JUL 26 A 10: 17

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

July 9, 2004
SM1 2004-0013.CMT

LD/NAV
Suspense Date: 7/21/04

MEMORANDUM:

TO:
*XXX Division of Forestry & Wildlife
*XXX Na Ala Hele Trails
XXX Engineering Division
*XXX Division of State Parks
*XXX Commission on Water Resource Management
*XXX Office of Conservation and Coastal Lands
XXX Land-Maui District Land Office (RD)
*XXX Land-Planning and Development
*XXX Land Development

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT:
I. D. No.: SM1 2004/0013
Applicant: Hale Mahaolu
Project: Elderly Housing Project
TMK: 2nd/ 2-2-002: 073
Authority: County of Maui Department of Planning

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

***Note: One copy of the document is available for your review in the Land Division Office, Room 220.**

Should you have any questions, please contact Nicholas A. Vaccaro at ext.: 7-0384. If this office does not receive your comments by the suspense date, we will assume there are no comments.

(✓) We have no comments.

( ) Comments attached.

Division: MDLO

Signed: Jason K. Koga

Date: 7-21-04

Print Name: Jason K. Koga

RECEIVED
LAND DIVISION

2004 JUL 22 A

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

LD/NAV

July 9, 2004
SM1 2004-0013.CMT

Suspense Date: 7/21/04

MEMORANDUM:

TO:
*XXX Division of Forestry & Wildlife
*XXX Na Ala Hele Trails
XXX Engineering Division
*XXX Division of State Parks
*XXX Commission on Water Resource Management
*XXX Office of Conservation and Coastal Lands
XXX Land-Maui District Land Office (RD)
*XXX Land-Planning and Development
*XXX Land Development

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT:
I. D. No.: SM1 2004/0013
Applicant: Hale Mahaolu
Project: Elderly Housing Project
TMK: 2nd/ 2-2-002: 073
Authority: County of Maui Department of Planning

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

***Note: One copy of the document is available for your review in the Land Division Office, Room 220.**

Should you have any questions, please contact Nicholas A. Vaccaro at ext.: 7-0384. If this office does not receive your comments by the suspense date, we will assume there are no comments.

(✓) We have no comments.

( ) Comments attached.

Division: MDLO

Signed: Jason K. Koga

Date: 7-21-04

Print Name: Jason K. Koga

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

2004 JUL 19 A 10: 21

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

July 9, 2004
SM1 2004-0013.CMT

LD/NAV
Suspense Date: 7/21/04

MEMORANDUM:

TO: *XXX Division of Forestry & Wildlife
*XXX Na Ala Hele Trails
XXX Engineering Division
*XXX Division of State Parks
*XXX Commission on Water Resource Management
*XXX Office of Conservation and Coastal Lands
XXX Land-Maui District Land Office (RD)
*XXX Land-Planning and Development
*XXX Land Development

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: I. D. No.: SM1 2004/0013
Applicant: Hale Mahaolu
Project: Elderly Housing Project
TMK: 2nd/ 2-2-002: 073
Authority: County of Maui Department of Planning

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

***Note: One copy of the document is available for your review in the Land Division Office, Room 220.**

Should you have any questions, please contact Nicholas A. Vaccaro at ext.: 7-0384. If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments. (✓) Comments attached.

Division: Engineering

Signed: [signature]

Date: 7/15/04

Print Name: ERIC T. HIRANO, CHIEF ENGINEER

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LA/NAV

Ref.: SM1 2001-0013.CMT

COMMENTS

(X) **We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone C. However, portion of the project site is also located in Zone B. The National Flood Insurance Program does not have any regulation for development within these areas.**

( ) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.
( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments: ______________________________

( ) Other: ______________________________

Should you have any questions, please call Mr. Andrew Monden of the Planning Branch at 587-0229.

Signed: [signature]
ERIC T. HIRANO, CHIEF ENGINEER

Date: 7/15/04

LINDA LINGLE
GOVERNOR OF HAWAII

'04 AUG -2 P1:22
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

HAWAI'I HISTORIC PRESERVATION
DIVISION REVIEW

Log #: 2004.2348
Doc #: 0407CD59
Received: 7 July 2004

Applicant/Agency: Mr. Michael Foley, Planning Director
Address: County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Application for Special Management Area Use Permit for the Proposed Hale Mahaolu Ehiku Elderly Housing Project (Subject I.D.: SM12004/0013) [County/Planning]
Ahupua'a: Keokea
District, Island: Makawao, Maui
TMK: (2) 2-2-002:073

1. We believe there are no historic properties present, because:

____ a) intensive cultivation has altered the land
____ b) residential development/urbanization has altered the land
____ c) previous grubbing/grading has altered the land
____ d) an acceptable archaeological assessment or inventory survey found no historic properties
_✓_ e) other: PHRI conducted an archaeological inventory survey in 1989, which included the subject property. During the inventory survey, sixteen historic habitation and agricultural sites were identified, and only one site (Site 50-50-10-4503 --previously designated 2524 -- a rock pile) was located on the southern part of the subject property. This site, of undetermined function, was subsequently determined significant only for information content, with no further archaeological work recommended. (See SHPD DOC NO.: 0306CD22/LOG NO.: 2003.0831; SHPD DOC NO.: 0206CD02/LOG NO.: 30032)

2. This project has already gone through the historic preservation review process, and mitigation has been completed ___.

✓ Thus, we believe that "no historic properties will be affected" by this undertaking

In the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O'ahu.

Staff: Cathleen A. Dagher Date: 28 July 2014

Cathleen A. Dagher
Assistant Maui/Lana'i Island Archaeologist
(808) 692-8023

JWA

LINDA LINGLE
GOVERNOR
STATE OF HAWAII

'04 JUL 12 P1:04

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS
P.O. BOX 1879
HONOLULU, HAWAII 96805

MICAH A. KANE
CHAIRMAN
HAWAIIAN HOMES COMMISSION

BEN HENDERSON
DEPUTY TO THE CHAIRMAN

KAULANA H. PARK
EXECUTIVE ASSISTANT

July 9, 2004

Mr. Michael W. Foley, Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Attention: Mr. Joseph W. Alueta

Dear Mr. Foley:

Subject: ID No. SM1 2004/0013
TMK No. 2-2-002: 073
Elderly Housing Project

Thank you for the opportunity to review the application for special management area use permit for the Hale Mahaolu Ehiku Elderly Housing Project. The Department of Hawaiian Home Lands has no comments to offer.

If you have any questions, please call me at (808) 586-3801 or call our Planning Office at 586-3836.

Aloha and mahalo,

Micah A. Kane, Chairman
Hawaiian Homes Commission

fh

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
Comptroller

KATHERINE H. THOMASON
Deputy Comptroller

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING
AND GENERAL SERVICES
SURVEY DIVISION
P.O. BOX 119
HONOLULU, HAWAII 96810-0119

'04 AUG -3 A11 :57

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

August 2, 2004

MEMORANDUM

TO: Michael W. Foley, Planning Director
Maui County Planning Department

ATTN: Joseph W. Alueta, Staff Planner

FROM: Melvin M. Masuda, Acting State Land Surveyor
DAGS, Survey Division

SUBJECT: SM1 2004/0013
TMK: 2-2-002:073
Project Name: Elderly Housing Project
Applicant: Hale Mahaolu

The subject proposal has been reviewed and confirmed that no Government Survey Triangulation Stations or Benchmarks are affected. Survey has no objections to the proposed project.

LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF BUSINESS SERVICES

'04 JUL 30 A11:59
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

July 30, 2004

Mr. Michael W. Foley, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

Attention: Mr. Joseph W. Alueta, Staff Planner

Dear Mr. Foley:

Subject: Application for Special Management Area Permit for
Hale Mahaolu Ehiku Elderly Housing Project
Kihei, Maui, Hawaii, TMK: 2-2-2: 73 (SMI 2004/0013)

The Department of Education (DOE) has reviewed the application for a Special Management Area (SMA) permit for the 112-unit senior housing project in Kihei, Maui.

The DOE does not request the imposition of a school fair-share condition for housing that prohibits school-age children. Although the application does not mention such a prohibition, it is assumed that children will not be living in the project. Also, the DOE does not request school fair-share conditions on applications for SMA permits only.

The DOE has no further comment on the application but appreciates the opportunity to review the plans. If you have any questions, please call me at 586-3444 or Heidi Meeker of the Facilities and Support Services Branch at 733-4862.

Sincerely,

Rae M. Loui
Assistant Superintendent

RML:mp

c: Ken Nomura, CAS, Baldwin/King Kekaulike/Maui Complex

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

MUNEKIYO & HIRAGA, INC.

September 9, 2004

Ms. Rae Loui, Assistant Superintendent
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Ms. Loui:

Thank you for your letter dated July 30, 2004, providing us with your comments on the proposed project. On behalf of our client Hale Mahaolu (HM), we would like to offer the following response.

We note your comment with regards to school age children at the Hale Mahaolu Ehiku affordable elderly housing project. Housing will be provided to those that are 62 years of age and older who also meet the financial criteria. It is further noted that at the other seven (7) Hale Mahaolu elderly housing sites in Maui County, housing is also limited to those age 62 years and older.

Should you have any questions, please feel free to contact me at (808)244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda and Robyne Nishida Nakao, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Alice Lee, Department of Housing and Human Concerns
Michael Foley, Department of Planning
hha\hmehiku\doe.deares

environment
planning
government

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M. D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M. D., M. P. H
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2102

'04 JUL 19 P3:38
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

July 19, 2004

Mr. Michael W. Foley
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Attention: Joseph W. Alueta

Dear Mr. Foley:

Subject: **Elderly Housing Project**
TMK: (2) 2-2-002: 073
SM1 2004/0013

Thank you for the opportunity to comment on the Special Management Area Permit application for the Hale Mahaolu Ehiku Elderly Housing Project. Our concerns remain as documented in my May 28, 2003, letter to Mr. Dean Frampton of Munekiyo & Hiraga, Inc. The letter was a response to the early consultation process of the environmental assessment. We have no further comments to offer at this time.

Should you have any questions, please call me at 984-8230.

Sincerely,

Herbert S. Matsubayashi
District Environmental Health Program Chief

MUNEKIYO & HIRAGA, INC.

September 9, 2004

Mr. Herbert Matsubayashi
District Environmental Health Program Chief
Maui District Health Office
54 High Street
Wailuku, Hawaii 96793

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Mr. Matsubayashi:

Thank you for your letter dated July 19, 2004, providing us with your comments on the proposed project. We note your comment with regards to the department's early consultation comments and hope that our response letter to you dated July 24, 2004 answered your questions on the project.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
Enclosure
cc: Roy Katsuda and Robyne Nishida Nakao, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc.
Alice Lee, Department of Housing and Human Concerns
Michael Foley, Department of Planning

hha\hmehiku\dohmaui.deares

environment planning government

MUNEKIYO & HIRAGA, INC.

July 24, 2003

Mr. Herbert Matsubayashi
District Environmental Health Program Chief
Maui District Health Office
54 High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project

Dear Mr. Matsubayashi:

Thank you for your letter dated May 28, 2003, providing us with your comments on the proposed project.

With regards to your first concern, our client, Hale Mahaolu (HM), has sought early consultation with the State Department of Health's Clean Water Branch and will implement their requirements accordingly. Secondly, HM will work with the contractor, to insure that all necessary permits are obtained prior to the start of construction. Third, we have forwarded your comments on the potential noise issues with stationary equipment to the architect for his review and consideration. Fourth, HM will work with the contractor to insure that adequate measures are in place such as dust fences or water trucks, to control fugitive dust during construction. Additionally, HM will work with the contractor to insure that vector control measures for the project site are implemented, as appropriate, before the start of construction.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects, Inc.
hha\hmehiku\dohmaui.res

environment
planning
government

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

'04 JUL 15 P12:02

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

HRD04-1468

June 13, 2004

Joseph W. Alueta, Staff Planner
for Michael W. Foley, Planning Director
County of Maui
Department of Planning
250 South High Street
Wailuku, HI 96793

Subject: Special Management Area (SMA) Permit Application, SM1 2004/0013, Elderly Housing Project, Hale Mahaolu, TMK: (2) 2-2-02: Parcel 73

Dear Mr. Alueta:

Thank for your letter dated June 25, 2004 regarding the Special Management Area (SMA) Permit Application, Special Management Area (SMA) Permit Application, SM1 2004/0013, Elderly Housing Project, Hale Mahaolu, TMK: (2) 2-2-02: Parcel 73. Your letter requests that the Office of Hawaiian Affairs (OHA) review and comment on the proposed project.

Project Scope

The project description notes, "Hale Mahaolu proposes to develop an affordable elderly housing facility, to include 112 one-bedroom housing units, a three-bedroom manager's unit, a Senior Center/Community Building, an Adult Day Care Center, and an Adult Residential Care Home."

The SMA Use Permit Application indicates a portion of the proposed property is used by the County of Maui as a community recycling drop-off station. A large percentage of the property appears to be undeveloped.

Flora and Fauna

The SMA Use Permit application indicates there do not appear to be rare, threatened or endangered species in the proposed project area.

Archaeological Sites

The SMA permit application indicates an extensive archaeological inventory was completed in 1990, which included the subject parcel (TMK: (2) 2-2-02: Parcel 73) and two (2) properties north of the subject parcel (TMK: (2) 2-2-02: Parcel 42 and TMK: (2) 2-2-02: Parcel 72[1]) and identified multiple sites. The survey found one site (#2524) on the subject property. A 1982 survey completed for the subject property by the Environmental Impact Statement Corporation (EISC) noted that previous archaeological sites had been identified. However, the current archaeological survey noted that grubbing activities between 1982 and 1990 destroyed the majority of these archaeological sites, in addition to erosion and cattle grazing that occurred on the subject property.

It is still important to note (despite the impacts to the subject property) as the project proceeds, in accordance with Hawaii Revised Statutes (HRS), §6E-43.6 and Hawaii Administrative Rules (HAR), Title 13, Subtitle 13, Chapter 300, Rules of Practice and Procedure Relating to Burial Sites and Human Remains, if any significant cultural deposits or human burials are encountered on the site[2], work will cease in this particular area and the SHPD will be contacted.

If you have questions or concerns please contact Matthew Myers, Policy Advocate at 594-1945 or matthewm@oha.org.

'O wau iho nō,

Clyde W. Namu'o
Administrator

[1]The majority of archaeological sites identified appear to be located on TMK: (2) 2-2-02: Parcel 42 and TMK: (2) 2-2-02: Parcel 72 (not on the subject parcel).
[2]OHA staff notes that during the trenching, digging, grading, grubbing for the proposed Hale Mahaolu-Elderly Housing Project burials sitesmaybe found on (subsurface) portions of the parcel.

MUNEKIYO & HIRAGA, INC.

September 9, 2004

Mr. Clyde W. Namu'o, Director
State of Hawaii
Office of Hawaiian Affairs
711 Kapi'olani Boulevard, Suite 500
Honolulu, Hawaii 96813

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Mr. Namu'o:

We are in receipt of your comment letter dated June 13, 2004 regarding the above-mentioned project. On behalf of our client, Hale Mahaolu (HM), we would like to offer the following response.

The State Historic Preservation Division (SHPD) comment letter on the project noted that an approved archaeological inventory survey report was filed on the project and that *"Thus, we believe that 'no historic properties will be affected' by this undertaking."* Please see enclosed letter from SHPD. Should an archaeological cultural deposits or burials be encountered during construction, however, construction work will cease in the immediate area and contact will be made with the SHPD, in accordance with applicable rules and laws.

305 High Street, Suite 104 • Wailuku, Hawaii 96793 • ph: (808)244-2015 • fax: (808)244-8729 • planning@mhinconline.com
environment planning government

Should you have any further questions regarding this matter, please do not hesitate to call me at (808)244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
Enclosure
cc: Roy Katsuda and Robyne Nishida Nakao, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Alice Lee, Department of Housing and Human Concerns
Michael Foley, Department of Planning

hha\hmehiku\oha.deares

3A

LINDA LINGLE
GOVERNOR OF HAWAII

2004 AUG -2 P1 :22
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING, ROOM 555
601 KAMOKILA BOULEVARD
KAPOLEI, HAWAII 96707

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

HAWAI'I HISTORIC PRESERVATION DIVISION REVIEW

Log #: 2004.2348
Doc #: 0407CD59
Received: 7 July 2004

Applicant/Agency: Mr. Michael Foley, Planning Director
Address: County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Application for Special Management Area Use Permit for the Proposed Hale Mahaolu Ehiku Elderly Housing Project (Subject I.D.: SM12004/0013) [County/Planning]
Ahupua`a: Keokea
District, Island: Makawao, Maui
TMK: (2) 2-2-002:073

1. We believe there are no historic properties present, because:

_____ a) intensive cultivation has altered the land
_____ b) residential development/urbanization has altered the land
_____ c) previous grubbing/grading has altered the land
_____ d) an acceptable archaeological assessment or inventory survey found no historic properties
__✓__ e) other: PHRI conducted an archaeological inventory survey in 1989, which included the subject property. During the inventory survey, sixteen historic habitation and agricultural sites were identified, and only one site (Site 50-50-10-4503 --previously designated 2524 -- a rock pile) was located on the southern part of the subject property. This site, of undetermined function, was subsequently determined significant only for information content, with no further archaeological work recommended. (See SHPD DOC NO.: 0306CD22/LOG NO.: 2003.0831; SHPD DOC NO.: 0206CD02/LOG NO.: 30032)

2. This project has already gone through the historic preservation review process, and mitigation has been completed ___.

✓ Thus, we believe that "no historic properties will be affected" by this undertaking

In the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O'ahu.

Staff: Cathleen A. Dagher   Date: 28 July 2014

Cathleen A. Dagher
Assistant Maui/Lana'i Island Archaeologist
(808) 692-8023

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

August 4, 2004

Alice Lee
Department of Housing & Human Concerns
200 South High Street
Wailuku, HI 96793

Dear Ms. Lee:

Subject: Draft Environmental Assessment (EA), **Hale Mahaolu Ehiku Elderly Housing**

We have the following comments to offer:

Sustainable Building Design: Please consider applying sustainable building techniques presented in the "Guidelines for Sustainable Building Design in Hawaii." In the final EA include a description of any of the techniques you will implement. Contact our office for a paper copy or go to our homepage at *http://www.state.hi.us/health/oeqc/guidance/sustainable.htm.*

Paving: Hawaii Revised Statutes 103D-407 requires the use of recycled glass in paving materials whenever possible. Please consider this for the paved areas.

Landscaping: HRS 103D-408 requires the use of native Hawaiian flora whenever and wherever possible. For the text of the sections of HRS on paving and landscaping contact our office for a paper copy or go to our website at *http://www.state.hi.us/health/oeqc/guidance/index.html.*

Power outages: Will there be elevators and a backup generator for power outages? Some of the residents may be frail elderly who are unable to walk down steps to evacuate the building during emergencies.

Special management area: On one of the existing maps or on a new map in the final EA indicate the mauka boundaries of the special management area.

Income limits: In the final EA indicate the HUD income limits. Section I.B. *Proposed Improvements*, lists the Low-Income limit as $38,000 for a one-person household, while section

C, *Project Need*, lists $38,000 as the Very-Low Income level. For a one-person household $38,000 seems rather high to qualify for affordable housing.

If you have any questions, call Nancy Heinrich at 586-4185.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON
Director

c: Karlynn Kawahara, Munekiyo & Hiraga

MUNEKIYO & HIRAGA, INC.

September 8, 2004

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

SUBJECT: Draft Environmental Assessment for the Proposed Hale Mahaolu Ehiku Elderly Housing located at TMK (2) 2-2-02:073

Dear Ms. Salmonson:

Thank you for your letter dated August 4, 2004, providing us with your comments on the Draft Environmental Assessment prepared for the proposed project. On behalf of our client, Hale Mahaolu (HM), we would like to offer the following responses.

1. We note your comments with regards to inclusion of sustainable building techniques presented in the *"Guidelines for Sustainable Building Design in Hawaii."* The Final Environmental Assessment (FEA) will include a description of techniques that the project will consider.

2. We note your comment with regards to the use of recycled glass in paving materials and will consider its use, as applicable, to the project.

3. We note your comment with regards to the use of native Hawaiian flora whenever and wherever possible. The applicant is willing to consider the use of native Hawaiian plants, if feasible, and will forward your comments to the landscape architect for consideration.

4. We note your comment with regards to a backup generator for the elevators. A battery backup system will be included to provide emergency service for the elevator should any power outages occur. The backup system will allow the elevator to get to the ground floor and open the doors.

environment
planning

305 High Street, Suite 104 • Wailuku, Hawaii 96793 • ph: (808)244-2015 • fax: (808)244-8729 • planning@mhinconline.com

5. We note your comment with regards to a figure indicating the Special Management Area mauka boundary. A figure indicating such will be included in the FEA.

6. We note your comment with regards to the income limits. According to HUD, the Low-Income limit is $38,000.00 for a single person. The Very-Low Income limit should be $23,750.00 for a single person. The income limits will be corrected in the FEA.

Should you have any questions, please feel free to contact me at (808)244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto+Higuchi Architects
Russel Gushi, Russel Gushi Landscape Architect
Alice Lee, Department of Housing and Human Concerns
Michael Foley, Department of Planning

hha\hmehiku\oeqc.deares

ALAN M. ARAKAWA
MAYOR

OUR REFERENCE tj
YOUR REFERENCE

POLICE DEPARTMENT

COUNTY OF MAUI

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

'04 AUG -3 A10 :01

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

THOMAS M. PHILLIPS
CHIEF OF POLICE

KEKUHAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

July 30, 2004

MEMORANDUM

TO	:	MICHAEL W. FOLEY, PLANNING DIRECTOR		
FROM	:	THOMAS M. PHILLIPS, CHIEF OF POLICE		
SUBJECT	:	I.D.	:	SM1 2004/0013
		TMK	:	2-2-002: 073
		Project Name	:	Elderly Housing Project
		Applicant	:	Hale Mahaolu

____ No recommendation or comment to offer.

_x_ Refer to enclosed comments and/or recommendations.

Thank you for giving us the opportunity to comment on this project.

Acting Assistant Chief Glenn Miyahira
For: THOMAS M. PHILLIPS
Chief of Police

Enclosure

COPY

Valid concerns expressed by Off. Brown and should be taken into consideration.
Sgt. Alexander 7/30/04

TO	:	**THOMAS PHILLIPS, CHIEF OF POLICE**
VIA	:	**CHANNELS**
FROM	:	**ALAN BROWN, P.O. III, DISTRICT VI**
SUBJECT	:	**SMA PERMIT FOR "HALE MAHAOLU EHIKU"**

This officer has reviewed the Application for Special Management Area use permit approval for "Hale Mahaolu Ehiku" elderly housing project. Based upon this review, this officer makes the following comment.

IMPACTS:

Impacts to Police, Fire and Health Care are mentioned to not adversely affect the service capabilities of these entities. Singularly the project probably would not cause an noticeable effect on services. But when added to the other projects that have already gained approval or are awaiting approval within the Maalaea, Kihei, Wailea and Makena areas these would greatly effect the capabilities of Police, Fire and Emergency Medical Services.

TRAFFIC:

Upon reviewing the Traffic Impact Study that was submitted for this project it appears that the information is out dated. The report is dated 11/08/02 and refers to State of Hawaii traffic counts that were conducted in April and May of 2001, three years ago. It would be safe to assume that those numbers have changed since then. It also refers to the restriping of Piilani Hwy from two lanes to four lanes at a future act yet to take place. .

The applicant states that the "proposed project would have a minor impact to traffic conditions along Welakahao Rd. and in Kihei". Again singularly the project would probably have a negligible effect on the traffic. But with the other projects in the area already approved or pending approval, such as the north-south collector road, traffic will be significantly affected until further roadway improvements are made.

OTHER CONCERNS:

I would just like to reiterate Ofc. B. HICKLE's earlier comments (submitted on 05/28/03) regarding the close proximity to the County Waste Water Reclamation Center. In the event of a accidental chlorine spill at that location the evacuation zone would be 300' in every direction and 1.5 miles downwind. There is the possibility that this could be a risk to residents and employees of the project along with emergency services personnel.

Alan BROWN E-1505
070604 @ 0905

CONCUR WITH OFFICER BROWN.
IMPACT ON POLICE SERVICE WOULD
INCREASE, TRAFFIC STUDY NEEDS
TO BE UPDATED AND MOST IMP-
ORTANT THE ADVERSE EFFECTS ON
THE ELDERLY SHOULD A CRI-
TICAL INCIDENT OCCUR AT
THE SEWAGE TREATMENT PLANT.
SHOULD BE SERIOUSLY CONSIDERED.

-1642

MUNEKIYO & HIRAGA, INC.

September 9, 2004

Chief Thomas Phillips
Maui Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Chief Phillips:

Thank you for your comments dated July 30, 2004, regarding the proposed Hale Mahaolu Ehiku Affordable Elderly Housing project. On behalf of our client, Hale Mahaolu, we would like to offer the following responses to your concerns.

1. Cumulative impacts of projects in the Kihei-Makena region, particularly with respect to emergency services, is a recognized concern of Hale Mahaolu as well. A primary objective of each Hale Mahaolu facility is to ensure the safety and well-being of its elderly residents. While regional issues can be better addressed through a coordinated forum such as the Kihei Community Association, Hale Mahaolu is willing to work with emergency services providers to ensure that the project's design and operations will allow emergency services providers to respond in an efficient and timely manner.

2. We note your comments with regards to the traffic study. We have asked the traffic engineer to review the latest plans for the project and update the traffic study accordingly. Any updates to the traffic study will be included in the Final Environmental Assessment. Further, based on their past experience at other Hale Mahaolu sites, we note that the Ehiku project will be a hundred percent (100%) affordable elderly housing, which has a minimal traffic generation. Your comments have been forwarded to the traffic engineer recommending that the community police officer be contacted to address these concerns.

3. We note your comments with regards to the Kihei Wastewater Reclamation Facility (KWRF). We note that in our response to Officer Hinkle's comments, we stated the

various precautionary measures that the Department of Public Works and Environmental Management (DPWEM) has in place to insure security and safety with the chlorine used at the KWRF. Please see enclosed response letter.

Should you have any further comments or questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawhara, Planner

KK:yp
Enclosure
cc: Roy Katsuda and Robyne Nishida Nakao, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Alice Lee, Department of Housing and Human Concerns
Michael W. Foley, Department of Planning
hha\hmehiku\mpd.deares

MUNEKIYO & HIRAGA, INC.

April 12, 2004

Police Chief Tom Phillips
Maui Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Hale Mahaolu Ehiku Elderly Housing Project

Dear Chief Phillips:

Thank you for your letter dated June 4, 2003, providing us with your comments on the proposed project. Our client, Hale Mahaolu (HM), understands your department's concern for the future residents of this proposed independent living facility.

We contacted the Kihei Wastewater Treatment facility to inquire about the handling of chlorine used at their facility. It is our understanding that there are safety measures in place to control the chlorine. The product is mixed with water and is in liquid form, as opposed to gaseous. The chlorine is handled in one building and there is an automatic scrubber system in place that automatically neutralizes the air before it leaves the building. HM appreciates and is satisfied with the safeguards put in place by the County. HM recognizes that the safety of their clients is important.

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp
cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto+Higuchi Architects, Inc.
hha\hmehiku\mpd.reslir

environment
planning

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

ALAN M. ARAKAWA
Mayor

GEORGE Y. TENGAN
Director

JEFFREY T. PEARSON, P.E
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 South High Street
WAILUKU, MAUI, HAWAII 96793-2155
Telephone (808) 270-7816 • Fax (808) 270-7833
www.mauiwater.org

July 16, 2004

Mr. Joseph W. Alueta
Department of Planning
County of Maui
250 South High Street
Wailuku HI 96793

Re: I.D.: SM1 2004/0013
TMK: 2-2-02:073
Project Name: Elderly Housing Project

Dear Mr. Alueta

Thank you for the opportunity to comment on this application. We provide the following information:

Source Availability and Consumption
The project area is served by the Central Maui System. The main sources of water for this system are the designated lao aquifer, the Waihee aquifer, the lao tunnel and the lao-Waikapu Ditch. The Department does not guarantee that water will be available for this project. Water availability is determined at the time of meter application.

The applicant's water use estimate of 69,740 gpd is comparable to estimated use based on system standards of 64,700 gpd, excluding irrigation to be provided by reclaimed sources. Domestic and irrigation calculations will be required in the building permit process.

System Infrastructure
As stated by the applicant, service to the project site will need to be constructed from the 12-inch waterline in Kupuna Street South of the parcel. Easements must be provided for the Department 18-inch and 30-inch water lines situated in the future North-South collector road. The applicant will be required to provide for adequate fire protection in accordance with system standards. Fire flow calculations, prepared, signed and stamped by a certified engineer or architect, will be required in the building permit process. The approved fire flow calculation methods for use include Guidance for Determination of Fire Flow- Insurance Service Office, 1974 and Fire Flow- Hawaii Insurance Bureau, 1991 The applicant should contact our engineering division with regards to system improvements at: 270-7835.

Conservation
We recommend that the following water conservation measures be considered in project design and implementation:
Use Non-potable Water: Reclaimed water, readily available along the West end of the project site, should be used for dust control during construction.
Eliminate Single-Pass Cooling: Single-pass, water-cooled systems should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some

models of air conditioners, freezers, and commercial refrigerators.
Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip".
Use Climate-adapted Plants: The project is located in the "Maui County Planting Plan" - Plant Zone 3. Native plants adapted to the area conserve water and protect the watershed from degradation due to invasive alien species. The brochure "Saving Water In The Yard - What and How to Plant In Your Area" is attached for your reference.

Pollution Prevention
The project overlies the Kamaole aquifer. In order to protect ground and surface water sources in the area, we encourage the applicant to utilize Best Management Practices (BMPs) designed to minimize infiltration and runoff from construction. We have attached sample BMPs for reference. Additional mitigation measures are enumerated below and should be implemented during construction.

- Prevent cement products, oil, fuel and other toxic substances from falling or leaching into the water
- Properly and promptly dispose of all loosened and excavated soil and debris material from drainage structure work
- Retain ground cover until the last possible date
- Stabilize denuded areas by sodding or planting as soon as possible. Replanting should include soil I amendments, fertilizers and temporary irrigation. Use high seeding rates to ensure rapid stand establishment
- Avoid fertilizers and biocides, or apply only during periods of low rainfall to minimize chemical run-off.
- Keep run-off on site
- Construct drainage control features, such as berms
- Maintain drainage structures, detention, silting and debris basins
- Control dust by proper stockpiling and use non-potable water for dust control
- Cover open vehicles carrying soils, gravel or other particulate matter.

Should you have any questions, please contact our Water Resources and Planning Division at 270-7199.

Sincerely,

George Y. Tengan
Director
emb

c: engineering division
applicant, with attachments:

The Costly Drip
Ordinance No. 2108 - A Bill for an Ordinance Amending Chapter 16.20 of the Maui County Code, Pertaining to the Plumbing Code
Maui County Planting Plan-Plant Zone 3-Saving Water in the Yard-What and How to Plant in your Area
Selected BMP's from "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters"-EPA

C:\WPdocs\Permcomm\Elderly Housing Project SM1.wpd

ORDINANCE NO. 2108

BILL NO. 6 (1992)

Draft 1

A BILL FOR AN ORDINANCE AMENDING CHAPTER 16.20 OF THE MAUI COUNTY CODE, PERTAINING TO THE PLUMBING CODE

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Title 16 of the Maui County Code is amended by adding a new section to Chapter 10 of the Uniform Plumbing Code to be designated and to read as follows:

"**16.20.675 Section 1050 added.** Chapter 10 of the Uniform Plumbing Code is amended by adding a new section, pertaining to low-flow water fixtures and devices, to be designated and to read as follows:

Sec. 1050 Low-flow water fixtures and devices. (a) This section establishes maximum rates of water flow or discharge for plumbing fixtures and devices in order to promote water conservation.

(b) For the plumbing fixtures and devices covered in this section, manufacturers or their local distributors shall provide proof of compliance with the performance requirements established by the American National Standards Institute (ANSI) and such other proof as may be required by the director of public works. There shall be no charge for this registration process.

(c) Effective December 31, 1992, only plumbing fixtures and devices specified in this section shall be offered for sale or installed in the County of Maui, unless otherwise indicated in this section. All plumbing fixtures and devices which were installed before December 31, 1992, shall be allowed to be used, repaired or replaced after December 31, 1992.

(1) Faucets (kitchen): All kitchen and bar sink faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two-tenths gallons per minute at sixty pounds per square inch of water pressure.

(2) Faucets (lavatory): All lavatory faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two tenths gallons per minute at sixty pounds per square inch of water

pressure.

(3) Faucets (public rest rooms): In addition to the lavatory requirements set forth in paragraph (2), lavatory faucets located in rest rooms intended for use by the general public shall be of the metering or self-closing types.

(4) Hose bibbs: Water supply faucets or valves shall be provided with approved flow control devices which limit flow to a maximum three gallons per minute.

EXCEPTIONS: (A) Hose bibbs or valves not used for fixtures or equipment designated by the director of public works.

(B) Hose bibbs, faucets, or valves serving fixed demand, timing, or water level control appliances, and equipment or holding structures such as water closets, pools, automatic washers, and other similar equipment.

(5) Showerheads: Showerheads, except where provided for safety or emergency reasons, shall be designed, manufactured, or installed with a flow limitation device which will prevent a water flow rate in excess of two and one-half gallons per minute at eighty pounds per square inch of water pressure. The flow limitation device must be a permanent and integral part of the showerhead and must not be removable to allow flow rates in excess of two and one-half gallons per minute or must be mechanically retained requiring force in excess of eight pounds to remove.

(6) Urinals: Urinals shall be designed, manufactured, or installed so that the maximum flush will not exceed one gallon of water. Adjustable type flushometer valves may be used provided they are adjusted so the maximum flush will not exceed one and six tenths gallons of water.

(7) Water closets (toilets): Water closets shall be designed, manufactured, or installed so that the maximum flush will not exceed one and six tenths gallons of water.

(d) Beginning December 31, 1992, it is unlawful to sell or install any plumbing fixtures or devices not specified in this section, except as permitted under this section.

(e) The director of public works may exempt the use of low-flow water fixtures and devices if there is a finding that the use of such fixtures and devices would not be consistent with accepted engineering practices and would be detrimental to the public health, safety and welfare.

(f) Any person violating this section shall be fined $250 for each violation and shall correct all instances of non-compliance for which a citation is issued. Violation of this section shall constitute a violation as defined in section 701-107 Hawaii Revised Statutes and shall be enforceable by employees of the department of public works. The foregoing fine may also be imposed in a civil, administrative proceeding pursuant to Rules and Regulations adopted by the department of public works in accordance with chapter 91 Hawaii Revised Statutes."

SECTION 2. New material is underscored. In printing this bill, the County Clerk need not include the underscoring.

SECTION 3. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:

HOWARD M. FUKUSHIMA
Deputy Corporation Counsel
County of Maui
c:\wp51\ords\flows4\pk

WE HEREBY CERTIFY that the foregoing BILL NO. 6 (19 92), Draft 1

1. Passed FINAL READING at the meeting of the Council of the County of Maui, State of Hawaii, held on the 1st day of May, 1992, by the following votes:

Howard S. KIHUNE Chair	Patrick S. KAWANO Vice-Chair	Vince G. BAGOYO, Jr.	Goro HOKAMA	Alice L. LEE	Ricardo MEDINA	Wayne K. NISHIKI	Joe S. TANAKA	Leinaala TERUYA DRUMMOND
Aye	Aye	Excused	Excused	Aye	Aye	Aye	Aye	Aye

2. Was transmitted to the Mayor of the County of Maui, State of Hawaii, on the 1st day of May, 1992.

DATED AT WAILUKU, MAUI, HAWAII, this 1st day of May, 1992.

HOWARD S. KIHUNE, CHAIR
Council of the County of Maui

DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

THE FOREGOING BILL IS HEREBY APPROVED THIS 5th DAY OF MAY, 1992.

LINDA CROCKETT LINGLE, MAYOR
County of Maui

I HEREBY CERTIFY that upon approval of the foregoing BILL by the Mayor of the County of Maui, the said BILL was designated as ORDINANCE NO. 2108 of the County of Maui, State of Hawaii.

DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

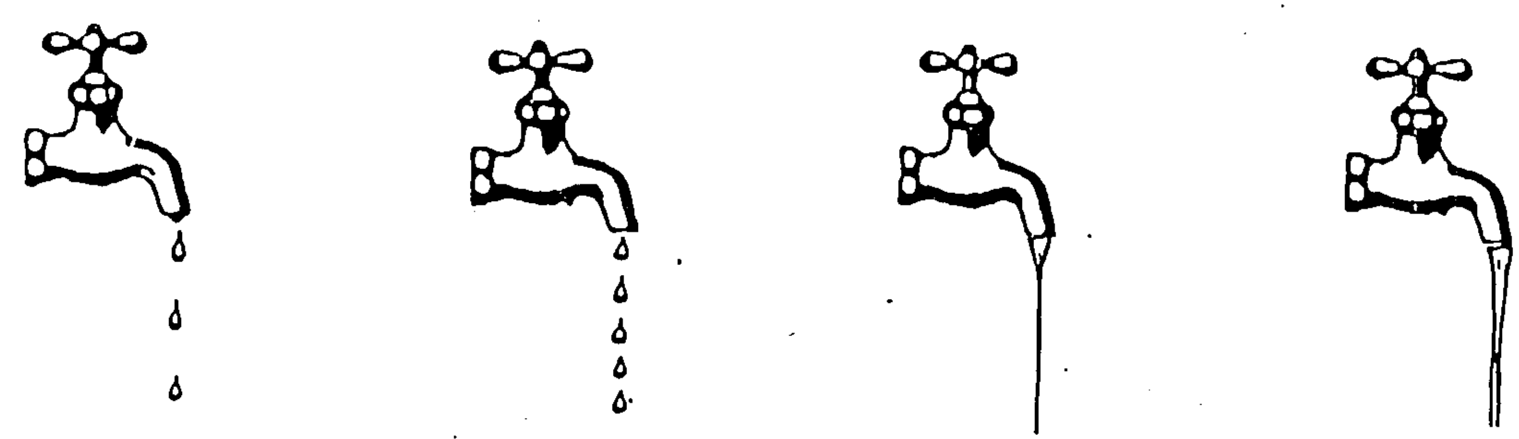
Passed First Reading on January 17, 1992.
Effective date of Ordinance May 5, 1992.

I HEREBY CERTIFY that the foregoing is a true and correct copy of Ordinance No. 2108, the original of which is on file in the Office of the County Clerk, County of Maui, State of Hawaii.

Dated at Wailuku, Hawaii, on

County Clerk, County of Maui

"THE COSTLY DRIP"



Slowly Dripping Spigot Wastes 15 Gallons a day.	1/32" Leak Wastes 25 Gallons a day.	1/16" Stream Wastes 100 Gallons a Day.	1/8" Stream Wastes 400 Gallons a day.

United States
Environmental Protection
Agency

Office of Water
Washington, DC 20460

840-B-92-002
January 1993

EPA

Guidance Specifying Management Measures For Sources Of Nonpoint Pollution In Coastal Waters

Issued Under the Authority of
Section 6217(g) of the Coastal Zone Act
Reauthorization Amendments of 1990

III. CONSTRUCTION ACTIVITIES

A. Construction Site Erosion and Sediment Control Management Measure

(1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, and

(2) Prior to land disturbance, prepare and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

1. Applicability

This management measure is intended to be applied by States to all construction activities on sites less than 5 acres in areas that do not have an NPDES permit[1] in order to control erosion and sediment loss from those sites. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The goal of this management measure is to reduce the sediment loadings from construction sites in coastal areas that enter surface waterbodies. This measure requires that coastal States establish new or enhance existing State erosion and sediment control (ESC) programs and/or require ESC programs at the local level. It is intended to be part of a comprehensive land use or watershed management program, as previously detailed in the Watershed and Site Development Management Measures. It is expected that State and local programs will establish criteria determined by local conditions (e.g., soil types, climate, meteorology) that reduce erosion and sediment transport from construction sites.

Runoff from construction sites is by far the largest source of sediment in urban areas under development (York County Soil and Water Conservation District, 1990). Soil erosion removes over 90 percent of sediment by tonnage in urbanizing areas where most construction activities occur (Canning, 1988). Table 4-14 illustrates some of the

[1] On May 27, 1992, the United States Court of Appeals for the Ninth Circuit invalidated EPA's exemption of construction sites smaller than 5 acres from the storm water permit program in *Natural Resources Defense Council v. EPA*, 965 F.2d 759 (9th Cir. 1992). EPA is conducting further rulemaking proceedings on this issue and will not require permit applications for construction activities under 5 acres until further rulemaking has been completed.

measured sediment loading rates associated with construction activities found across the United States. As seen in Table 4-14, erosion rates from natural areas such as undisturbed forested lands are typically less than one ton/acre/year, while erosion from construction sites ranges from 7.2 to over 1,000 tons/acre/year.

Table 4-14. Erosion and Sediment Problems Associated With Construction

Location	Problem	Reference
United States	Sediment loading rates vary from 36.5 to 1,000 ton/ac/yr. These are 5 to 500 times greater than those from undeveloped land. Approximately 600 million tons of soil erodes from developed sites each year. Construction site sediment in runoff can be 10 to 20 times greater than that from agricultural lands.	York County Soil and Water Conservation District, 1990
Franklin County, FL	*Sediment yield (ton/ac/yr):* forest < 0.5; rangeland < 0.5; tilled 1.4; construction site 30; established urban < 0.5	Franklin County, FL
Wisconsin	Erosion rates range from 30 to 200 ton/ac/yr (10 to 20 times those of cropland).	Wisconsin Legislative Council, 1991
Washington, DC	Erosion rates range from 35 to 45 ton/ac/yr (10 to 100 times greater than agriculture and stabilized urban land uses).	MWCOG, 1987
Anacostia River Basin, VA, MD, DC	Sediment yields from portions of the Anacostia Basin have been estimated at 75,000 to 132,000 ton/yr.	U.S. Army Corps of Engineers, 1990
Washington	Erosion rates range from 50 to 500 ton/ac/yr. Natural erosion rates from forests or well-sodded prairies are 0.01 to 1.0 ton/ac/yr.	Washington Department of Ecology, 1989
Anacostia River Basin, VA, MD, DC	Erosion rates range from 7.2 to 100.8 ton/ac/yr.	USGS, 1978
Alabama	1.4 million tons eroded per year.	Woodward-Clyde, 1991
North Carolina	6.7 million tons eroded per year.	
Louisiana	5.1 million tons eroded per year.	
Oklahoma	4.2 million tons eroded per year.	
Georgia	3.8 million tons eroded per year.	
Texas	3.5 million tons eroded per year.	
Tennessee	3.3 million tons eroded per year.	
Pennsylvania	3.1 million tons eroded per year.	
Ohio	3.0 million tons eroded per year.	
Kentucky	3.0 million tons eroded per year.	

Eroded sediment from construction sites creates many problems in coastal areas including adverse impacts on water quality, critical habitats, submerged aquatic vegetation (SAV) beds, recreational activities, and navigation (APWA, 1991). For example, the Miami River in Florida has been severely affected by pollution associated with upland erosion. This watershed has undergone extensive urbanization, which has included the construction of many commercial and residential buildings over the past 50 years. Sediment deposited in the Miami River channel contributes to the severe water quality and navigation problems of this once-thriving waterway, as well as Biscayne Bay (SFWMD, 1988).

ESC plans are important for controlling the adverse impacts of construction and land development and have been required by many State and local governments, as shown in Table 4-13 (in the Site Development section of this chapter). An ESC plan is a document that explains and illustrates the measures to be taken to control erosion and sediment problems on construction sites (Connecticut Council on Soil and Water Conservation, 1988). It is intended that existing State and local erosion and sediment control plans may be used to fulfill the requirements of this management measure. Where existing ESC plans do not meet the management measure criteria, inadequate plans may be enhanced to meet the management measure guidelines.

Typically, an ESC plan is part of a larger site plan and includes the following elements:

- Description of predominant soil types;
- Details of site grading including existing and proposed contours;
- Design details and locations for structural controls;
- Provisions to preserve topsoil and limit disturbance;
- Details of temporary and permanent stabilization measures; and
- Description of the sequence of construction.

ESC plans ensure that provisions for control measures are incorporated into the site planning stage of development and provide for the reduction of erosion and sediment problems and accountability if a problem occurs (York County Soil and Water Conservation District, 1990). An effective plan for urban runoff management on construction sites will control erosion, retain sediments on site, to the extent practicable, and reduce the adverse effects of runoff. Climate, topography, soils, drainage patterns, and vegetation will affect how erosion and sediment should be controlled on a site (Washington State Department of Ecology, 1989). An effective ESC plan includes both structural and nonstructural controls. Nonstructural controls address erosion control by decreasing erosion potential, whereas structural controls are both preventive and mitigative because they control both erosion and sediment movement.

Typical nonstructural erosion controls include (APWA, 1991; York County Soil and Water Conservation District, 1990):

- Planning and designing the development within the natural constraints of the site;
- Minimizing the area of bare soil exposed at one time (phased grading);
- Providing for stream crossing areas for natural and man-made areas; and
- Stabilizing cut-and-fill slopes caused by construction activities.

Structural controls include:

- Perimeter controls;
- Mulching and seeding exposed areas;
- Sediment basins and traps; and
- Filter fabric, or silt fences.

Some erosion and soil loss are unavoidable during land-disturbing activities. While proper siting and design will help prevent areas prone to erosion from being developed, construction activities will invariably produce conditions where erosion may occur. To reduce the adverse impacts associated with construction, the construction management measure suggests a system of nonstructural and structural erosion and sediment controls for incorporation into an

ESC plan. Erosion controls have distinct advantages over sediment controls. Erosion controls reduce the amount of sediment transported off-site, thereby reducing the need for sediment controls. When erosion controls are used in conjunction with sediment controls, the size of the sediment control structures and associated maintenance may be reduced, decreasing the overall treatment costs (SWRPC, 1991).

3. Management Measure Selection

This management measure was selected to minimize sediment being transported outside the perimeter of a construction site through two broad performance goals: (1) reduce erosion and (2) retain sediment onsite, to the extent practicable. These performance goals were chosen to allow States and local governments flexibility in specifying practices appropriate for local conditions.

While several commentors responding to the draft (May 1991) guidance expressed the need to define "more measurable, enforceable ways" to control sediment loadings, other commentors stressed the need to draft management measures that do not conflict with existing State programs and allow States and local governments to determine appropriate practices and design standards for their communities. These management measures were selected because virtually all coastal States control construction activities to prevent erosion and sediment loss.

The measures were specifically written for the following reasons:

(1) Predevelopment loadings may vary greatly, and some sediment loss is usually inevitable;

(2) Current practice is built on the use of systems of practices selected based on site-specific conditions; and

(3) The combined effectiveness of erosion and sediment controls in systems is not easily quantified.

4. Erosion Control Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Erosion controls are used to reduce the amount of sediment that is detached during construction and to prevent sediment from entering runoff. Erosion control is based on two main concepts: (1) disturb the smallest area of land possible for the shortest period of time, and (2) stabilize disturbed soils to prevent erosion from occurring.

■ a. *Schedule projects so clearing and grading are done during the time of minimum erosion potential.*

Often a project can be scheduled during the time of year that the erosion potential of the site is relatively low. In many parts of the country, there is a certain period of the year when erosion potential is relatively low and construction scheduling could be very effective. For example, in the Pacific region if construction can be completed during the 6-month dry season (May 1 - October 31), temporary erosion and sediment controls may not be needed. In addition, in some parts of the country erosion potential is very high during certain parts of the year such as the spring thaw in northern areas. During this time of year, melting snowfall generates a constant runoff that can erode soil. In addition, construction vehicles can easily turn the soft, wet ground into mud, which is more easily washed offsite. Therefore, in the north, limitations should be placed on grading during the spring thaw (Goldman et al., 1986).

b. *Stage construction.*

Avoid areawide clearance of construction sites. Plan and stage land disturbance activities so that only the area currently under construction is exposed. As soon as the grading and construction in an area are complete, the area should be stabilized.

By clearing only those areas immediately essential for completing site construction, buffer zones are preserved and soil remains undisturbed until construction begins. Physical markers, such as tape, signs, or barriers, indicating the limits of land disturbance, can ensure that equipment operators know the proposed limits of clearing. The area of the watershed that is exposed to construction is important for determining the net amount of erosion. Reducing the extent of the disturbed area will ultimately reduce sediment loads to surface waters. Existing or newly planted vegetation that has been planted to stabilize disturbed areas should be protected by routing construction traffic around and protecting natural vegetation with fencing, tree armoring, retaining walls, or tree wells.

c. *Clear only areas essential for construction.*

Often areas of a construction site are unnecessarily cleared. Only those areas essential for completing construction activities should be cleared, and other areas should remain undisturbed. Additionally, the proposed limits of land disturbance should be physically marked off to ensure that only the required land area is cleared. Avoid disturbing vegetation on steep slopes or other critical areas.

d. *Locate potential nonpoint pollutant sources away from steep slopes, waterbodies, and critical areas.*

Material stockpiles, borrow areas, access roads, and other land-disturbing activities can often be located away from critical areas such as steep slopes, highly erodible soils, and areas that drain directly into sensitive waterbodies.

e. *Route construction traffic to avoid existing or newly planted vegetation.*

Where possible, construction traffic should travel over areas that must be disturbed for other construction activity. This practice will reduce the area that is cleared and susceptible to erosion.

f. *Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells.*

Tree armoring protects tree trunks from being damaged by construction equipment. Fencing can also protect tree trunks, but should be placed at the tree's drip line so that construction equipment is kept away from the tree. The tree drip line is the minimum area around a tree in which the tree's root system should not be disturbed by cut, fill, or soil compaction caused by heavy equipment. When cutting or filling must be done near a tree, a retaining wall or tree well should be used to minimize the cutting of the tree's roots or the quantity of fill placed over the tree's roots.

g. *Stockpile topsoil and reapply to revegetate site.*

Because of the high organic content of topsoil, it cannot be used as fill material or under pavement. After a site is cleared, the topsoil is typically removed. Since topsoil is essential to establish new vegetation, it should be stockpiled and then reapplied to the site for revegetation, if appropriate. Although topsoil salvaged from the existing site can often be used, it must meet certain standards and topsoil may need to be imported onto the site if the existing topsoil is not adequate for establishing new vegetation.

h. Cover or stabilize topsoil stockpiles.

Unprotected stockpiles are very prone to erosion and therefore stockpiles must be protected. Small stockpiles can be covered with a tarp to prevent erosion. Large stockpiles should be stabilized by erosion blankets, seeding, and/or mulching.

i. Use wind erosion controls.

Wind erosion controls limit the movement of dust from disturbed soil surfaces and include many different practices. Wind barriers block air currents and are effective in controlling soil blowing. Many different materials can be used as wind barriers, including solid board fence, snow fences, and bales of hay. Sprinkling moistens the soil surface with water and must be repeated as needed to be effective for preventing wind erosion (Delaware DNREC, 1989); however, applications must be monitored to prevent excessive runoff and erosion.

j. Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain.

Earth dikes, perimeter dikes or swales, or diversions can be used to intercept and convey runoff above disturbed areas. An earth dike is a temporary berm or ridge of compacted soil that channels water to a desired location. A perimeter dike/swale or diversion is a swale with a supporting ridge on the lower side that is constructed from the soil excavated from the adjoining swale (Delaware DNREC, 1989). These practices should be used to intercept flow from denuded areas or newly seeded areas to keep the disturbed areas from being eroded from the uphill runoff. The structures should be stabilized within 14 days of installation. A pipe slope drain, also known as a pipe drop structure, is a temporary pipe placed from the top of a slope to the bottom of the slope to convey concentrated runoff down the slope without causing erosion (Delaware DNREC, 1989).

k. On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.

Benches, terraces, or ditches break up a slope by providing areas of low slope in the reverse direction. This keeps water from proceeding down the slope at increasing volume and velocity. Instead, the flow is directed to a suitable outlet, such as a sediment basin or trap. The frequency of benches, terraces, or ditches will depend on the erodibility of the soils, steepness and length of the slope, and rock outcrops. This practice should be used if there is a potential for erosion along the slope.

l. Use retaining walls.

Often retaining walls can be used to decrease the steepness of a slope. If the steepness of a slope is reduced, the runoff velocity is decreased and, therefore, the erosion potential is decreased.

m. Provide linings for urban runoff conveyance channels.

Often construction increases the velocity and volume of runoff, which causes erosion in newly constructed or existing urban runoff conveyance channels. If the runoff during or after construction will cause erosion in a channel, the channel should be lined or flow control BMPs installed. The first choice of lining should be grass or sod since this reduces runoff velocities and provides water quality benefits through filtration and infiltration. If the velocity in the channel would erode the grass or sod, then riprap, concrete, or gabions can be used.

n. Use check dams.

Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce the erosion in a swale or channel. Check dams should be used when a swale or channel will be used for a short time and therefore it is not feasible or practical to line the channel or implement flow control BMPs (Delaware DNREC, 1989).

o. *Seed and fertilize.*

Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once a dense vegetative cover has been established. However, often seeding and fertilizing do not produce as thick a vegetative cover as do seed and mulch or netting. Newly established vegetation does not have as extensive a root system as existing vegetation and therefore is more prone to erosion, especially on steep slopes. Care should be taken when fertilizing to avoid untimely or excessive application. Since the practice of seeding and fertilizing does not provide any protection during the time of vegetative establishment, it should be used only on favorable soils in very flat areas and not in sensitive areas.

p. *Use seeding and mulch/mats.*

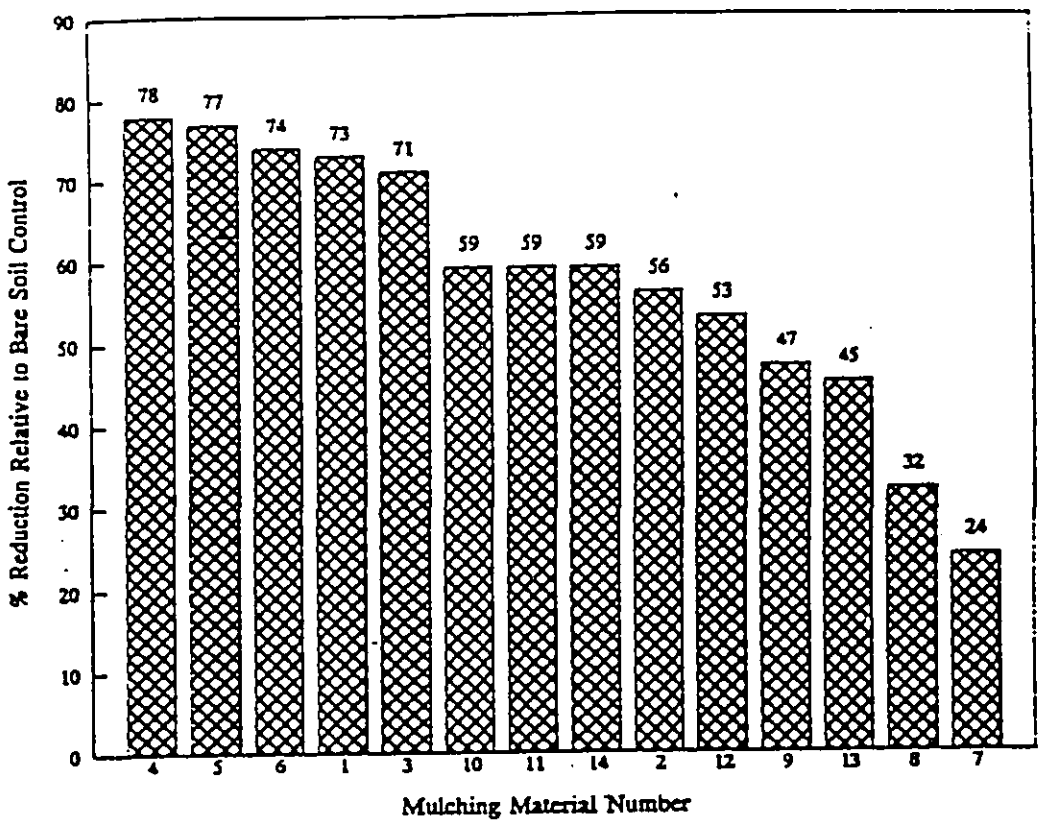
Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once the vegetative cover has been established. The mulching/mats protect the disturbed area while the vegetation becomes established.

The management of land by using ground cover reduces erosion by reducing the flow rate of runoff and the raindrop impact. Bare soils should be seeded or otherwise stabilized within 15 calendar days after final grading. Denuded areas that are inactive and will be exposed to rain for 30 days or more should also be temporarily stabilized, usually by planting seeds and establishing vegetation during favorable seasons in areas where vegetation can be established. In very flat, non-sensitive areas with favorable soils, stabilization may involve simply seeding and fertilizing. Mulching and/or sodding may be necessary as slopes become moderate to steep, as soils become more erosive, and as areas become more sensitive.

q. *Use mulch/mats.*

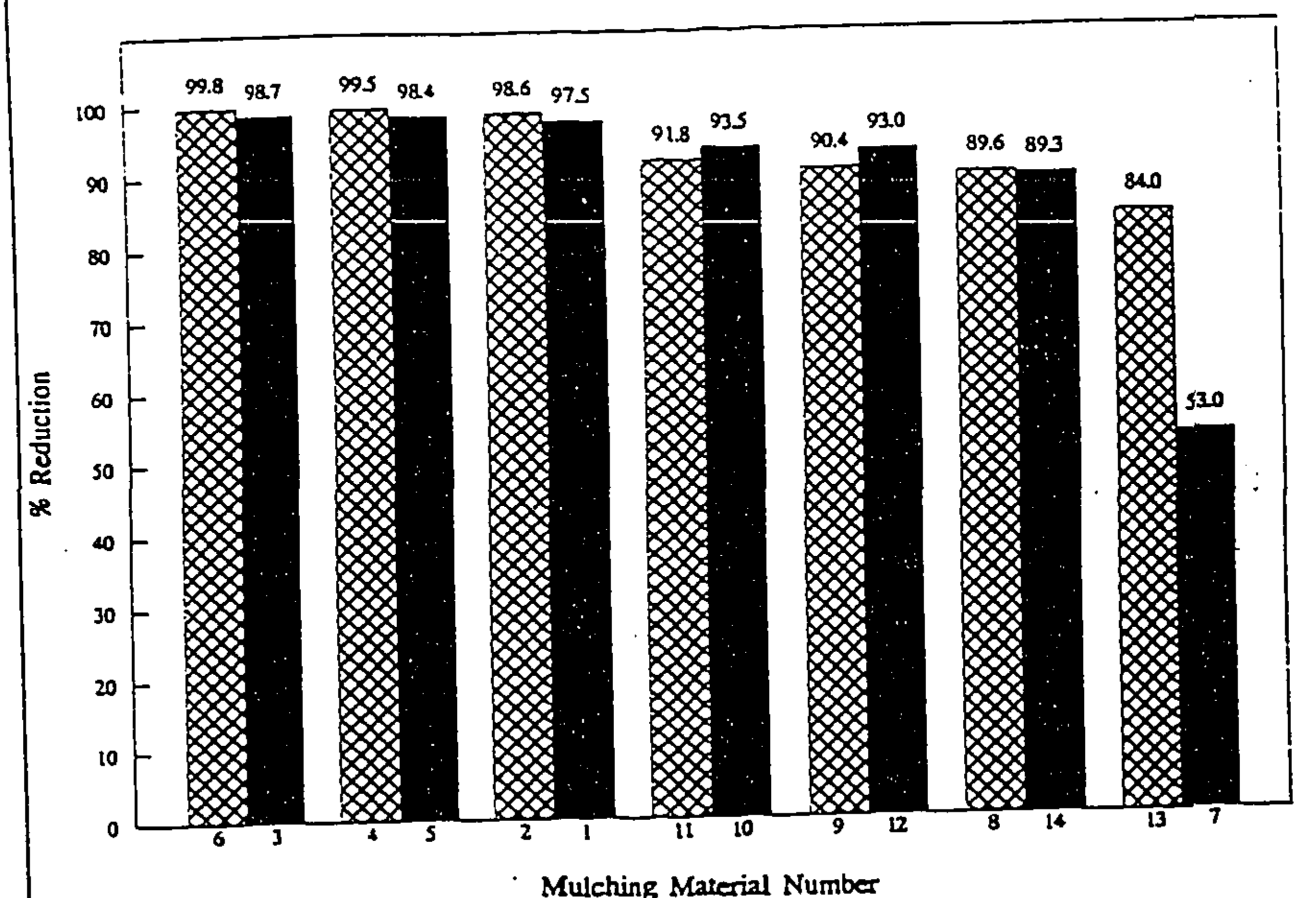
Mulching involves applying plant residues or other suitable materials on disturbed soil surfaces. Mulchs/mats used include tacked straw, wood chips, and jute netting and are often covered by blankets or netting. Mulching alone should be used only for temporary protection of the soil surface or when permanent seeding is not feasible. The useful life of mulch varies with the material used and the amount of precipitation, but is approximately 2 to 6 months. Figure 4-5 shows water velocity reductions that could be expected using various mulching techniques. Similarly, Figure 4-6 shows reductions in soil loss achievable using various mulching techniques. During times of year when vegetation cannot be established, soil mulching should be applied to moderate slopes and soils that are not highly erodible. On steep slopes or highly erodible soils, multiple mulching treatments should be used. On a high-elevation or desert site where grasses cannot survive the harsh environment, native shrubs may be planted. Interlocking ceramic materials, filter fabric, and netting are available for this purpose. Before stabilizing an area, it is important to have installed all sediment controls and diverted runoff away from the area to be planted. Runoff may be diverted away from denuded areas or newly planted areas using dikes, swales, or pipe slope drains to intercept runoff and convey it to a permanent channel or storm drain. Reserved topsoil may be used to revegetate a site if the stockpile has been covered and stabilized.

Consideration should be given to maintenance when designing mulching and matting schemes. Plastic nets are often used to cover the mulch or mats; however, they can foul lawn mower blades if the area requires mowing.



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw – 2,242 kg/ha
14	Uncrimped wheat straw – 4,484 kg/ha

Figure 4-5. Water velocity reductions for different mulch treatments (adapted from Harding, 1990).



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw – 2,242 kg/ha
14	Uncrimped wheat straw – 4,484 kg/ha

Figure 4-6. Actual soil loss reductions for different mulch treatments (adapted from Harding, 1990).

r. Use sodding.

Sodding permanently stabilizes an area. Sodding provides immediate stabilization of an area and should be used in critical areas or where establishment of permanent vegetation by seeding and mulching would be difficult. Sodding is also a preferred option when there is a high erosion potential during the period of vegetative establishment from seeding.

s. Use wildflower cover.

Because of the hardy drought-resistant nature of wildflowers, they may be more beneficial as an erosion control practice than turf grass. While not as dense as turfgrass, wildflower thatches and associated grasses are expected to be as effective in erosion control and contaminant absorption. Because thatches of wildflowers do not need fertilizers, pesticides, or herbicides, and watering is minimal, implementation of this practice may result in a cost savings (Brash et al., undated). In 1987, Howard County, Maryland, spent $690.00 per acre to maintain turfgrass areas, compared to only $31.00 per acre for wildflower meadows (Wilson, 1990).

A wildflower stand requires several years to become established; maintenance requirements are minimal once the area is established (Brash et al., undated).

5. Sediment Control Practices[4]

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Sediment controls capture sediment that is transported in runoff. Filtration and detention (gravitational settling) are the main processes used to remove sediment from urban runoff.

a. Sediment Basins

Sediment basins, also known as silt basins, are engineered impoundment structures that allow sediment to settle out of the urban runoff. They are installed prior to full-scale grading and remain in place until the disturbed portions of the drainage area are fully stabilized. They are generally located at the low point of sites, away from construction traffic, where they will be able to trap sediment-laden runoff.

Sediment basins are typically used for drainage areas between 5 and 100 acres. They can be classified as either temporary or permanent structures, depending on the length of service of the structure. If they are designed to function for less than 36 months, they are classified as "temporary"; otherwise, they are considered permanent structures. Temporary sediment basins can also be converted into permanent urban runoff management ponds. When sediment basins are designed as permanent structures, they must meet all standards for wet ponds.

b. Sediment Trap

Sediment traps are small impoundments that allow sediment to settle out of runoff water. Sediment traps are typically installed in a drainageway or other point of discharge from a disturbed area. Temporary diversions can be

[4] Adapted from Goldman (1986).

used to direct runoff to the sediment trap. Sediment traps should not be used for drainage areas greater than 5 acres and typically have a useful life of approximately 18 to 24 months.

c. *Filter Fabric Fence*

Filter fabric fence is available from many manufacturers and in several mesh sizes. Sediment is filtered out as urban runoff flows through the fabric. Such fences should be used only where there is sheet flow (i.e., no concentrated flow), and the maximum drainage area to the fence should be 0.5 acre or less per 100 feet of fence. Filter fabric fences have a useful life of approximately 6 to 12 months.

d. *Straw Bale Barrier*

A straw bale barrier is a row of anchored straw bales that detain and filter urban runoff. Straw bales are less effective than filter fabric, which can usually be used in place of straw bales. However, straw bales have been effectively used as temporary check dams in channels. As with filter fabric fences, straw bale barriers should be used only where there is sheet flow. The maximum drainage area to the barrier should be 0.25 acre or less per 100 feet of barrier. The useful life of straw bales is approximately 3 months.

e. *Inlet Protection*

Inlet protection consists of a barrier placed around a storm drain drop inlet, which traps sediment before it enters the storm sewer system. Filter fabric, straw bales, gravel, or sand bags are often used for inlet protection.

f. *Construction Entrance*

A construction entrance is a pad of gravel over filter cloth located where traffic leaves a construction site. As vehicles drive over the gravel, mud, and sediment are collected from the vehicles' wheels and offsite transport of sediment is reduced.

g. *Vegetated Filter Strips*

Vegetated filter strips are low-gradient vegetated areas that filter overland sheet flow. Runoff must be evenly distributed across the filter strip. Channelized flows decrease the effectiveness of filter strips. Level spreading devices are often used to distribute the runoff evenly across the strip (Dillaha et al., 1989).

Vegetated filter strips should have relatively low slopes and adequate length and should be planted with erosion-resistant plant species. The main factors that influence the removal efficiency are the vegetation type, soil infiltration rate, and flow depth and travel time. These factors are dependent on the contributing drainage area, slope of strip, degree and type of vegetative cover, and strip length. Maintenance requirements for vegetated filter strips include sediment removal and inspections to ensure that dense, vigorous vegetation is established and concentrated flows do not occur. Maintenance of these structures is discussed in Section II.A of this chapter.

6. Effectiveness and Cost Information

a. *Erosion Control Practices*

The effectiveness of erosion control practices can vary based on land slope, the size of the disturbed area, rainfall frequency and intensity, wind conditions, soil type, use of heavy machinery, length of time soils are exposed and unprotected, and other factors. In general, a system of erosion and sediment control practices can more effectively reduce offsite sediment transport than can a single system. Numerous nonstructural measures such as protecting natural or newly planted vegetation, minimizing the disturbance of vegetation on steep slopes and other highly erodible areas, maximizing the distance eroded material must travel before reaching the drainage system, and locating roads away from sensitive areas may be used to reduce erosion.

Table 4-15 contains the available cost and effectiveness data for some of the erosion controls listed above. Information on the effectiveness of individual nonstructural controls was not available. All reported effectiveness data assume that controls are properly designed, constructed, and maintained. Costs have been broken down into annual capital costs, annual maintenance costs, and total annual costs (including annualization of the capital costs).

b. Sediment Control Practices

Regular inspection and maintenance are needed for most erosion control practices to remain effective. The effectiveness of sediment controls will depend on the size of the construction site and the nature of the runoff flows. Sediment basins are most appropriate for drainage areas of 5 acres or greater. In smaller areas with concentrated flows, silt traps may suffice. Where concentrated flow leaves the site and the drainage area is less than 0.5 ac/100 ft of flow, filter fabric fences may be effective. In areas where sheet flow leaves the site and the drainage area is greater than 0.5 acre/100 ft of flow, perimeter dikes may be used to divert the flow to a sediment trap or sediment basin. Urban runoff inlets may be protected using straw bales or diversions to filter or route runoff away from the inlets.

Table 4-16 describes the general cost and effectiveness of some common sediment control practices.

c. Comparisons

Figure 4-7 illustrates the estimated TSS loading reductions from Maryland construction sites possible using a combination of erosion and sediment controls in contrast to using only sediment controls. Figure 4-8 shows a comparison of the cost and effectiveness of various erosion control practices. As can be seen in Figure 4-8, seeding or seeding and mulching provide the highest levels of control at the lowest cost.

Table 4-15. ESC Quantitative Effectiveness and Cost Summary

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sod	Immediate erosion protection where there is high erosion potential during vegetative establishment.	Average: 99% Observed range: 98% - 99% References: Minnesota Pollution Control Agency, 1989; Pennsylvania, 1983 cited in USEPA, 1991	2	Average: $0.2 per ft^2 [$11,300 per acre] Range: $0.1 - $1.1 References: SWRPC, 1991; Schueler, 1987; Virginia, 1980	Average: 5% Range: 5% Reference: SWRPC, 1991	$0.20 per ft^2 $7,500 per acre
Seed	Establish vegetation on disturbed area.	After vegetation established- Average: 90% Observed range: 50% - 100% References: SCS, 1985 cited in EPA, 1991; Minnesota Pollution Control Agency, 1989; Oberts, 1984 cited in City of Austin, 1988; Delaware Department of Natural Resources, 1989	2	Average: $400 per acre Range: $200 - $1000 per acre References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1980	Average: 20% Range: 15% - 25% References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991	$300 per acre
Seed and Mulch	Establish vegetation on disturbed area.	After vegetation established- Average: 90% Observed range: 50% - 100% References: SCS, 1985 cited in EPA, 1991; Minnesota Pollution Control Agency, 1989; Oberts, 1984 cited in City of Austin, 1988; Delaware Department of Natural Resources, 1989	2	Average: $1,500 per acre Range: $800 - $3,500 per acre References: Goldman, 1986; Washington DOT, 1990; NC State, 1990; Schueler, 1987; Virginia, 1980; SWRPC, 1991	Average: NA[b] Range: NA References: None	$1,100 per acre

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS			Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Mulch	Temporary stabilization of disturbed area.	Observed range:			Straw mulch: 0.25	Straw mulch: Average: $1,700 per acre Range: $500 - $5,000 per acre References: Wisconsin DOT cited in SWRPC, 1991; Washington DOT, 1990; Virginia, 1980	Average: NA[b] Range: NA References: None	Straw mulch: $7,500 per acre
		sand:						
			20% slope	50% slope				
		wood fiber @ 1500 lb/ac	50-60%	0-20%				
		wood fiber @ 3000 lb/ac	50-85%	50-70%				
		straw @ 3000 lb/ac	90-100%	95%				
		Silt-loam:			Wood fiber mulch: 0.33	Wood fiber mulch: Average: $1,000 per acre Range: $100 - $2,300 per acre References: Washington DOT, 1990; Virginia, 1980		Wood fiber mulch: $3,500 per acre
			20% slope	50% slope				
		wood fiber @ 1500 lb/ac	20-60%	40-60%				
		wood fiber @ 3000 lb/ac	60-90%	60-70%				
		straw @ 3000 lb/ac	80-95%	70-90%				
		Silt-clay-loam:			Jute netting: 0.33	Jute netting: Average: $3,700 per acre Range: $3,500-$4,100 per acre References: Washington DOT, 1990; Virginia, 1980		Jute netting: $12,500 per acre
			10-30% slope	30-50% slope				
		wood fiber @ 1500 lb/ac	5%	--				
		wood fiber @ 3000 lb/ac	40%	--				
		jute netting	30-60%	30%				
		straw @ 3000 lb/ac	40-70%	20-40%		Straw and jute: Average: $5,400 per acre Range: $4,000-$9,100 per acre References: Washington DOT, 1990; Virginia, 1980		Straw and jute: $18,000 per acre
		wood chips @ 10,000 lb/ac	60-80%	50-60%				
		mulch blanket	60-80%	50-60%	Straw and jute: 0.33			
		excelsior blanket	60-80%	50-60%				
		multiple treatment (straw and jute)	90%	90%				
		References: Minnesota Pollution Control Agency, 1989; Kay, 1983 cited in Goldman, 1986						

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Terraces	Break up long or steep slopes.	Observed range: Land Slope — Reduction in Erosion 1-12% — 70% 12-18% — 60% 18-24% — 55% Additionally, if the slope steepness is halved, while other factors are held constant, the soil loss potential decreases 2-1/2 times. If both the slope and length are halved, the soil loss potential is decreased 4 times. References: Goldman, 1986; Beasley, 1972	2	Average: $5 per lin ft Range: $1 - $12 References: SWRPC, 1991; Goldman, 1986; Virginia, 1991	Average: 20% Range: 20% Reference: SWRPC, 1991	$4 per lin ft
All Erosion Controls	Reduce amount of sediment entering runoff.	Average: 85% Observed range: 85% Reference: Schueler, 1990	--	Varies but typically low	Varies but typically low	Varies but typically low

NA - Not available.
[a] Useful life estimated as length of construction project (assumed to be 2 years).
[b] For Total Annual Cost, assume Annual Maintenance Cost = 2% of construction cost.

Table 4-16. ESC Quantitative Effectiveness and Cost Summary for Sediment Control Practices

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sediment basin	Minimum drainage area = 5 acres, maximum drainage area = 100 acres	Average: 70% Observed range: 55% - 100% References: Schueler, 1990; Engle, BW and Jarrett, AR, 1990; Baumann, 1990	2	Less than 50,000 ft^3 storage Average: $0.60 per ft^3 storage ($1,100 per drainage acre[c]) Range: $0.20 - $1.30 per ft^3 Greater than 50,000 ft^3 storage Average: $0.3 per ft^3 storage ($550 per drainage acre[c]) Range: $0.10 - $0.40 per ft^3 References: SWRPC, 1991	Average: 25% Range: 25% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	Less than 50,000 ft^3 storage $0.40 per ft^3 storage $700 per drainage acre[b] Greater than 50,000 ft^3 storage $0.20 per ft^3 storage $900 per drainage acre[c]
Sediment trap	Maximum drainage area = 5 acres	Average: 60% Observed range: (-7%) - 100% References: Schueler, et al., 1990; Tahoe Regional Planning Agency, 1989; Baumann, 1990	1.5	Average: $0.60 per ft^3 storage ($1,100 per drainage acre[c]) Range: $0.20 - $2.00 per ft^3 References: Denver COG cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986	Average: 20% Range: 20% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	$0.70 per ft^3 storage $1,300 per drainage acre[c]
Filter Fabric Fence	Maximum drainage area = 0.5 acre per 100 feet of fence. Not to be used in concentrated flow areas.	Average: 70% Observed range: 0% - 100% sand: 80% - 99% silt-loam: 50% - 80% silt-clay-loam: 0% - 20% References: Munson, 1991; Fisher et al., 1984; Minnesota Pollution Control Agency, 1989	0.5	Average: $3 per lin ft ($700 per drainage acre[c] Range: $1 - $8 per lin ft References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1991; NC State, 1990	Average: 100% Range: 100% References: SWRPC, 1991	$7 per lin ft $850 per drainage acre[c]

Table 4-16. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Straw Bale Barrier	Maximum drainage area = 0.25 acre per 100 feet of barrier. Not to be used in concentrated flow areas.	Average: 70% Observed Range: 70% References: Virginia, 1980 cited in EPA, 1991	0.25	Average: $4 per lin ft ($1,600 per drainage acre[d] Range: $2 - $6 per lin ft References: Goldman, 1986; Virginia, 1991	Average: 100% Range: 100% References: SWRPC, 1991	$17 per lin ft $6,800 per drainage acre[d]
Inlet Protection	Protect storm drain inlet.	Average: NA Observed Range: NA References: None	1	Average: $100 per inlet Range: $50 - $150 References: SWRPC, 1991; Denver COG cited in SWRPC, 1991; Virginia, 1991; EPA cited in SWRPC, 1991	Average: 60% Range: 20% - 100% References: SWRPC, 1991; Denver COG cited in SWRPC, 1991	$150 per inlet
Construction Entrance	Removes sediment from vehicles wheels.	Average: NA Observed Range: NA References: None	2	Average: $2,000 each Range: $1,000 - $4,000 References: Goldman, 1986; NC State, 1990	Average: NA[e] Range: NA References: None	$1,500 each
				With washrack: Average: $3,000 each Range: $1,000 - $5,000 References: Virginia, 1991		$2,200 each

Table 4-16. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Vegetative Filter Strip	Must have sheet flow.	Average: 70% Observed Range: 20% - 80% References: Hayes and Hairston, 1983 cited in Casman, 1990; Dillaha et al., 1989, cited in Glick et al., 1991; Virginia Department of Conservation, 1987; Nonpoint Source Control Task Force, 1983 cited in Minnesota PCA, 1989; Schueler, 1987	2	Established from existing vegetation- Average: $0 Range: $0 References: Schueler, 1987 Established from sod- Average: $11,300 per acre Range: $4,500 - $48,000 per acre References: Schueler, 1987; SWRPC, 1991	Average: NA Range: NA References: None	NA

NA - Not available.

[a] Useful life estimated as length of construction project (assumed to be 2 years)

[e] For Total Annual Cost, assume Annual Maintenance Cost=20% of construction cost.

[b] Assumes trap volume = 1800 cf/ac (0.5 inches runoff per acre).

[c] Assumes drainage area of 0.5 acre per 100 feet of fence (maximum allowed).

[d] Assumes drainage area of 0.25 acre per 100 feet of barrier (maximum allowed).

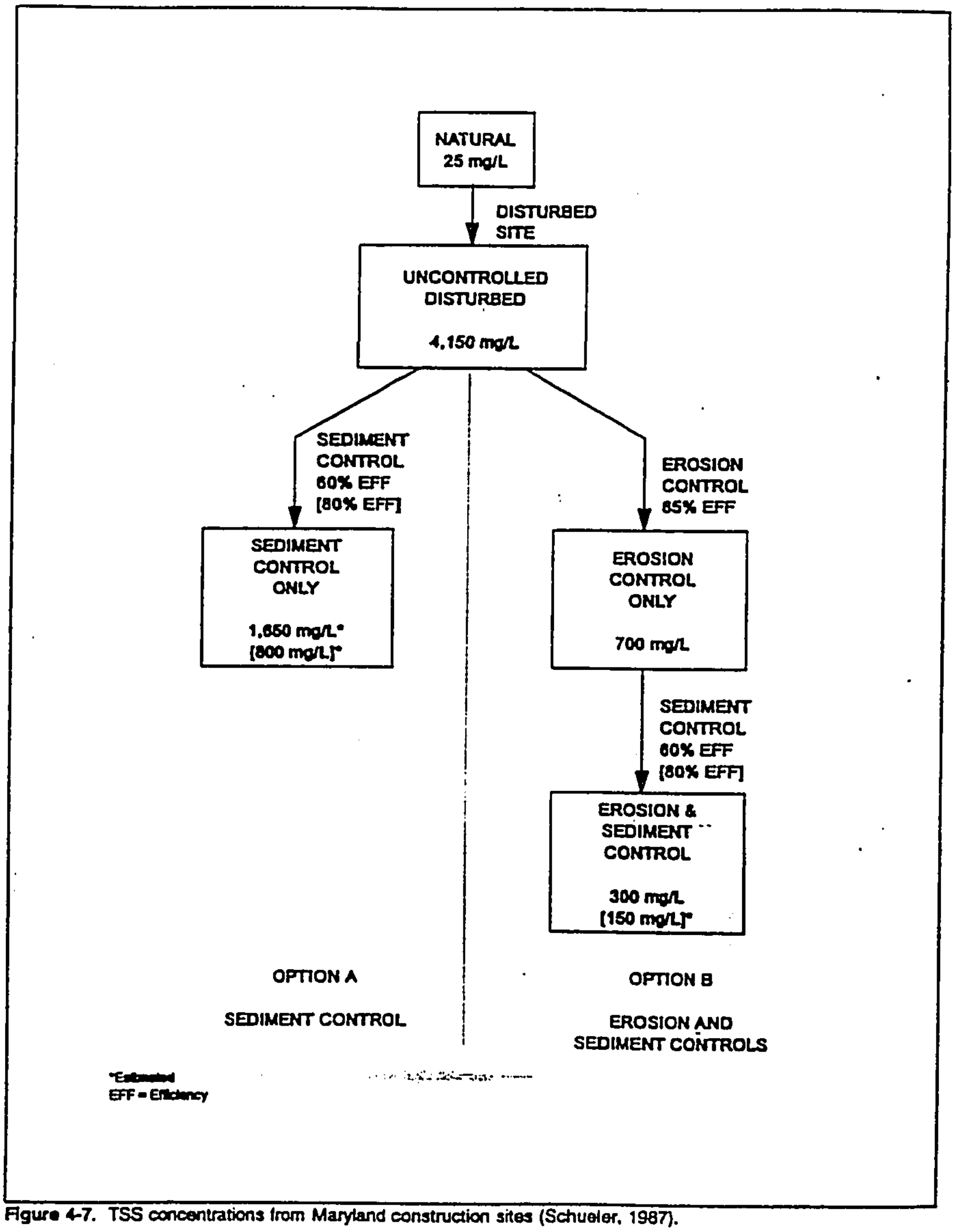


Figure 4-7. TSS concentrations from Maryland construction sites (Schueler, 1987).

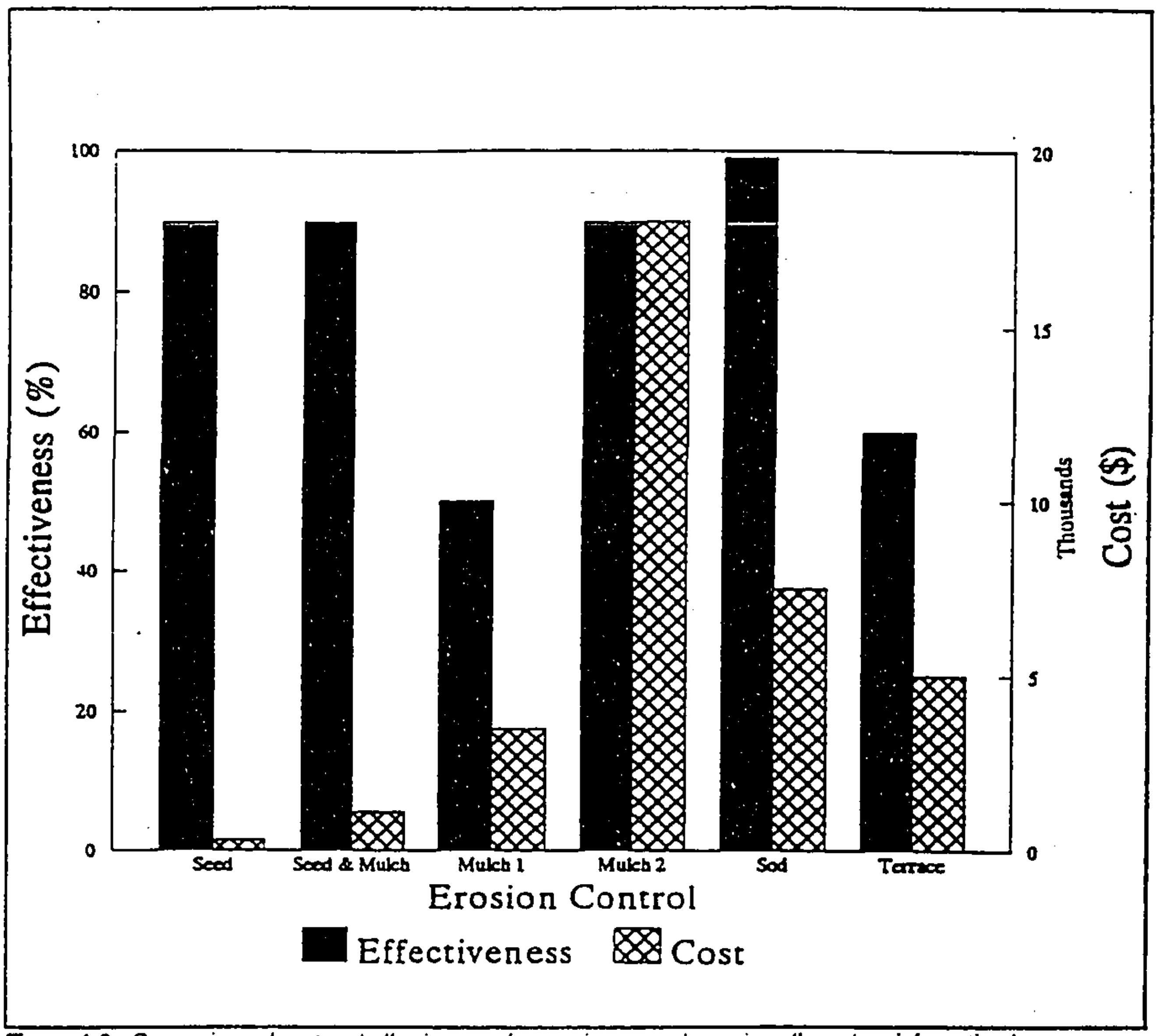


Figure 4-8. Comparison of cost and effectiveness for erosion control practices (based on information in Tables 4-15 and 4-16).

B. Construction Site Chemical Control Management Measure

(1) Limit application, generation, and migration of toxic substances;

(2) Ensure the proper storage and disposal of toxic materials; and

(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

1. Applicability

This management measure is intended to be applied by States to all construction sites less than 5 acres in area and to new, resurfaced, restored, and reconstructed road, highway, and bridge construction projects. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformance with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides (insecticides, fungicides, herbicides, and rodenticides); fertilizers used for vegetative stabilization; petrochemicals (oils, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary wastes (Washington State Department of Ecology, 1991).

The variety of pollutants present and the severity of their effects are dependent on a number of factors:

(1) **The nature of the construction activity.** For example, potential pollution associated with fertilizer usage may be greater along a highway or at a housing development than it would be at a shopping center development because highways and housing developments usually have greater landscaping requirements.

(2) **The physical characteristics of the construction site.** The majority of all pollutants generated at construction sites are carried to surface waters via runoff. Therefore, the factors affecting runoff volume,

such as the amount, intensity, and frequency of rainfall; soil infiltration rates; surface roughness; slope length and steepness; and area denuded, all contribute to pollutant loadings.

(3) **The proximity of surface waters to the nonpoint pollutant source.** As the distance separating pollutant-generating activities from surface waters decreases, the likelihood of water quality impacts increases.

a. Pesticides

Insecticides, rodenticides, and herbicides are used on construction sites to provide safe and healthy conditions, reduce maintenance and fire hazards, and curb weeds and woody plants. Rodenticides are also used to control rodents attracted to construction sites. Common insecticides employed include synthetic, relatively water-insoluble chlorinated hydrocarbons, organophosphates, carbamates, and pyrethrins.

b. Petroleum Products

Petroleum products used during construction include fuels and lubricants for vehicles, for power tools, and for general equipment maintenance. Specific petroleum pollutants include gasoline, diesel oil, kerosene, lubricating oils, and grease. Asphalt paving also can be particularly harmful since it releases various oils for a considerable time period after application. Asphalt overloads might be dumped and covered without inspection. However, many of these pollutants adhere to soil particles and other surfaces and can therefore be more easily controlled.

c. Nutrients

Fertilizers are used on construction sites when revegetating graded or disturbed areas. Fertilizers contain nitrogen and phosphorus, which in large doses can adversely affect surface waters, causing eutrophication.

d. Solid Wastes

Solid wastes on construction sites are generated from trees and shrubs removed during land clearing and structure installation. Other wastes include wood and paper from packaging and building materials, scrap metals, sanitary wastes, rubber, plastic and glass, and masonry and asphalt products. Food containers, cigarette packages, leftover food, and aluminum foil also contribute solid wastes to the construction site.

e. Construction Chemicals

Chemical pollutants, such as paints, acids for cleaning masonry surfaces, cleaning solvents, asphalt products, soil additives used for stabilization, and concrete-curing compounds, may also be used on construction sites and carried in runoff.

f. Other Pollutants

Other pollutants, such as wash water from concrete mixers, acid and alkaline solutions from exposed soil or rock, and alkaline-forming natural elements, may also be present and contribute to nonpoint source pollution.

Revegetation of disturbed areas may require the use of fertilizers and pesticides, which, if not applied properly, may become nonpoint source pollutants. Many pesticides are restricted by Federal and/or State regulations.

Hydroseeding operations, in which seed, fertilizers, and lime are applied to the ground surface in a one-step operation, are more conducive to nutrient pollution than are the conventional seedbed-preparation operations, in which fertilizers and lime are tilled into the soil. Use of fertilizers containing little or no phosphorus may be required by local authorities if the development is near sensitive waterbodies. The addition of lime can also affect the pH of sensitive waters, making them more alkaline.

Improper fueling and servicing of vehicles can lead to significant quantities of petroleum products being dumped onto the ground. These pollutants can then be washed off site in urban runoff, even when proper erosion and sediment controls are in place. Pollutants carried in solution in runoff water, or fixed with sediment crystalline structures, may not be adequately controlled by erosion and sediment control practices (Washington Department of Ecology, 1991). Oils, waxes, and water-insoluble pesticides can form surface films on water and solid particles. Oil films can also concentrate water-soluble insecticides. These pollutants can be nearly impossible to control once present in runoff other than by the use of very costly water-treatment facilities (Washington Department of Ecology, 1991).

After spill prevention, one of the best methods to control petroleum pollutants is to retain sediments containing oil on the construction site through use of erosion and sediment control practices. Improved maintenance and safe storage facilities will reduce the chance of contaminating a construction site. One of the greatest concerns related to use of petroleum products is the method for waste disposal. The dumping of petroleum product wastes into sewers and other drainage channels is illegal and could result in fines or job shutdown.

The primary control method for solid wastes is to provide adequate disposal facilities. Erosion and sediment control structures usually capture much of the solid waste from construction sites. Periodic removal of litter from these structures will reduce solid waste accumulations. Collected solid waste should be removed and disposed of at authorized disposal areas.

Improperly stored construction materials, such as pressure-treated lumber or solvents, may lead to leaching of toxics to surface water and ground water. Disposal of construction chemicals should follow all applicable State and local laws that may require disposal by a licensed waste management firm.

3. Management Measure Selection

This management measure was selected based on the potential for many construction activities to contribute to nutrient and toxic NPS pollution.

This management measure was selected because (1) construction activities have the potential to contribute to increased loadings of toxic substances and nutrients to waterbodies; (2) various States and local governments regulate the control of chemicals on construction sites through spill prevention plans, erosion and sediment control plans, or other administrative devices; (3) the practices described are commonly used and presented in a number of best management practice handbooks and guidance manuals for construction sites; and (4) the practices selected are the most economical and effective.

4. Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

■ a. *Properly store, handle, apply, and dispose of pesticides.*

Pesticide storage areas on construction sites should be protected from the elements. Warning signs should be placed in areas recently sprayed or treated. Persons mixing and applying these chemicals should wear suitable protective clothing, in accordance with the law.

Application rates should conform to registered label directions. Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in applicable Federal, State, and local regulations that govern their usage, handling, storage, and disposal. Pesticides and herbicides should be used only in conjunction with Integrated Pest Management (IPM) (see Chapter 2). Pesticides should be the tool of last resort; methods that are the least disruptive to the environment and human health should be used first.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage, and disposal (TSD) facility. Containers should be triple-rinsed before disposal, and rinse waters should be reused as product.

Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage area, and notifying neighboring property owners prior to spraying.

■ *b. Properly store, handle, use, and dispose of petroleum products.*

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped into oils and lubricants should be disposed of in proper receptacles or recycled. Waste oil for recycling should not be mixed with degreasers, solvents, antifreeze, or brake fluid.

■ *c. Establish fuel and vehicle maintenance staging areas located away from all drainage courses, and design these areas to control runoff.*

Proper maintenance of equipment and installation of proper stream crossings will further reduce pollution of water by these sources. Stream crossings should be minimized through proper planning of access roads. Refer to Chapter 3 for additional information on stream crossings.

■ *d. Provide sanitary facilities for constructions workers.*

■ *e. Store, cover, and isolate construction materials, including topsoil and chemicals, to prevent runoff of pollutants and contamination of ground water.*

■ *f. Develop and implement a spill prevention and control plan. Agencies, contractors, and other commercial entities that store, handle, or transport fuel, oil, or hazardous materials should develop a spill response plan.*

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Spill control plan components should include:

- Stop the source of the spill.
- Contain any liquid.
- Cover the spill with absorbent material such as kitty litter or sawdust, but do not use straw. Dispose of the used absorbent properly.

g. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm sewer systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled. Do not discharge any solvents into sewers.

Washout from concrete trucks should be disposed of into:

- A designated area that will later be backfilled;
- An area where the concrete wash can harden, can be broken up, and then can be placed in a dumpster; or
- A location not subject to urban runoff and more than 50 feet away from a storm drain, open ditch, or surface water.

Never dump washout into a sanitary sewer or storm drain, or onto soil or pavement that carries urban runoff.

h. Develop and implement nutrient management plans.

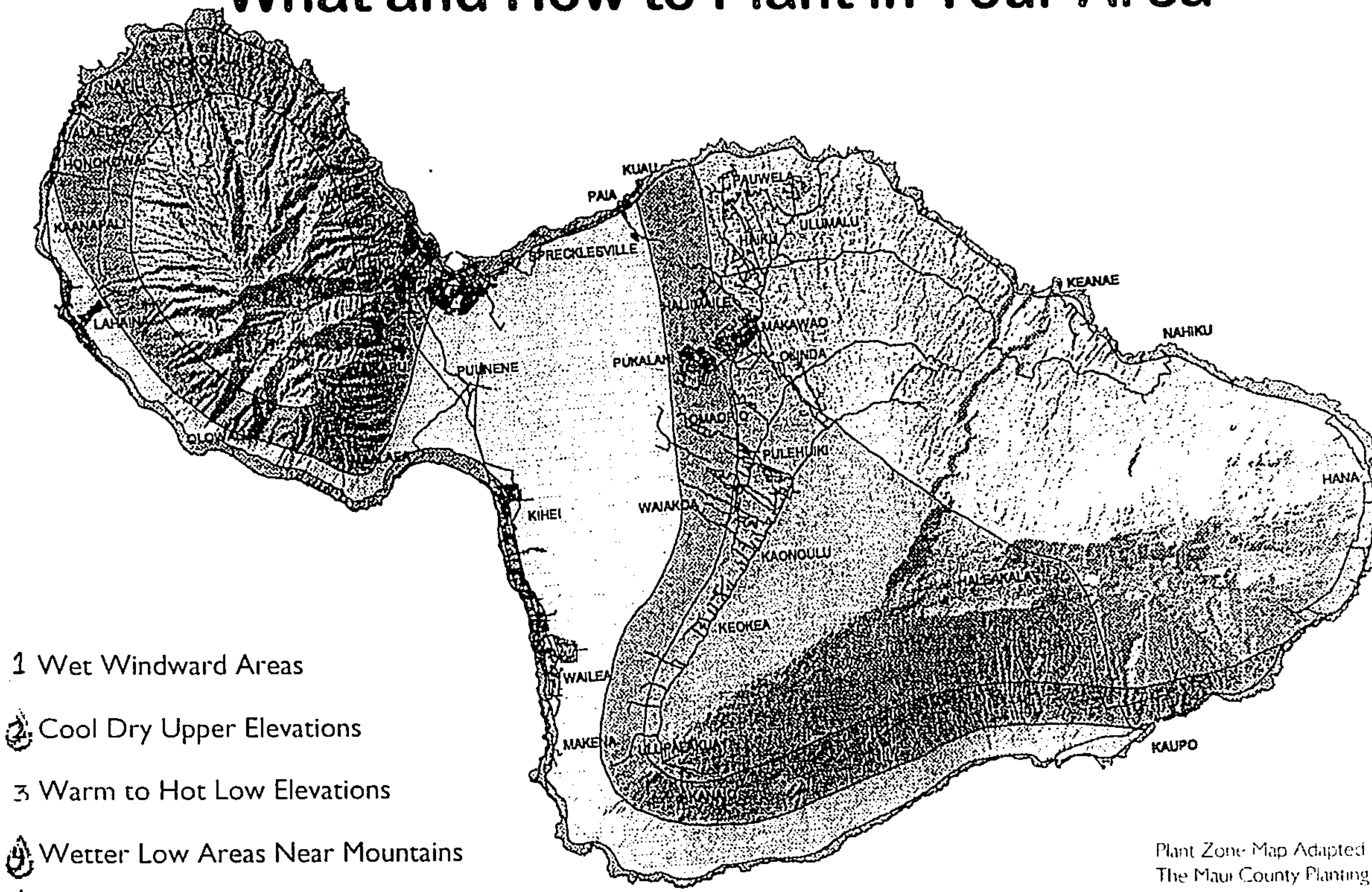
Properly time applications, and work fertilizers and liming materials into the soil to depths of 4 to 6 inches. Using soil tests to determine specific nutrient needs at the site can greatly decrease the amount of nutrients applied.

i. Provide adequate disposal facilities for solid waste, including excess asphalt, produced during construction.

j. Educate construction workers about proper materials handling and spill response procedures. Distribute or post informational material regarding chemical control.

Saving Water in The Yard

What and How to Plant in Your Area



1 Wet Windward Areas

2 Cool Dry Upper Elevations

3 Warm to Hot Low Elevations

4 Wetter Low Areas Near Mountains

5 Windward Coastal Salt Spray Zones

Plant Zone Map Adapted From
The Maui County Planting Plan

Tips From The Maui County Department of Water Supply
By Water All Things Find Life

Selection

As a general rule, it is best to select the largest and healthiest specimens. However, be sure to note that they are not pot-bound. Smaller, younger plants may result in a low rate of plant survival.[1] When selecting native species, consider the site they are to be planted in, and the space that you have to plant. For example: Mountain species such as koa and maile will not grow well in hot coastal areas exposed to strong ocean breezes. Lowland and coastal species such as wiliwili and Kou require abundant sunshine and porus soil. They will not grow well with frequent cloud cover, high rainfall and heavy soil.

Consider too, the size that the species will grow to be. It is not wise to plant trees that will grow too large.[2] Overplanting tends to be a big problem in the landscape due to the underestimation of a species' height, width or spread.

A large, dense canopied tree such as the kukui is a good shade tree for a lawn. However, it's canopy size and density of shade will limit what can be planted in the surrounding area. Shade cast by a koa and ohia lehua is relatively light and will not inhibit growth beneath it.

Keep seasons in mind when you are selecting your plants. Not all plants look good year round, some plants such as ilima will look scraggly after they have flowered and formed seeds. Avoid planting large areas with only one native plant. Mixing plants which naturally grow together will ensure the garden will look good all year round.[3] Looking at natural habitats helps to show how plants grow naturally in the landscape.

When planting an area with a mixed-ecosystem, keep in mind the size and ecological requirements of each plant. Start with the hardiest and most easily grown species, but allow space for fragile ones in subsequent plantings.

Acquiring natives

Plants in their wild habitat must be protected and maintained. It is best and easiest to get your plants from nurseries (see list), or friend's gardens. Obtain proper permits from landowners and make sure you follow a few common sense rules:

- collect sparingly from each plant or area.
- some plants are on the state or Federal Endangered Species list. Make sure you get permits (see app. A,B)

---

[1] K. Nagata, P.6

[2] K. Nagata, P.9

[3] Nagata, P.9

Soil

Once you have selected your site and the plants you wish to establish there, you must look at the soil conditions on the site. Proper soil is necessary for the successful growth of most native plants, which preform poorly in hard pan, clay or adobe soils. If natives are to be planted in these types of soil, it would be wise to dig planting holes several times the size of the rootball and backfill with 50-75% compost.[4] A large planting hole ensures the development of a strong root system. The plant will have a headstart before the roots penetrate the surrounding poor soil.[5]

It is recommended that native plants not be planted in ground that is more dense than potting soil. If there is no alternative, dig a hole in a mound of soil mixed with volcanic cinder which encourages maximum root development. Fill the hole with water, if the water tends to puddle or drain too slowly, dig a deeper hole until the water does not puddle longer than 1 or 2 minutes.[6] Well-drained soil is one of the most important things when planting natives as you will see in the next section.

Irrigation

Most natives do very poorly in waterlogged conditions. Do not water if the soil is damp. Water when the soil is dry and the plants are wilting. Once established, a good soaking twice a week should suffice. Deep soaking encourages the development of stronger, and deeper root systems. This is better than frequent and shallow watering which encourage weaker, more shallow root systems.

The following is a watering schedule from Kenneth Nagata's Booklet, *How To Plant A Native Hawaiian Garden*:

WATER REQUIREMENT	WATERING FREQUENCY
Heavy	3x / week
Moderate	2x / week
Light	1x / week

Red clay soils hold more water for a longer period of time than sandy soils do. If your area is very sunny or near a beach, things will dry out faster. Even in the area of one garden, there are parts that will need more or less water. Soils can vary and amount of shade and wind differ. After plants are established (a month or two for most plants, up to a year for some trees), you can back off watering.

---

[4] Nagata, p. 6.

[5] Nagata, p. 8

[6] Nagata, p. 8

Automatic sprinkler systems are expensive to install and must be checked and adjusted regularly. Above-ground systems allow you to monitor how much water is being put out, but you lose a lot due to malfunctioning of sprinkler heads and wind. The most efficient way to save water and make sure your plants get enough water, is to hand-water. This way you are getting our precious water to the right places in the right amounts.[7]

Fertilizer

An all-purpose fertilizer 10-10-10 is adequate for most species. They should be applied at planting time, 3 months later, and 6 months thereafter. Use half the dosage recommended for ornamentals and pay special attention to native ferns which are sensitive to strong fertilizers. Use of organic composts and aged animal manures is suggested instead of chemical fertilizers. In addition, use of cinders for providing trace minerals is strongly recommended.[8]

Natives are plants which were here hundreds of years before the polynesians inhabited the Hawaiian Islands. They were brought here by birds, or survived the harsh ocean conditions to float here. They are well-adapted to Hawaii's varying soil and environmental conditions. This is why they make prime specimens for a xeriscape garden. However, natives will not thrive on their own, especially under harsh conditions. On the other hand, like any other plant, if you over-water and over-fertilize them, they will die. Follow the instructions given to you by the nursery you buy the plant from, or from this booklet. Better yet, buy a book (suggested readings can be found in the bibliography in the back of this pamphlet), read it, and learn more about native plants. I guarantee that you will be pleased with the results.

---

[7] Bornhorst, p. 19-20

[8] Nagata, p. 6

Propagation

There are many ways to propagate and plant-out native Hawaiian species. One of the most thourough and helpful book is Heidi Bornhorst's book, *Growing Native Hawaiian Plants.* The easiest, and best way to obtain natives for the novice gardener is to get them from a reputable nursery (see appendix c). That way all you will have to do is know how to transplant (if necessary) and plant-out when you are ready. These are the two methods I have listed here.

Transplanting

1. Use pots that are one size bigger than the potted plant is in
2. Get your potting medium ready

Good potting medium is a ½, ½ mixture of peat moss and perlite. If the plant is from a dry or coastal area, add chunks of cinder or extra perlite. If it is a wet forest species, add more peat moss or compost. Be aware that peat moss is very acidic and certain plants react severely to acidity.

If the plant is to eventually be planted into the ground, make a mix of equal parts peat moss, perlite, and soil from the area in which the plant is to be planted. Slow-release fertilizer can be mixed into the potting medium.

3. Once pots, potting medium, fertilizer and water are ready, you can begin re-potting. Keep the plant stem at the same depth it was in the original pot. Avoid putting the plant in too large a pot, as the plant may not be able to soak up all the water in the soil and the roots may drown and rot.

Mix potting medium and add slow-release fertilizer at this time. Pre-wet the medium to keep dust down and lessen shock to the plant. Put medium in bottom of pot. Measure for the correct depth in the new pot. Make sure there is from ½ to 2 inches from the top of the pot so the plant can get adequate water. Try to stand the plant upright and center the stem in the middle of the pot.

Water the plant thoroughly after transplanting. A vitamin B-1 transplanting solution can help to lessen the transplant shock. Keep the plant in the same type of environment as it was before, sun or shade. If roots were broken, trimm off some of the leaves to compensate for the loss.[9]

Planting out

1. Plant most native Hawaiian plants in a sunny location in soil that is well-drained.
2. Make the planting hole twice as wide as the root ball or present pot, and just as deep. If the soil is clay-like, and drains slowly, mix in some coarse red or bland cinder, coarse perlite or

---

[9] Bornhorst, p.20-21

coarse compost. Place some slow-release fertilizer at the bottom of the hole.

3. Carefully remove the plant from the container and place it in the hole. The top of the soil should be at the same level as the top of the hole, if it is too high or too low, adjust the soil level so that the plant is at the right depth.

4. Water thoroughly after you transplant.

Mulch

Most natives cannot compete with weeds, and therefore must be weeded around constantly in order to thrive. Mulch is a practical alternative, which discourages and prevents weeds from growing.

Hawaii's hot, humid climate leads to the breaking down of organic mulches. Thick organic mulches such as wood chips and leaves, may also be hiding places for pests.

Stone mulches are attractive, permanent and can help to improve soil quality. Red or black cinder, blue rock chips, smooth river rocks and coral chips are some natural choices.[10] Macadamia nut hulls are also easy to find and can make a nice mulch.[11]

Never pile up mulch right next to the stem or trunk of a plant, keep it a few inches away.

---

[10] Bornhorst, p. 24

[11] Nagata, p. 7

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.

PLACES TO SEE NATIVES ON:

The following places propagate native Hawaiian plants from seeds and/or cuttings. Their purpose is to protect and preserve these native plants. Please contact them before going to view the sites, they can provide valuable information and referral to other sources.

Maui:

1.	Hoolawa Farms, P.O. Box 731, Haiku, Hawaii, 96708	572-4835
2.	The Hawaiian Collection, 1127 Manu St., Kula, Hawaii, 96790	878-1701
3.	Kula Botanical Gardens, RR 4, Box 228, Kula, Hawaii, 96790	878-1715
4.	Maui Botanical Gardens, Kanaloa Avenue across from stadium	243-7337
5.	Kula Forest Reserve, access road at the end of Waipouli Rd. Call the Maui District Forester	984-8100
6.	Wailea Point, Private Condominium residence, 4000 Wailea Alanui, public access points at Four Seasons Resort or Polo Beach	875-9557
7.	Kahanu Gardens, National Tropical Botanical Garden, Alau Pl, Hana, Hawaii, 96713	248-8912
9.	Kahului Library Courtyard, 20 School Street, Kahului, Hawaii	873-3097

Yellow

Zone 3

Zone-specific Native and Polynesian plants for Maui County

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	1'	2'	sea to 1,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'			
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium

Yellow

Zone 3

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Bidens mauiensis	ko'oko'olau	1'	3'	sea to 1,000'	Dry to Medium
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3'		
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tameiameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kauaiensis kauaiensis	'akia, Molokai osmanthus				
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000'	Dry to Medium
Tr	Erythrina sandwicensis	wiliwili	20'	20'	sea to 1,000'	Dry
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet

Yellow

Zone 3

Zone-specific Native and Polynesian plants for Maui County

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Nesoluma polynesicum	keahi	15'	15'	sea to 3,00'	Dry
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Reynoldsia sandwicensis	'ohe makai	20'	20'	1,000' to 3,000'	Dry
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
	Jasminum fluminense	Oleaceae
	Arthrostema ciliatum	Melastomataceae
	Dissotis rotundifolia	Melastomataceae
	Erigeron karvinskianus	Asteraceae
	Eucalyptus robusta	Myrtaceae
	Hedychium gardnerianum	Zingiberaceae
	Juncus planifolius	Juncaceae
	Lophostemon confertus	Myrtaceae
	Medinilla cumingii	Melastomataceae
	Medinilla magnifica	Melastomataceae
	Medinilla venosa	Melastomataceae
	Melastoma candidum	Melastomataceae
	Melinis minutiflora	Poaceae
	Olea europaea	
	Oxyspora paniculata	Melastomataceae
	Panicum maximum	Poaceae
	Paspalum urvillei	Poaceae
	Passiflora edulis	Passifloraceae
	Phormium tenax	Agavaceae
	Pinus taeda	Pinaceae
	Prosopis pallida	Fabaceae
	Pterolepis glomerata	Melastomataceae
	Rhodomyrtus tomentosa	Myrtaceae
	Schefflera actinophylla	Araliaceae
	Syzygium jambos	Myrtaceae
Australian blackwood	Acacia melanoxylon	Mimosaceae
Australian tree fern	Cyathea cooperi	Cyatheaceae
Australian tree fern	Sphaeropteris cooperi	Cyatheaceae
Beggar's tick, Spanish needle	Bidens pilosa	Asteraceae
California grass	Brachiaria mutica	Poaceae
Chinese banyon, Maylayan banyon	Ficus mirocarpa	Moraceae
Chinese violet	Asystasia gangelica	Acanthaceae
Christmasberry, Brazilian pepper	Schinus terebinthifolius	Anacardiaceae
Formosan koa	Acacia confusa	Mimosaceae
German ivy	Senecio mikanioides	Asteraceae
Japanese honeysuckle	Lonicera japonica	Caprifoliaceae
Koster's curse	Clidemia hirta	Melastomataceae
Lantana	Lantana camara	Verbenaceae
Mauritius hemp	Furcraea foetida	Agavaceae
Mexican ash, tropical ash	Fraxinus uhdei	Oleaceae
Mexican tulip poppy	Hunnemannia fumariifolia	Papaveraceae
Mules foot, Madagascar tree fern	Angiopteris evecta	Marattiaceae
New Zealand laurel, karakaranut	Corynocarpus laevigatus	Corynocarpaceae
New Zealand tea	Leptospermum scoparium	Myrtaceae
Pampas grass	Cortaderia jubata	Poaceae
Panama rubber tree, Mexican rubber tree	Castilloa elastica	Moraceae
Shoebutton ardisia	Ardisia elliptica	Myrsinaceae
banana poka	Passiflora mollissima	Passifloraceae

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
black wattle	Acacia mearnsii	Mimosaceae
blackberry	Rubus argutus	Rosaceae
blue gum	Eucalyptus globulus	Myrtaceae
bocconia	Bocconia frutescens	Papaveraceae
broad-leaved cordia	Cordia glabra	Boraginaceae
broomsedge, yellow bluestem	Andropogon virginicus	Poaceae
buffelgrass	Cenchrus ciliaris	Poaceae
butterfly bush, smoke bush	Buddleja madagascariensis	Buddlejaceae
cats claw, Mysore thorn, wait-a-bit	Caesalpinia decapetala	Caesalpiniaceae
common ironwood	Casuarina equisetifolia	Casuarinaceae
common velvet grass, Yorkshire fog	Holcus lanatus	Poaceae
fiddlewood	Citharexylum spinosum	Verbenaceae
fire tree, faya tree	Myrica faya	Myricaceae
glorybower	Clerodendrum japonicum	Verbenaceae
hairy cat's ear, gosmore	Hypochoeris radicata	Asteraceae
haole koa	Leucaena leucocephala	Fabaceae
ivy gourd, scarlet-fruited gourd	Coccinia grandis	Cucurbitaceae
juniper berry	Citharexylum caudatum	Verbenaceae
kahili flower	Grevillea banksii	Proteaceae
klu, popinac	Acacia farnesiana	Mimosaceae
logwood, bloodwood tree	Haematoxylon campechianum	Caesalpiniaceae
loquat	Eriobotrya japonica	Rosaceae
meadow ricegrass	Ehrharta stipoides	Poaceae
melaleuca	Melaleuca quinquenervia	Myrtaceae
miconia, velvet leaf	Miconia calvescens	Melastomataceae
narrow-leaved carpetgrass	Axonopus fissifolius	Poaceae
oleaster	Elaeagnus umbellata	Elaeagnaceae
oriental mangrove	Bruguiera gymnorrhiza	Rhizophoraceae
padang cassia	Cinnamomum burmanii	Lauraceae
palmgrass	Setaria palmifolia	Poaceae
pearl flower	Heterocentron subtriplinervium	Melastomataceae
quinine tree	Cinchona pubesens	Rubiaceae
satin leaf, caimitillo	Chrysophyllum oliviforme	Sapotaceae
silkwood, Queensland maple	Flindersia brayleyana	Rutaceae
silky oak, silver oak	Grevillea robusta	Proteaceae
strawberry guava	Psidium cattleianum	Myrtaceae
swamp oak, saltmarsh, longleaf ironwood	Casuarina glauca	Casuarinaceae
sweet vernalgrass	Anthoxanthum odoratum	Poaceae
tree of heaven	Ailanthus altissima	Simaroubaceae
trumpet tree, quarumo	Cecropia obtusifolia	Cecropiaceae
white ginger	Hedychium coronarium	Zingiberaceae
white moho	Heliocarpus popayanensis	Tiliaceae
yellow ginger	Hedychium flavescens	Zingiberaceae

MUNEKIYO & HIRAGA, INC.

September 8, 2004

Mr. George Tengan, Director
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Mr. Tengan:

Thank you for your letter dated July 16, 2004, providing us with your comments on the proposed project. On behalf of our client Hale Mahaolu (HM), we would like to offer the following responses.

1. We note your comment with regards to potable water usage. A 2-inch water meter has been installed for the first phase of the project.

2. We note your comment with regards to system infrastructure for the project site. Fire flow calculations prepared and certified by the project's civil engineer will be submitted with the building permit application.

3. Additionally, we note your suggestion of using brackish and/or reclaimed water for dust control or irrigation uses for the project. The applicant will work with the contractor to implement this suggestion if sources are available.

4. Finally, we note your suggestions on ways to conserve water and the Best Management Practices (BMPs) to be considered for the proposed project. These comments have been forwarded to the civil engineering consultant, architect and landscape architect for review and consideration.

305 High Street, Suite 104 • Wailuku, Hawaii 96793 • ph: (808)244-2015 • fax: (808)244-8729 • planning@mhinconline.com

environment
planning
government

Should you have any questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp

cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Michael Ishikawa, Richard Sato & Associates
Russel Gushi, Russel Gushi Landscape Architect
Alice Lee, Department of Housing and Human Concerns
Michael W. Foley, Department of Planning

hha\hmdhiku\dws.deares

ALAN M. ARAKAWA
Mayor

GILBERT S. COLOMA-AGARAN
Director

MILTON M. ARAKAWA, A.I.C.P.
Deputy Director

RALPH M. NAGAMINE, L.S., P.E.
Development Services Administration

TRACY TAKAMINE, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

JOHN D. HARDER
Solid Waste Division

AUG 30 2004

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND ENVIRONMENTAL MANAGEMENT
DEVELOPMENT SERVICES ADMINISTRATION
250 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

August 19, 2004

MEMO TO: MICHAEL W. FOLEY, DIRECTOR OF PLANNING

FROM: GILBERT S. COLOMA-AGARAN, DIRECTOR OF PUBLIC WORKS AND ENVIRONMENTAL MANAGEMENT

SUBJECT: SPECIAL MANAGEMENT AREA PERMIT APPLICATION
HALE MAHAOLU EHIKU
ELDERLY HOUSING PROJECT
TMK (2) 2-2-002:073
SM1 20040013

We reviewed the subject application and have the following comments:

1. Submit plan for disposal/composting of cleared and grubbed material and disposal/recycling of construction waste.

2. A 30' radius shall be provided at the intersection of proposed driveways and the adjoining roads.

3. A verification shall be provided by a Registered Civil Engineer that the grading and runoff water generated by the project will not have an adverse effect on the adjacent and downstream properties.

4. A detailed and final drainage report and a Best Management Practices Plan (BMP) shall be submitted with the grading plans for review and approval prior to issuance of grading permits. The drainage report shall include hydro logic and hydraulic calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui" and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream

properties. The BMP plan shall show the location and details of structural and non-structural measures to control erosion and sedimentation to the maximum extent practicable.

5. All existing features such as structures, driveways, drainage ways, edge of the pavement, etc. shall be shown on the project plat plan.

6. A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for our review and approval.

7. Access to the future North-South Collector road will be minimized and turning movements entering and exiting said driveway may be limited right turn in/out only.

8. Although wastewater system capacity is currently available as of July 27, 2004, the developer should be informed that wastewater system capacity cannot be ensured until the issuance of the building permit.

9. Provide discussion and calculations (sewer impact study) to substantiate that the existing wastewater system is adequate to serve this project.

10. Wastewater contribution calculations are required before building permit is issued.

11. Developer shall pay assessment fees for treatment plant expansion costs in accordance with ordinance setting forth such fees.

12. Developer is required to fund any necessary off-site improvements to collection system and wastewater pump stations.

13. Plans should show the installation of a service manhole near the property line prior to connection to County sewer facilities.

14. Non-contact cooling water, condensate, etc. should not drain to the wastewater system.

15. Indicate on the plans the ownership of each easement (in favor of which party). Note: County will not accept sewer easements that traverse private property.

16. Recycled water lines exist adjacent to the site. Recycled water must ab eutilized for landscaping irrigation and/or other approved uses.

17. Kitchen facilities (common) within the proposed project shall comply with pretreatment requirements (including grease interceptors, sample boxes, screens etc.)

18. The plans submitted for this project does not adequately show sufficient detail to determine whether the project is compliant with the building and housing codes. We will review the project for building and housing code requirements during the building permit application process.

19. Pursuant to Section 18.04.470 of the Maui County Code (MCC), the construction of four or more dwelling units on a lot shall be subject to the provisions of Title 18 (Subdivision Ordinance) MCC.

20. The grading/grubbing for the subject project shall comply with Chapter 20.08 (Soil Erosion and Sedimentation Control) of the Maui County Code. Best management practices shall be implemented to the maximum extent practicable to prevent pollutants including dust and sediment from discharging off the project site.

21. The subject project shall comply with Section 16.26.3304 (Improvements to Public Streets) of the Maui County Code.

22. The subject project shall comply with Section 18.04.470 (Subdivision) of the Maui County Code which states in part, "...the construction of four or more dwelling units on a lot, parcel, or site shall be subject to the provisions of this title."

23. We are currently processing a subdivision for the subject tax map key parcel. The "Hale Mahaolu Ehiku Subdivision" (Subdivision File No. 2.2822) proposes to create three lots and one road widening lot and was granted preliminary subdivision approval on March 12, 2004.

If you have any questions regarding this memorandum, please call Milton Arakawa at 270-7845.

da
S:\LUCA\CZM\Hale Mahaolu Ehiku_sm1_22002073_da.wpd

MUNEKIYO & HIRAGA, INC.

September 9, 2004

Mr. Gilbert Coloma-Agaran, Director
Department of Public Works and
Environmental Management
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Draft Environmental Assessment and Special Management Area Use Permit Application for the Proposed Hale Mahaolu Ehiku Affordable Elderly Housing Project at TMK 2-2-02:073, Kihei, Maui, Hawaii

Dear Mr. Coloma-Agaran:

Thank you for your comments dated August 19, 2004, regarding the proposed Hale Mahaolu Ehiku elderly housing project. On behalf of our client, Hale Mahaolu, (HM), we would like to offer the following responses to your comments:

1. We concur with your comment with regards to the development of a plan for disposal/composting of cleared and grubbed material and a construction waste plan. HM will work with the contractor, once selected, to develop the plans which will be submitted to your department prior to construction.

2. We note your comment with regards to the 30 foot radius at the intersection of the proposed driveways and the adjoining roads. The civil engineering consultant will coordinate with the Engineering Division to ensure that intersection design criteria are addressed.

3. The detailed final drainage report will provide verification by the civil engineering consultant, that the grading and runoff water will not have an adverse impact on adjacent downstream properties.

4. A detailed and final drainage report and a Best Management Practices plan (BMP) will be submitted with the grading plans for review and approval prior to the issuance of the grading permits.

environment
planning
government

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

5. We note your comment with regards to the project plat plan's inclusion of existing structures, driveways, drainage ways and edge of pavement. These comments have been forwarded to the civil engineering consultant to ensure that this requirement is met.

6. A report indicating sight distance and available sight distance at the existing and proposed street intersections will be submitted to your department for review and approval.

7. We concur with your comment with regards to the restriction of movement at the project driveway with the future North-South Collector Road. The roadway may be restricted to right turn in /out movements only.

8. We understand your comment with regards to wastewater capacity at the Kihei Wastewater Treatment Facility.

9. Detailed sewer calculations, as well as a discussion on the impact of the project on the existing Kihei Wastewater Treatment Facility for the project will be submitted to the department for review and approval.

10. The project's civil engineer will prepare and submit wastewater calculations prior to issuance of building permit.

11. The project has been approved as an affordable housing project by the Department of Housing and Human Concerns (DHHC). As such, we will be filing a 201G-118, HRS application with DHHC and are requesting an exemption from the sewer assessment fees.

12. We concur with your comment. In discussions with the Wastewater Reclamation Division, no offsite improvements were identified for the project except for the connection to the system at Kupuna Street, which the project will pay for.

13. Civil design plans will indicate where service manholes will be located.

14. We acknowledge your comment with regards to non-contact cooling water and condensate draining into the wastewater system.

15. Easements and their respective grantees will be indicated on the design plans.

16. We concur with your comment with regards to utilizing recycled water for landscaping irrigation and will be in contact with the Wastewater Reclamation Division for further information.

17. We concur with your comment on the compliance of kitchen facilities and pre-treatment requirements.

18. We acknowledge your comment with regards to detailed plans for the project. Detailed plans will be submitted for building permit review.

19. As previously noted, the project has been approved as a 201G-118, HRS project by the DHHC. As such, the project will be requesting exemptions from the provisions of Title 18, *"Subdivision Ordinance"*, in its application, if needed.

20. We acknowledge your comment with regards to grading/grubbing for the project and compliance with Chapter 20.08, *"Soil Erosion and Sedimentation Control"* of the Maui County Code (MCC). BMPs will also be implemented to mitigate pollutants from discharging off the project site.

21. As previously noted in our response to the Department on April 21, 2004, the project will seek an exemption from Section 16.26.3304, relative to improvements to public streets.

22. As previously noted, the project has been approved as a 201G-118, HRS, project by the DHHC. As such, the project will be requesting exemptions from the provisions of Title 18, *"Subdivision Ordinance"*, in its application, if needed.

23. We acknowledge your comment with regards to the subdivision processing for Hale Mahaolu. The various funding sources for the project and their requirements have necessitated the subdivision of the parcel.

Should you have any further comments or questions, please feel free to contact me at 244-2015.

Very truly yours,

Karlynn Kawahara, Planner

KK:yp

cc: Roy Katsuda, Hale Mahaolu
Gerald Hiyakumoto, Hiyakumoto + Higuchi Architects
Michael Ishikawa, Richard Sato & Associates
Alice Lee, Department of Housing and Human Concerns
Michael Foley, Department of Planning

hha\hmehiku\dpwem.doares

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
COUNTY OF MAUI

ALAN M. ARAKAWA
Mayor
ALICE L. LEE
Director
HERMAN T. ANDAYA
Deputy Director

200 SOUTH HIGH STREET • WAILUKU, HAWAII 96793 • PHONE (808) 270-7805 • FAX (808) 270-7165

'04 JUL 15 P2:14

July 13, 2004

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

TO: JOE W. ALUETA, Staff Planner
Department of Planning

FROM: ALICE L. LEE, Director
Department of Housing and Human Concerns

SUBJECT: **I.D.: SM1 2004/0013**
TMK: 2-2-002:073
PROJECT NAME: ELDERLY HOUSING PROJECT
APPLICANT: HALE MAHAOLU

As indicated in my May 13, 2004 letter to Mr. Dean K. Frampton of Munekiyo & Hiraga, Inc. (See Chapter X of the Draft Environmental Assessment for the Hale Mahaolu Ehiku Elderly Housing Project that is included in the subject application), we fully support the development of the project and will be assisting the applicant in securing the required governmental approvals to develop the project.

Thank you for the opportunity to comment.

ETO:hs

c: Housing Administrator

ALAN M. ARAKAWA
Mayor

GLENN T. CORREA
Director

JOHN L. BUCK III
Deputy Director

DEPARTMENT OF PARKS & RECREATION
700 Hali'a Nakoa Street, Unit 2, Wailuku, Hawaii 96793

(808) 270-7230
Fax (808) 270-7934

MEMORANDUM

July 15, 2004

'04 JUL 19 AI0:09
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

TO: Michael W. Foley, Planning Director

FROM: Glenn T. Correa, Director

SUBJECT: Hale Mahaolu Ehiku Elderly Housing Project
Draft Environmental Assessment and
Special Management Area Use Permit Application
SM1 2004/0013
TMK: 2-2-002:079

Thank you for the opportunity to review and comment on the Draft Environmental Assessment and Special Management Area Use Permit Application for the Hale Mahaolu Ehiku Elderly Housing Project in Kihei.

Upon review of the submitted documents, our department is in support of the project and Hale Maholu's application for a Section 201G-118 exemption from the County subdivision ordinance regarding park dedication requirements.

Should you have any questions, or need of additional comment or clarification, please call me, or Patrick Matsui, Chief of Parks Planning & Development at 270-7387.

c: Patrick Matsui, Chief of Parks Planning & Development

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, HI 96733-6898 • (808) 871-846

'04 JUL 19 P12:39

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

July 14, 2004

Mr. Joseph W. Alueta
Staff Planner
County of Maui
Department of Planning
250 S. High Street
Wailuku, HI 96793

Dear Mr. Alueta:

Subject: Elderly Housing Project
TMK: 2-2-002:073
I.D.: SM1 2004/0013

Thank you for allowing us to comment on the subject project.

In reviewing the information transmitted and our records, we have no objection to the subject project. We encourage the developer's electrical consultant to meet with us as soon as practical to verify the project's electrical requirements so that service can be provided on a timely basis

If you have any questions or concerns, please call Dan Takahata at 871-2385.

Sincerely,

Neal Shinyama

Neal Shinyama
Manager, Engineering

NS/dt:lkh

References

References

Community Resources, Inc., Maui County Community Plan Update Program Socio-Economic Forecast Report, January, 1994.

County of Maui, Maui County Data Book 2002.

Munekiyo, Arakawa & Hiraga, Inc., Application for Change in Zoning and Special Management Area Permit-Kihei Kalama Village Phase II-B Improvements, April 1998.

Munekiyo, Arakawa & Hiraga, Inc., Application for Special Management Area Permit - Worldmark, The Club, August 1998.

Munekiyo, Arakawa & Hiraga, Inc., Applications for Change in Zoning, Special Management Area Use Permit, Conditional Permit, Off-Site Parking Approval and Planned Development Approval - Wailea Business Center and Wailea Tennis Center Parking Improvements, March 1999.

Munekiyo, Arakawa & Hiraga, Inc., Applications for Change in Zoning, Special Management Area Use Permit and Off-Site Parking Approval - Kihei Town Center Renovations and Related Improvements, September 1999.

Munekiyo, Arakawa & Hiraga, Inc., Draft Environmental Assessment - Proposed Retail Plant Nursery at 2021 South Kihei Road, August 2000.

Munekiyo & Hiraga, Inc., Applications for Change in Zoning and Special Management Area Use Permit - Kihei Boat Storage and Rental at TMK 3-9-3:5, March 2002.

Munekiyo & Hiraga, Inc., Market Study for Hale Mahaolu Ehiku, February 2004.

Pacific Business News, July 28, 2000.

State of Hawaii, Department of Education, Kihei Elementary School Staff, Facility and Support Services Branch, June 4, 2003.

State of Hawaii, Department of Labor and Industrial Relations, Employment Figures, August 2004.

State of Hawaii, Department of Labor and Industrial Relations, Employment Figures, September 2002.

U.S. Census, 2000.

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

University of Hawaii, Department of Geography, Atlas of Hawaii, Third Edition, 1999.

Appendices

Appendix A

Summary of Proposed 201G Exemption Request

DRAFT

HALE MAHAOLU EHIKU ELDERLY AFFORDABLE HOUSING PROJECT PROPOSED SECTION 201G-118, HRS, COUNTY EXEMPTIONS FROM THE MAUI COUNTY CODE (MCC)

A. 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.

B. EXEMPTIONS FROM TITLE 14, MCC, PUBLIC SERVICES

1. An exemption from Chapter 14.34, MCC, Wastewater Assessment Fees for Facility Expansion and the Collection/Transmission System Upgrade for the Kihei Regional Wastewater Treatment System, shall be granted to exempt the project from the payment of fees for facility expansion and collection/transmission system upgrades.

2. An exemption from Chapter 14.68, MCC, Impact Fees for Traffic and Roadway Improvements in Kihei and Makena, Maui, Hawaii, shall be granted to exempt the project from traffic impact fees which may be adopted prior to the issuance of building permits for the project.

C. EXEMPTIONS FROM TITLE 16, MCC BUILDINGS AND CONSTRUCTION

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

2. An exemption from Chapter 16.26.3304, MCC, Improvements to Public Streets, relating to frontage improvements, shall be granted to exempt the project from providing public street improvements along the North-South Collector Road.

D. EXEMPTION FROM TITLE 18, MCC, SUBDIVISIONS

1. An exemption from Section 18.16.320, MCC, Parks and Playgrounds, shall be granted to exempt the project from park dedication and assessment requirements.

DRAFT

E. *EXEMPTIONS FROM TITLE 19, MCC, ZONING*

1. An exemption from Chapter 19.36, MCC, Off-Street Parking and Loading, shall be granted to permit a parking ratio of one (1) stall per elderly housing unit. For the Senior Center/Community and Adult Day Care Buildings, a parking ratio of two (2) stalls per 1,200 square feet shall be permitted. For the Adult Residential Care Home Building, the total parking requirement shall be two (2) stalls.

2. An exemption from Chapter 19.45, MCC, Project District Processing Regulations, shall be granted to exempt the project from the requirements of Project District Phase I, II, and III approvals.

3. An exemption from Chapter 19.74, MCC, Kihei-Makena Project District 5, shall be granted to allow the implementation of the proposed elderly housing project, including the Senior Center/Community Building, Adult Day Care Building, and Adult Residential Care Home. This exemption shall also permit building heights, setbacks, floor area ratio, and lot coverage as shown in the proposed site plan and preliminary architectural drawings dated August, 2004.

4. An exemption from Section 19.74.030, MCC, Multifamily PD-K/5, shall be granted to permit the use of a nursing or convalescent home and domiciliary facilities operated and maintained to provide nursing or supporting care without obtaining approval for special use.

5. An exemption from Section 19.74.060, MCC, Open Space PD-K/5, shall be granted to permit the use of lands designated as open space for the Adult Residential Care Home, related parking spaces, maintenance facility and retention basin.

F. *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.

G. *EXEMPTION FROM THE RULES AND REGULATIONS OF THE DEPARTMENT OF WATER SUPPLY*

1. An exemption from Section 2-4 (b), Rules and Regulations of the Department of Water Supply, Fire Protection, shall be granted to exempt the project from providing fire hydrants in the Old Welakahao Road and future North-South Collector Road rights-of-way. Fire hydrants will be provided on the project site at locations approved by the Department of Water Supply.

Appendix B

Archaeological Inventory Survey

Report 698-032090

Archaeological Inventory Survey Piilani Residential Community Phase II

Land of Keokea, Makawao District Island of Maui

PHRI

Paul H. Rosendahl, Ph.D., Inc.

Archaeological • Historical • Cultural Resource Management Studies & Services

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 • fax (808) 961-6998
P.O. Box 12838 • Tamuning, Guam 96911 • (671) 649-3045 • fax (671) 649-2411

Report 698-032090

Archaeological Inventory Survey Piilani Residential Community Phase II

Land of Keokea, Makawao District Island of Maui

by

Theresa K. Donham, M.A.
Supervisory Archaeologist

Prepared for

Belt Collins & Associates
680 Ala Moana Blvd., Suite 200
Honolulu, Hawaii 96813

April 1990

PHRI

Paul H. Rosendahl, Ph.D., Inc.
Archaeological • Historical • Cultural Resource Management Studies & Services

305 Mohouli Street • Hilo, Hawaii 96720 • (808) 969-1763 • FAX (808) 961-6998
P.O. Box 12835 • Tamuning, Guam 96911 • (671) 649-3045 • FAX (671) 649-2611

SUMMARY

At the request of Mr. Ed Kuniyoshi of Belt, Collins & Associates, representing Baldwin Pacific, Paul H. Rosendahl, Inc. (PHRI) conducted an archaeological inventory survey of the Phase II increment of the Piilani Residential Community project area, located in the Land of Keokea, Makawao District, Island of Maui (TMK:2-2-02:Por.42). The pedestrian survey portion of the inventory survey was conducted November 6-7, 1989, and site recording and testing was conducted December 28-30, 1989 and January 2-6, 1990.

Sixteen sites with 30 component features were identified during the survey. Three of these sites had been previously identified (Cordy 1977) and assigned numbers on the State Inventory of Historic Places (SIHP sites 1709-1711*). Thirteen new SIHP site numbers were assigned during the current survey (Sites 2512-2524). Identified features include nine terraces, seven enclosures, four C-shapes, four rock piles, two platforms, two midden scatters, an alignment, and a modified outcrop.

Limited subsurface testing was conducted at five sites. Portable cultural remains were identified at one of the five tested sites (2516).

Six sites identified within the project area are assessed as having significant information value at the regional and local level, and further data recovery is recommended at these sites. Additional vegetation clearing, mapping, and/or excavation is recommended at Sites 1710, 2514-2516, 2519, and 2522. One of these sites (2512) may include a shrine feature; provisional preservation is recommended, pending the findings of data collection. Sufficient data has been recovered from the remaining ten sites to warrant a recommendation of no further work.

---

* State Inventory of Historic Places (SIHP) site designation system: all five-digit site numbers prefixed by 50-50-10 (50=State of Hawaii, 50=Island of Maui, 10=USGS 7.5'series quad map ["Puu O Kali"]).

CONTENTS

ILLUSTRATIONS

TABLES

Table **Page**

INTRODUCTION

BACKGROUND

This report presents the results of an archaeological inventory survey conducted at the Phase II increment of the Piilani Residential Community project area, located at Kihei in the Land of Keokea, Makawao District, Island of Maui (TMK 2-2-02:Por.42). The survey was conducted by Paul H. Rosendahl, Ph.D., Inc. (PHRI) at the request of Mr. Ed Kuniyoshi of Belt, Collins & Associates, on behalf of their client, Baldwin Pacific. The overall purpose of the survey was to provide information appropriate to and sufficient for compliance with Special Management Area (SMA) and Phase II Project District development conditions as outlined by the County of Maui.

The pedestrian survey was conducted December 28-30, 1989, under the supervision of Supervisory Archaeologist Debra L. Soper, B.S., assisted by Field Archaeologists Jenny O'Clarey and Joanne SanFillipo. Site recordation and testing was conducted January 2-6, 1990 by Supervisory Archaeologist Theresa K. Donham, M.A., and Jenny O'Clarey. Approximately 180 labor-hours were expended during the field work portion of the survey.

This report constitutes the final report for the project. It includes project objectives and a scope of work, describes field methods and procedures, and findings, and presents general significance assessments and recommended general treatments for identified sites.

SCOPE OF WORK

The basic purpose of an inventory survey is to identify—to discover and locate on available maps—all sites and features of potential archaeological significance present within a specified project area. An inventory survey is extensive rather than intensive in scope, and is conducted basically to determine the presence or absence of archaeological resources within a specified project area. This level of survey indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. It permits a general significance assessment of the archaeological resources and facilitates formulation of realistic recommendations and estimates for any subsequent mitigation work as might be necessary or appropriate. Such work could include intensive data collection involving detailed recording of sites and features, and selected test excavations; and possibly subsequent data recovery research excavations, construction monitoring, interpretive planning and development, and/or preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The basic objectives of this inventory survey were (a) to identify all sites within the project area, (b) to evaluate the potential general significance of all identified resources, (c) to determine the possible impacts of proposed development on the identified resources, and (d) to define the general scope of any subsequent data collection and/or other mitigation work that might be necessary or appropriate.

Based on a review of available background literature, general familiarity with the Kihei/Kula area, and discussions with Ms. Agnes Griffin, staff archaeologist for Maui and Molokai in DLNR-HSS/SHPO, the following specific tasks were determined to constitute an appropriate scope of work for the inventory survey:

1. Conduct limited archaeological and historical documentary background research involving review and evaluation of readily available archaeological and historical literature, historic documents and records, and cartographic sources relevant to the immediate project area;

2. Conduct 100% coverage, variable-intensity (30- to 90-ft intervals) surface survey of the Phase II increment area in order to identify, record, and evaluate (a) all previously identified sites, and (b) all newly identified sites;

3. Conduct limited subsurface testing of selected sites and features identified within the Phase I area (a) to determine the presence or absence of potentially significant buried cultural features or deposits, and (b) to obtain suitable samples for age determination analyses;

4. Analyze background and field data, and prepare appropriate reports; and

5. Prepare a formal Archaeological Data Recovery Plan, to be reviewed by DLNR-HSS/SHPO, to provide guidance for any subsequent archaeological mitigation work.

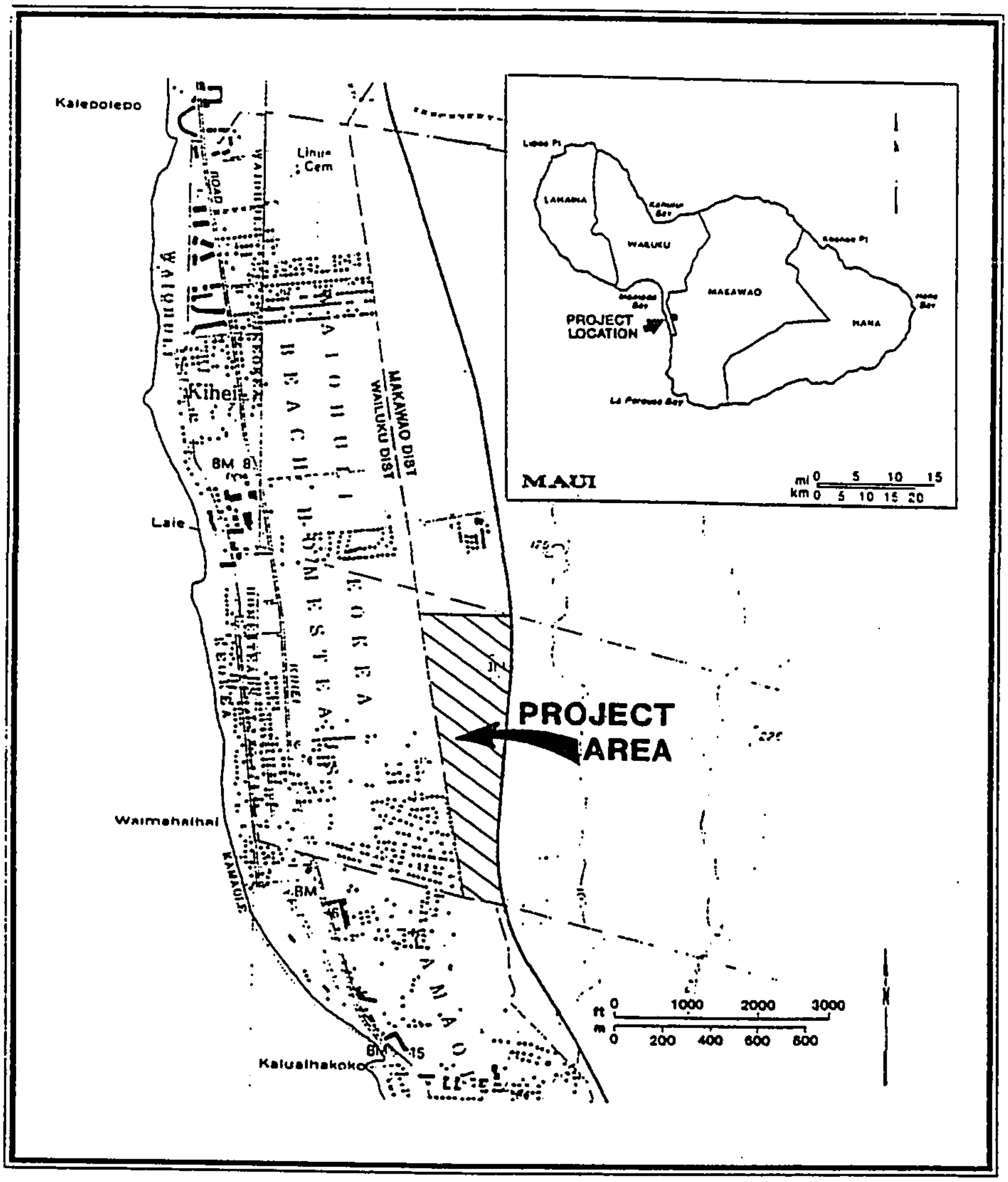


Figure 1. PROJECT AREA LOCATION MAP

ARCHAEOLOGICAL INVENTORY SURVEY
PIILANI RESIDENTIAL COMMUNITY - PHASE II
Land of Keokea, Makawao District, Island of Maui
(TMK:2-2-02:Por.42)

PHRI Project 89-698 *April 1990*

(including 11 heiau) were, however, recorded in the uplands of Waiohuli and Keokea (Walker 1931). Walker's survey, other less extensive surveys, and excavations conducted in Maui County prior to 1970 were summarized by Emory and Hommon (1972) in a broad cultural resource management plan prepared for the County of Maui.

Numerous archaeological studies have been conducted in the coastal portion of Makawao District since 1970 in conjunction with resort development. These studies are concentrated in the Wailea/Makena area, located approximately three miles south of the project area. One of the earliest contract projects in the Wailea/Makena area was Kirch's survey and subsequent excavations at Palauea (Kirch 1969, 1970, and 1971). Kirch's analysis of two coastal site complexes (SIHP Sites 1028 and 1029) offered hypotheses regarding Pre-Contact Period settlement patterns, subsistence, and social organization for leeward east Maui (Kirch 1971).

Kirch proposed that coastal settlement along the arid coastline of Palauea was nonpermanent, or transient, and was primarily for gathering sea resources. Permanent habitation sites were hypothesized to occur in upland resource zones, where intensive agriculture was conducted (Kirch 1971:83-85). Kirch also hypothesized that the residential complex examined (Site 1028) was probably occupied by a single descent group, whereas the heiau site (1029) was probably used or upkept by all occupants of the ahupua'a (Kirch 1971:83-85). A single radiocarbon date was assayed from a charred post excavated at Site 1028; it yielded a calendrical range of AD 1545-1745 (Kirch 1971:76).

Subsequent to Kirch's study, a number of reconnaissance and testing projects have been conducted in the Wailea/ Makena area (Barrera 1974, Clark 1974, Cleghorn 1974 and 1975, Barrere 1975, Hommon 1975, Cordy 1978, Haun 1978, Sinoto 1978, Jourdane and Sinoto 1979, Bordner 1980, Schilt and Dobyns 1980, Bordner and Cox 1982, Walker, Rosendahl and Haun 1985, Dicks and Haun 1987, Dobyns 1988, Haun 1988, Shapiro and Haun 1988). Interpretation of findings for specific project areas by the B.P.Bishop Museum have generally upheld Kirch's model of temporary coastal use from permanent residential sites located in the uplands (Jourdane and Sinoto 1979, Schilt and Dobyns 1980). Schilt and Dobyns refer to this model as a "dual pattern of occupation and utilization" (1980:77).

Schilt and Dobyns located 76 features and tested six sites in the Mokapu Beach area of Wailea. Among the features identified were 23 C-shapes, 13 circular enclosures, 13 hillside terraces, wall segments, terraces, cairns, and a single platform. Radiometric dates obtained during the testing are within the relatively late prehistoric period, between AD 1550 and 1750 (Schilt and Dobyns 1980:46). Many of the C-shapes and small enclosures were interpreted by Schilt and Dobyns as agricultural features, and they indicate that the presence of these features in the coastal zone is not in accordance with the rather specialized, nonpermanent use of this zone proposed by Kirch (Schilt and Dobyns 1988:77).

Radiometric dates assayed during additional testing and mitigation projects for coastal Makawao District have continued to exhibit late Pre-Contact Period use (Haun 1978:75, Dicks and Haun 1987:29).

Four previous studies have been conducted either within or adjacent to the project area. The earliest of these was a reconnaissance survey of the proposed Piilani Highway Corridor, which presently defines the eastern boundary of the project area. This corridor was examined by Cox (1976), who located two C-shapes in Keokea, and recovered volcanic glass, dated at AD 1724-1784, from a small cave in Kamaole (Cox 1976).

The following year, Cordy conducted a survey of nine drainage gullies and an inland corridor through the barren scrub zone between Kealia Pond and Wailea (1977). His survey corridor through Keokea incorporated a strip 300-350 ft wide to the east of the jeep road which defines the western boundary of the project area. At the time of Cordy's survey, Kihei Elementary and Intermediate School had not been constructed, although bulldozer disturbance was noted for both Waiohuli and Keokea (Cordy 1977:30-32). Cordy located seven sites within and immediately north of the project area in Keokea. These are summarized below:

Site 1706 - Rock mound and a 10-20.0 m long wall at the base of a knoll, at the northern end of the Keokea section of the corridor.

Site 1707 - Low enclosure on the knoll above Site 1706.

Site 1708 - Two low enclosures on a knoll, 20-30.0 m inland from Site 1707.

Site 1709 - Two low enclosures on a knoll, 20-30.0 m east of Site 1706.

Site 1710 - Enclosure located just inland of the jeep road along the western boundary of the corridor.

Site 1711 - Small C-shape.

Site 1712 - Low enclosure built on bare pahoehoe (Cordy 1977:34-39).

In conjunction with his survey, Cordy offered a reexamination of Kirch's settlement model for leeward East Maui. Briefly, he proposed that permanent habitation did occur at several locales along the coastline, as well as in the uplands, and that permanent coastal settlement was more likely to occur where the inland agricultural zone was less than seven miles from the coast (Cordy 1977:14-16). Coastal habitation sites were expected by Cordy to be less specialized than Kirch proposed, and to include small-scale agriculture, livestock raising, and aquaculture as well as fishing (1977:23).

In 1982, Environmental Impact Statement Corporation (EISC) conducted a biological and archaeological survey of the Phase I and II increments of the Piilani Residential Community project area. A single site was located within the Waiohuli (Phase I) portion of the project area, and eight sites were located in Keokea. The sites are summarized below:

Site 1 - L-shaped wall and C-shape on a ridge outcrop.

Site 2 - C-shaped shelter

Site 3 - Possible alignment on an outcrop

Site 4 - Alignment with uprights

Site 5 - Two alignments on an outcrop

Site 6 - Low enclosure between two outcrops

Site 7 - C-shape on the side of a large outcrop

Site 8 - Wall 25 m southwest of Site 7 (EISC 1982:B-3,B-4).

As far as could be determined, only one of the EISC sites (Site 2) correlates with a site previously recorded by Cordy (SHIP Site 1711). The EISC sites were not registered on the State Inventory of Historic Places at the time of that survey.

In 1986, Kennedy conducted a surface reconnaissance survey of the proposed golf course immediately east of the project area (Silversword Golf Course). Kennedy's brief letter report of findings indicates that no archaeological features were located within the project area (1986).

Other field work conducted within Keokea Ahupua'a includes studies by B.P. Bishop Museum and PHRI of Hawaiian Homes lands in upper Waiohuli and Keokea. In 1987, Riford reported findings 53 sites in the Waiohuli section; these were primarily agricultural features (60%), with about 20% interpreted as habitation features (Riford 1987:32-33). A reexamination of this area was recently completed by PHRI and the report of findings is in preparation (Haun et al., in prep).

HISTORICAL DOCUMENTARY RESEARCH

As part of their corridor surveys associated with Piilani Highway, Cox (1976) and Cordy (1977) conducted archival research which focused on identifying Land Commission Awards (LCA) within the affected ahupua'a. EISC also conducted LCA record searches. These studies indicate that no native kuleana (house and/or garden plots) were claimed and awarded by the Land Commission within the project area. Land Commission Awards were given for the uplands of Keokea, in the area described in native testimonies as being between the mountain and the kula. Awards in this area were for patches of sweet potatoes, Irish potatoes, bananas, taro, sugarcane, and house lots (cf. Native Testimonies for LCA 6414-6417, 6540, 6543, 6592, 6656, 6705, 6738, and 7971).

Historical documentary research by Wong Smith (Appendix B) indicates that there are no known coastal heiau in Keokea; however, three major upland heiau were recorded by Walker (1931)—Molohai, Papakea, and Kaumiumimua Heiau. A fourth upland heiau (Ho'oula Ua) is described by Ashdown (1971:46 [Appendix B]). These heiau are described in Appendix B.

Cox's (1976) study includes information on two heiau which were known to exist at Kalepolepo along the coastal boundary between Waiohuli and Kaonoulu. These include Kalaihi Heiau (in Kaonoulu) and the Kealalipoa Heiau. Both heiau have apparently been destroyed (Cox 1976:14).

Cox also identified, from historic sources, three fishponds in coastal Waiohuli and Keokea (1976). These were constructed as walls on the shallow reef shelf present in this area. The ponds include Kalepolepo, Keokeakai, and Waiohulikai (Cox 1976:4). Kalepolepo Pond was apparently in use at the time of Kamehameha I, who had it rebuilt (Cox 1976:4). The wall remnants identified by Cordy at the mouth of Waipuilani Gulch (Site 1704) in Waiohuli may be remains of this pond.

The project area is within Apana I of Grant 9325 to Haleakala Ranch Company. Historic land use within the project area has been associated with ranch activities, such as cattle grazing.

FIELD METHODS AND PROCEDURES

A 100%-coverage pedestrian survey was conducted at the project area November 6 and 7, 1989 by a crew of three persons. Pedestrian sweeps were oriented east-west, beginning at the northern end of the project area. The southernmost corridor of each sweep was flagged so that the adjacent sweep would be properly spaced. Crew members were spaced at 10.0 m intervals, except where grass was particularly thick. In these areas, intervals between surveyors were decreased to 5.0 m. The vicinities of previously located sites were subjected to further examination if these sites could not be relocated during the sweeps. All cultural features were flagged, given temporary site numbers, and were plotted on the project area topographic map (Belt Collins & Associates, 1":200') as they were encountered. After completion of the pedestrian sweeps, sites were returned to and cleared.

Twenty temporary site numbers were initially assigned during the sweeps. After vegetation clearing, it became obvious that four of these sites were the result of bulldozer disturbance, and were deleted (T-1, -5, -19, and -20). The remaining sixteen sites were recorded (described and measured), mapped, and photographed using 35 mm black and white Tri-X film. Recordation was conducted December 28-30 and January 2-4, 1990, by a crew of two persons. Each recorded site was marked with pink-and-blue flagging tape and with an aluminum tag bearing the temporary site number, date, and PHRI project identification number (PHRI 89-698).

The correlation of temporary PHRI numbers, EISC numbers, and SIHP numbers is shown in Table 1. Five of the EISC sites (Sites 3-6 and 8) and four of the SIHP sites previously recorded by Cordy (1706-1708 and 1712) could not be relocated despite considerable effort to find them. All of the EISC sites not relocated are at the southern end of the project area, which has been been extensively grubbed (by bulldozer). Three of the four SIHP sites not relocated were within the portion of Keokea affected by the Kihei Elementary and Intermediate School construction.

Subsurface testing was conducted January 4-6, 1990 by a crew of two persons. All test units were 0.5 by 0.5 m square and were excavated in natural soil layers, with arbitrary levels of 0.1 m when warranted. The deposits were generally quite thin, with most layers averaging c. 0.05 m thick. Standard PHRI excavation grid forms were completed for all layers and levels, and excavated soil was screened through 1/8" hardware cloth. Portable remains observed in the screen were retained by layer/level and were subsequently washed, counted, weighed, and tabulated.

Charcoal was observed in the project area, but in quantities insufficient for dating samples. Soil samples were collected from layers so that color, texture and consistence could be compared between the various tested features. All test units were photographed after excavation, one or two walls were profiled, and the units were backfilled.

Table 1.

CORRELATION OF SITE NUMBERS

PHRI 1989 Survey		Cordy 1977 Survey	EISC 1982 Survey
Temp. No.	SIHP No.	SIHP No.	Temp.No.
T-2	2512	-	-
T-3	-	1711	2
T-4	2513	-	-
T-6	2514	-	-
T-7	2515	-	-
T-8	2516	-	-
T-9	2517	-	-
T-10	2518	-	-
T-11	2519	-	-
T-12	2520	-	-
T-13	2521	-	-
T-14	2522	-	7?
T-15	-	1710	-
T-16	2523	-	1
T-17	-	1709	-
T-18	2525	-	-

FINDINGS

As mentioned previously, the project area was included in two previous archaeological surveys, one conducted in 1977 by Cordy and the other conducted in 1982 by Environmental Impact Study Corporation (EISC). Cordy located seven sites within the project area, and EISC located eight sites. One of the EISC sites had been previously recorded by Cordy, for a total of fourteen previously located sites within the project area. Five of these sites were relocated during the current survey. The remaining nine sites have been destroyed by construction activities and surface grubbing. Three of the previously identified sites that were relocated had been registered on the State Inventory of Historic Places (SIHP). Thirteen new SIHP numbers were assigned during the current survey.

SURFACE FINDINGS

Sixteen archaeological sites with thirty component features were identified within the project area during the current project (Table 2). Nine of these sites consist of a single feature; four sites consist of two features; two sites have four features, and one site consists of five features. In general, the sites are located on the top and upper slope areas of low to prominent knolls situated along the edges of natural terraces. Elevation of the sites ranges from 38 to 96 ft AMSL; average elevation is 70 ft AMSL. All but one of the identified sites are in the northern half of the project area (Figure 2). This patterning is a reflection of recent grubbing activities, which have obliterated sites in the southern portion. At least four sites were destroyed in the southern portion of the project area, as indicated by the prior EISC survey.

Nine formal feature types are represented among the thirty identified features (Table 3). Terraces are the predominant formal type, with nine identified. It is likely that additional terraces will be located during further data recovery. Sites 2514, 2516, 2519, and 2522 are suspected of containing additional terrace features.

Two types of terraces were identified. The most common form consists of stepped soil flats defined by aligned boulders and cobbles. These features are most common along the slopes of knolls and natural terraces. They are generally in an eroded condition, and it is safe to assume they they were once more clearly defined and probably contained more soil than is now present. None of the soil terraces have been tested to date; it is unlikely that cultural deposits or datable remains are present in subsurface contexts at these features. Stepped soil terraces are currently identified at Sites 2512, 2518, and 2519. They occur in association with a low platform at Site 2512.

Four of the identified terrace features are rock-filled and occur on flat as opposed to sloping terrain. These terraces are generally small and low. The surface is either covered with rocks, or rocks are protruding out of a thin soil layer. In three cases (all at Site 2520) loose rocks are piled on top of the terraces.

A rock-filled terrace at Site 2520 was tested, and found to contain a layer of loose, loamy soil intermixed with rocks, overlying the old ground surface. This soil layer represents either naturally accumulated duff and colluvium, or it was artificially deposited at the time of terrace construction. In either case, the feature has been functional in retaining the soil.

Both types of terraces identified within the project area are assumed to reflect agricultural activities. They are all too small and irregular to be considered as habitation features. One terrace at Site 2512 (Feature D) may represent a shrine. Its perimeter alignments contain a number of branch coral heads, and two upright stones are present at the base of the lowest terrace level.

Six low enclosures were identified at five sites within the project area. These features are constructed with single alignments or two courses of stacked boulders or cobbles. The enclosures are a range of shapes, including circular, oval, rectangular, and square. Two size categories are represented among these features. Two relatively large enclosures with interior areas of 14.4 and 12.9 sq m were identified at Sites 1711 and 2516, respectively. The four smaller enclosures have interior areas which range from 6.96 to 4.10 sq m. Both of the large enclosures and one of the small ones were tested during this project. A cultural deposit which appears to reflect habitation was identified at one of the large enclosures (Site 2516, Feature B). This feature is associated with a second low enclosure (Feature B), which exhibits the smallest interior area among the identified enclosures.

The enclosures that were tested and which contained no cultural remains are interpreted as agricultural features. It should be noted that the portable cultural remains recovered from Feature B at Site 2516 were all very small and the deposit was somewhat indistinct. It is therefore possible

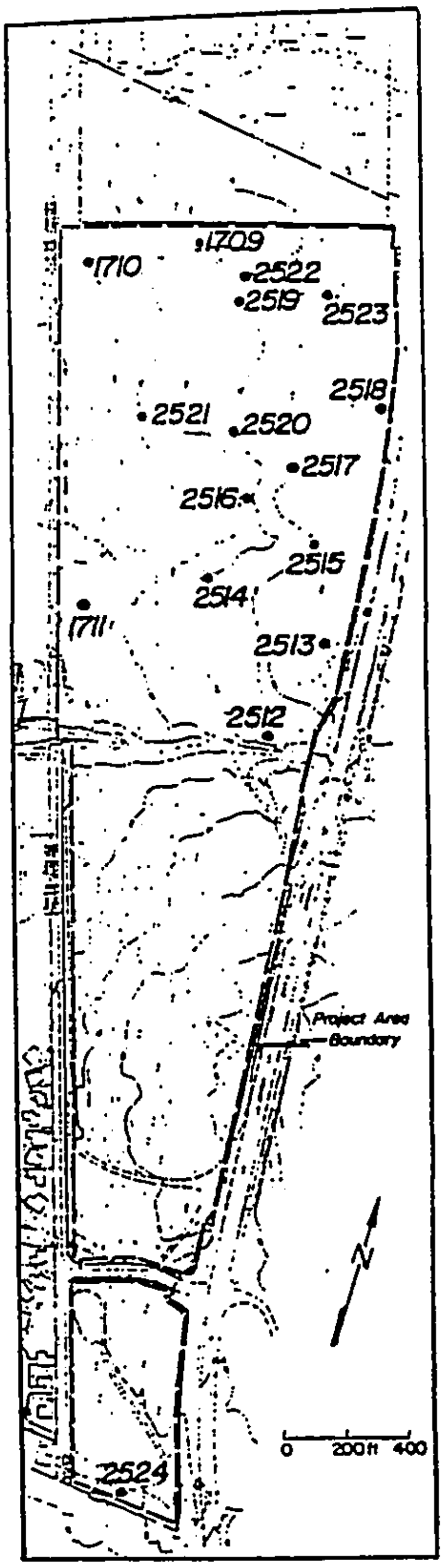


Figure 2. SITE LOCATION MAP

Table 2.

SUMMARY OF IDENTIFIED SITES

*SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess. R	I	C	+Field Work Tasks DR	SC	EX
1709	Low enclosure	Agriculture	M	L	L	-	-	-
1710	Enclosure	Agriculture/ temp. habitation	M	M	L	+	-	+
1711	Complex (2)++	Agriculture	M	L	L	-	-	-
	A Low enclosure							
	B C-Shape							
2512	Complex (5)		M/H	L	L/H	+	-	+
	A Platform	Possible habitation						
	B Low enclo.	Possible agriculture						
	C Terrace	Agriculture						
	D Terrace	Possible shrine						
	E Rock pile	Indeterminate						
2513	Low enclosure	Agriculture	M	L	L	-	-	-
2514	Platform	Habitation	M	M	L	+	+	+
2515	Modified outcrop	Agriculture	L	L	L	-	-	-
2516	Complex (2)		M	L	L	+	-	+
	A Low enclosure	Agriculture						
	B Low enclo.	Temp. habitation						

*State Inventory of Historic Places (SIHP) site number (50-50-10-)

#Cultural Resource Management Value Mode Assessment:
Value: R = scientific research
I = interpretive
C = cultural
Degree: H = high
M = moderate
L = low

+Recommended Field Work Tasks:
DR = detailed recording
SC = surface collection
EX = excavation

++ Number of component features

Table 2. (cont.)

SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess. R	I	C	Field Work Tasks DR	SC	EX
2517	Midden Scatter	Habitation	L	L	L	-	-	-
2518	Complex (4)	Agriculture	M	L	L	-	-	-
	A Terrace B Terrace C Rock pile D Alignment							
2519	Terrace	Agriculture	M	L	L	+	-	+
2520	Complex (4)	Agriculture	M	L	L	-	-	-
	A Terrace B Terrace C Terrace D Rock pile							
2521	Midden scatter	Habitation	L	L	L	-	-	-
2522	Complex (2)	Agriculture/ poss. habitation	M	L	L	+	-	+
	A Box C-shape B Terrace							
2523	Complex (2)	Agriculture	M	L	L	-	-	-
	A C-shape B C-shape							
2534	Rock pile	Indeterminate	L	L	L	-	-	-

that the enclosure was used for agricultural purposes sometime after its use as a habitation feature, resulting in the mixing and considerable breakage of portable remains.

Among the low enclosures, only the one with the identified cultural deposit exhibits an opening in the perimeter alignment or wall. Three of the enclosures contain soil fill that is raised slightly above the surrounding ground surface, and three have depressed interiors. All are generally cleared of surface stones, and most appear to have no buried or partially buried stones inside.

A single relatively high-walled enclosure was identified within the project area (1710). Average wall height of this feature is about 0.7 m, and the interior area is 102.0 sq m. The interior wall height of this enclosure in most places is insufficient to indicate it was used as an animal pen. The interior surface along portions of the wall is nearly level with the top of the wall. This feature to date has not been tested; it may represent either agriculture or temporary habitation, or both.

Table 3.

OCCURRENCE AND FREQUENCY OF FORMAL FEATURE TYPES

Formal Type	Count	% of Total	Occurrence (SIHP Site)
Alignment	1	3.33	2518 (D)
C-shape	4	13.33	1711 (B), 2522 (A), 2523 (A,B)
High enclosure	1	3.33	1710
Low enclosure	6	20.00	1709, 1711 (A), 2512 (B), 2513 2516 (A,B)
Modified outcrop	1	3.33	2515
Platform	2	6.67	2512 (A), 2514
Rock pile	4	13.33	2512 (E), 2518 (C), 2525 (D), 2524
Shell midden	2	6.67	2517, 2521
Terrace	9	30.00	2512 (C,D), 2518 (A,B), 2519, 2520 (A,B,C), 2522 (B)
Total :	**30**	**99.99**	

Four small C-shaped walls were identified at three sites within the project area. Interior area of these four features ranges from 5.0 to 3.0 sq m. Three of the four C-shapes are curved and are constructed of loosely piled rocks. One feature (2522 A) has straight sides and squared corners. This feature has an interior area of only 3.64 sq m, which is quite small to be considered as a possible habitation feature.

One of the C-shaped walls was tested during this survey (2523 A). This feature is one of the largest C-shapes identified (4.2 sq m interior area). No cultural remains were identified. In general, the interiors of the C-shapes are irregular and contain partially buried and surface rocks. They are interpreted as agricultural features.

It should be noted that in certain survey areas along the coast in Makawao District, C-shapes and low enclosures have been associated with WWII period infantry exercises (Haun 1988). The features identified in Keokea cannot be readily associated with modern military construction. All of these features were totally cleared for mapping and excavation and in no case were portable remains suggesting military use, such as tin cans, present. In addition, the features are generally eroded and in poorer condition than expected for structures erected c. 45 years ago.

Two platforms were identified within the project area (2512 and 2514). These features exhibit surface areas of 58.5 and 18.0 sq m, respectively. Shell midden occurs on the surface of both features, and they appear to represent habitation features. The platforms are located along the edge of the same terrace formation, at similar elevations, 165.00 m apart. These features have not been tested to date.

Two surface scatters of marine shell were identified (2517 and 2521). These sites are both badly eroded, and little to no soil remains overlying bedrock. Both scatters are sparse with no visible concentrations.

Detailed descriptions of the recorded sites and features are presented in Appendix A.

SUBSURFACE FINDINGS

Test units were excavated at five sites within the project area. As indicated above, all test units were 0.5 by 0.5 sq m, and were excavated in natural layers, with 1/8" mesh screening of all soil. The purpose of testing was to aid in determining the function of various features, to obtain samples for age determination, and to determine the nature and extent of any subsurface cultural deposits that might be present.

Features tested include three low enclosures, a rock-filled terrace, and a C-shape (Table 4). In all cases, excavation continued until virtually impenetrable decomposing bedrock was encountered. This stratum is very similar at all test unit locales, and was encountered at depths ranging from 0.15 to 0.27 m below surface. Three soil layers were observed in all test units; Layer III was generally uniform at all sites, whereas Layers I and II varied somewhat.

Layer III consists of a gravelly silty loam or silty clay loam. Coloration of this layer ranges from 7.5YR3/2 to 2.5YR3/4 and 2.5/2. It is an undisturbed natural stratum in all features examined, and ranges in thickness from 0.08 to 0.12 m. Beginning depth of this layer ranges from 0.06 to 0.19 m below surface.

Layer II consists of silty loam in three cases, sandy loam in one case, and silty clay in one case (Table 4). The silty loam Layer II deposits are very thin, ranging in thickness from 0.02 to 0.05 m. These deposits are dark reddish-brown and are consistently darker than the underlying Layer III soils. They contain small amounts of naturally occurring gravels, and appear to be natural, undisturbed strata.

The sandy loam Layer II stratum at Site 2523 is 0.03 m thick and is dark reddish-brown (5YR3/4). It is uncertain whether the sand in this layer is naturally or artificially introduced. Sand does not occur in the overlying Layer I soil at this site.

The silty clay Layer II soil at Site 2516 is the only soil stratum encountered that can be considered a cultural deposit. It is 0.09 m thick, and begins 0.10 m below surface. The boundary between this and the two surrounding layers is diffuse; it is, however, distingishable based on color, texture, consistence, the absence of natural gravels, and the presence of midden and artifacts. This layer is very dense and rather packed. Color is 5YR3/2-3/3 with patches of darker matrix.

A relatively wide range of portable remains were recovered from the Layer II deposit at Site 2516 (Table 5). At least four species of marine shellfish are represented, in addition to Echinoidea and Crustacea. Charcoal and burned earth are present in small quantities, and both basalt and volcanic glass debitage is present. This deposit appears to represent a period of habitation (continuous or discontinuous) in and/or around the feature. The horizontal extent of the deposit is presently unknown. The known vertical extent is 0.09 m thick with no internal stratification observed.

A total of 4.45 g of portable remains were recovered from 36 liters of soil removed from Layer II. All of the portable remains are small, as indicated by the weight to count ratio. The overall size grade of the remains suggests that the deposit was subjected to exposure, or other factors causing breakage, after the remains were discarded. An insufficient quantity of charcoal was recovered for age determination. It appears, however, that a sufficient quantity should be obtainable if a larger area of the feature is excavated.

Layer I soils encountered in test units include silty sand, silty loam, and silty clay loam. Thickness of these layers range form 0.03 to 0.10 m. They are relatively free of gravel, although cobbles and surface stones are present in some cases. In general, this layer exhibits a very poorly defined to absent O horizon, or surface duff deposit. It is eroded in all cases, and probably represents the remnants of a deflated surface layer. No cultural remains were encountered in this layer.

The only feature containing a silty clay loam Layer I soil is Feature B, Site 2516, which also contains the cultural deposit. The setting of this feature contrasts with most of the tested features in that it is situated at the base of a steep terrace slope, rather than on top of the terrace. The clay components in the soil here may therefore be the effect of colluvial deposition.

Table 4.

SUMMARY OF TEST UNIT EXCAVATIONS

		Layer I		Layer II		Layer III		Max.
Site	Feature	Thkns.	Text.	Thkns.	Text.	Thkns.	Text.	Depth
1711	A	0.03	SiS	0.03	SiL	0.09	GSiL	0.15
2513	-	0.03	SiL	0.05	SiL	0.13	GSiCL	0.21
2516	B	0.10	SiCL	0.09	SiC*	0.08	SSiCL	0.26
2520	A	0.08	SiL	0.02	SiL	0.17	GSiCL	0.27
2523	A	0.05	SiL	0.03	SL	0.12	GSiCL	0.20

Thickness (Thkns.) in meters
Texture (Text.): C=clay, G=gravelly, L=loam, S=sand, Si=silt
*Cultural deposit

Table 5.

SUMMARY OF PORTABLE REMAINS, SITE 2516
FEATURE B, LAYER II

	Count	*Grams*
MARINE INVERTEBRATES		
GASTROPODS		
Cypraeidae	1	0.70
Litterina pintado spp.	2	0.20
Planaxis labiosa	2	0.40
Unidentified gastropods	5	0.10
SUBTOTAL GASTROPODS:	10	1.40
BIVALVES		
Brachidontes crebristriatus	2	0.20
OTHER		
Echinoidea	49	2.10
Crustacea	12	0.30
TOTAL M. INVERTEBRATES :	73	4.00
VEGETAL REMAINS		
Charcoal	6	0.10
OTHER		
Burned earth	4	0.20
ARTIFACTS		
LITHICS		
Basalt flake	1	0.10
Volcanic glass flake	1	0.05
TOTAL PORTABLE REMAINS :	85	4.45

CONCLUSION

DISCUSSION

Among the 30 features identified during the current survey, 23 (77%) are interpreted as agricultural features, five appear to represent habitation activities (2512, Feature A; 2514 and 2516, Feature B; and 2517 and 2521), one feature (1710) is either agricultural or habitational, and one feature (2512, Feature D) is a possible shrine. Among the agricultural features, five are low enclosures, four are C-shapes, eight are terraces, four are rock piles, one is a modified outcrop, and one is an alignment. With one exception, the rock piles and alignment are associated with and appear to be functionally related to terraces.

The identified agricultural features occur at a range of elevations that include the lowest (38 ft AMSL) and highest (96 ft AMSL) site locales within the project area. Immediate topographic settings for these features include the upper slopes of low to prominent knolls at the edges of natural terraces, and relatively low lying flats at the bases of natural terrace slopes. The spatial patterning of agricultural features and sites in general within the project area is affected rather severely by historic and modern land alterations. The most representative area of site patterning occurs between Kihei Elementary and Intermediate School and the ephemeral drainage gully near the center of the project area. In this section, sites are regularly spaced, with no clear tendency to cluster.

Habitation features include two low platforms, two surface scatters of shell midden, and a low enclosure. The platforms could well represent relatively permanent habitation, whereas the other three features most likely reflect temporary or short-term habitation.

As mentioned previously, the project area is situated within the dry scrub zone referred to as the kula, or barren zone (Cox 1976 and Cordy 1977). In Keokea, the kula zone begins roughly one-quarter mile inland from the coast and extends inland for 6.8 miles. Prior to intensive archaeological investigations in the kula zone, the area was thought to have been mostly unoccupied and unexploited by traditional Hawaiian agriculturalists. According to Cordy, "Work in similar environments in Hawaii has indeed revealed that barren zones were not used for permanent housing or subsistence" (1977:24). Intensive use of the zone was assumed to have begun with the introduction of cattle, which were generally pastured on open kula ranges.

More recent survey work by Cordy and Athens (1988) in the Makena area, and Schilt and Dobyns (1980) in Paeahu, found a very similar distribution pattern of feature types within the lower elevations of the kula zone. Low enclosures, C-shapes, hillside terraces and rock piles were the most numerous features in the Paeahu survey area; these were interpreted as having an agricultural function (Schilt and Dobyns 1980:8-11; 22-24). Likewise, Cordy and Athens recorded low enclosures with cleared interiors, terraces, and alignments (1988:24). The latter study was also able to document clusters of these features associated with both temporary and permanent habitation sites (1988:24). The findings of the Makena survey led Cordy and Athens to postulate that "...*the area of Makena from about 0.25 miles* inland (80 ft) up to the old forest line at the 1200 ft contour 2.1 miles inland was the cultivation zone" (Cordy and Athens 1988:23).

The findings of Schilt and Dobyns (1980), Cordy and Athens (1988), and this survey, clearly indicate that the barren zone was more extensively utilized by traditional Hawaiian agriculturalists than has been assumed. In addition, it appears that despite a much more extensive kula zone for Keokea (6.8 miles vs. 2.1 miles for Makena), a very similar pattern of agricultural land use was implemented in both areas. The agricultural zone in Keokea began at a lower elevation than that indicated for Makena, but at a similar linear distance from the coast. The absence of clear patterning within the project area could well be a function of the size of the study area and recent land alterations.

It is clear that erosion, cattle grazing, and grubbing have effectively diminished much of the archaeological record in the portion of the kula immediately mauka of Kihei and Wailea. Grubbing within and immediately around the project area has reduced the site count considerably within the last decade, as indicated by the loss of sites recorded in earlier surveys by Cordy (1977) and EISC (1982). The extant remains therefore represent a fraction of the features that were once present, and a portion of the actual activities are therefore represented.

On the basis of age determination analysis completed for other projects in leeward East Maui, it is likely that the features within the survey area post date c. AD 1500 (Dobyns 1988:27 and Cordy and Athens 1988).

CONCLUSION

DISCUSSION

Among the 30 features identified during the current survey, 23 (77%) are interpreted as agricultural features, five appear to represent habitation activities (2512, Feature A; 2514 and 2516, Feature B; and 2517 and 2521), one feature (1710) is either agricultural or habitational, and one feature (2512, Feature D) is a possible shrine. Among the agricultural features, five are low enclosures, four are C-shapes, eight are terraces, four are rock piles, one is a modified outcrop, and one is an alignment. With one exception, the rock piles and alignment are associated with and appear to be functionally related to terraces.

The identified agricultural features occur at a range of elevations that include the lowest (38 ft AMSL) and highest (96 ft AMSL) site locales within the project area. Immediate topographic settings for these features include the upper slopes of low to prominent knolls at the edges of natural terraces, and relatively low lying flats at the bases of natural terrace slopes. The spatial patterning of agricultural features and sites in general within the project area is affected rather severely by historic and modern land alterations. The most representative area of site patterning occurs between Kihei Elementary and Intermediate School and the ephemeral drainage gully near the center of the project area. In this section, sites are regularly spaced, with no clear tendency to cluster.

Habitation features include two low platforms, two surface scatters of shell midden, and a low enclosure. The platforms could well represent relatively permanent habitation, whereas the other three features most likely reflect temporary or short-term habitation.

As mentioned previously, the project area is situated within the dry scrub zone referred to as the kula, or barren zone (Cox 1976 and Cordy 1977). In Keokea, the kula zone begins roughly one-quarter mile inland from the coast and extends inland for 6.8 miles. Prior to intensive archaeological investigations in the kula zone, the area was thought to have been mostly unoccupied and unexploited by traditional Hawaiian agriculturalists. According to Cordy, "Work in similar environments in Hawaii has indeed revealed that barren zones were not used for permanent housing or subsistence" (1977:24). Intensive use of the zone was assumed to have begun with the introduction of cattle, which were generally pastured on open kula ranges.

More recent survey work by Cordy and Athens (1988) in the Makena area, and Schilt and Dobyns (1980) in Paeahu, found a very similar distribution pattern of feature types within the lower elevations of the kula zone. Low enclosures, C-shapes, hillside terraces and rock piles were the most numerous features in the Paeahu survey area; these were interpreted as having an agricultural function (Schilt and Dobyns 1980:8-11; 22-24). Likewise, Cordy and Athens recorded low enclosures with cleared interiors, terraces, and alignments (1988:24). The latter study was also able to document clusters of these features associated with both temporary and permanent habitation sites (1988:24). The findings of the Makena survey led Cordy and Athens to postulate that "...the area of Makena from about 0.25 miles inland (80 ft) up to the old forest line at the 1200 ft contour 2.1 miles inland was the cultivation zone" (Cordy and Athens 1988:23).

The findings of Schilt and Dobyns (1980), Cordy and Athens (1988), and this survey, clearly indicate that the barren zone was more extensively utilized by traditional Hawaiian agriculturalists than has been assumed. In addition, it appears that despite a much more extensive kula zone for Keokea (6.8 miles vs. 2.1 miles for Makena), a very similar pattern of agricultural land use was implemented in both areas. The agricultural zone in Keokea began at a lower elevation than that indicated for Makena, but at a similar linear distance from the coast. The absence of clear patterning within the project area could well be a function of the size of the study area and recent land alterations.

It is clear that erosion, cattle grazing, and grubbing have effectively diminished much of the archaeological record in the portion of the kula immediately mauka of Kihei and Wailea. Grubbing within and immediately around the project area has reduced the site count considerably within the last decade, as indicated by the loss of sites recorded in earlier surveys by Cordy (1977) and EISC (1982). The extant remains therefore represent a fraction of the features that were once present, and a portion of the actual activities are therefore represented.

On the basis of age determination analysis completed for other projects in leeward East Maui, it is likely that the features within the survey area post date c. AD 1500 (Dobyns 1988:27 and Cordy and Athens 1988).

Available historical information for Keokea indicates that there was a substantial population within the ahupua'a, with permanent residencies concentrated in the upland portion of the ahupua'a. This pattern could be a reflection of changes in land use that occurred in the nineteenth century. The documentation of permanent residencies in the lower kula zone for the Pre-Contact Period is a crucial factor in determining if, and to what extent, residential sites were at one time more evenly distributed over the landscape.

There were also undoubtedly trails connecting the uplands with the coast, with associated shelters and other features located along the trails which crossed the kula zone. No indication of transportation routes between the coastal and upland zones of Keokea was observed within the project area, probably due to historic land alteration and dense ground cover. The temporary habitation features located within the project area could have been associated with trail corridors, but could have also been associated with agricultural activities conducted within the area. The locations of these sites do not, therefore, provide clues as to the possible routes of muaka/makai trails.

GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

A summary of tentative general significance assessments is given (Table 6) in order to facilitate HSS/SHPO review and cultural resource management planning. Significance categories are based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36CFR Par 60). Sites determined to be potentially significant for information content (Category A, Table 6) are assessed under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites potentially significant as excellent examples of a unique site or site type (Category B) are evaluated under Criterion C, which defines significant resources as those which "...embody the distinctive characteristics of a type, period or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction."

Sites with potential cultural significance (Category C) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (Draft Report, August 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historic depth." The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have a traditional cultural value."

Ten of the 16 sites identified within the project area during this survey contained a limited amount of information for the study of past cultural systems at the local and regional level. Information currently considered to be of potential use or value has been collected from these sites, and no further data collection is recommended at this time. Sites for which no further work is recommended include 1709, 1711, 2513, 2515, 2517, 2518, 2520, 2521, 2523, and 2524.

Six sites (1710, 2512, 2514, 2516, 2519, and 2522) are assessed as still containing information of value in the study of past cultural systems at the regional level. The information contained in these sites will aid substantially in the development of a new land use model for the lower elevation kula zone of leeward East Maui. Additional vegetation clearing, mapping, and excavation is recommended at these six sites. One of the six sites (2512) contains a feature that may represent a shrine (Feature D). If the specific function of this feature can be determined with additional field work, and if it is determined to be a shrine, then preservation of the feature "as is" is recommended.

In order to facilitate future client management decision regarding site treatments, sites are further evaluated in terms of three PHRI cultural resource management (CRM) value modes which are derived from the previously mentioned state and federal evaluation criteria. The archaeological sites are evaluated in terms of potential scientific research, interpretive, and/or cultural values. **Research value** refers to the potential of archaeological resources for producing information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and interregional levels of organization. **Interpretive value** refers to the potential of archaeological resources for public education and recreation. **Cultural value** refers to the potential of archaeological resources to preserve and promote cultural and ethnic identity and values. CRM value modes for specific sites are presented in Table 2.

It should be noted that the evaluations and recommendations presented within this final report have been based solely on a surface and limited subsurface inventory survey. There is always the possibility that potentially significant, unidentified subsurface cultural features or deposits will be encountered during the course of future archaeological investigations or subsequent development activities. In such situations, archaeological consultation should be sought immediately.

Table 6.

SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

Site Number	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
1709	-	+	-	-	-	+	-	-
1711	-	+	-	-	-	+	-	-
2513	-	+	-	-	-	+	-	-
2515	-	+	-	-	-	+	-	-
2517	-	+	-	-	-	+	-	-
2518	-	+	-	-	-	+	-	-
2520	-	+	-	-	-	+	-	-
2521	-	+	-	-	-	+	-	-
2523	-	+	-	-	-	+	-	-
2524	-	+	-	-	-	+	-	-
Subtotal:	**0**	**10**	**0**	**0**	**0**	**10**	**0**	**0**
1710	+	-	-	-	+	-	-	-
2514	+	-	-	-	+	-	-	-
2516	+	-	-	-	+	-	-	-
2519	+	-	-	-	+	-	-	-
2522	+	-	-	-	+	-	-	-
Subtotal:	**5**	**0**	**0**	**0**	**5**	**0**	**0**	**0**
2512	+	-	-	*	+	-	-	*
Subtotal:	**1**	**0**	**0**	**1**	**1**	**0**	**0**	**1**
Total:	**6**	**10**	**0**	**1**	**6**	**10**	**0**	**1**

General Significance Categories:

A = Important for information content, further data collection necessary (CRM value mode=research value);
X = Important for information content, no further data collection necessary (CRM value mode=research value, SHPO=not significant);
B = Excellent example of site type at local, region, island, state, or national level (CRM value mode=interpretive value); and
C = Culturally significant (CRM value mode=cultural value).

Recommended General Treatments:

FDC = Further data collection necessary (further survey and testing, and possibly subsequent data recovery/mitigation excavations);
NFW = No further work of any kind necessary, sufficient data collected archaeological clearance recommended, no preservation potential;
PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work); and
PAI = Preservation "as is", with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

* Provisional assessment/treatment; definite assessment pending further data collection

REFERENCES CITED

ACHP (Advisory Council on Historic Preservation)

1985 Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review. Washington, D.C.: Advisory Council on Historic Preservation. (Draft Report) (August)

Barrera, W.

1974 An Archaeological Phase I Survey of Wailea, Kihei, Maui. Ms.080475. Dept. Anthro., B.P. Bishop Museum.

Barrere, D.

1975 Waile'a: Waters of Pleasure for the Children of Kama. Ms.090474 Dept. Anthro., B.P. Bishop Museum.

Bordner, R.M.

1980 Archaeological Reconnaissance of the Proposed Realignment of the Makena Coast Road: Update of Alignment "C." Prepared for Environmental Impact Study Corp.

Bordner, R.M., and D. Cox

1982 Makena Golf Course Extension: Archaeological Reconnaissance. Ms. Environmental Impact Study Corp.

CFR (Code of Federal Regulations)

36 CFR Part 60 National Register of Historic Places. Washington, D.C.: Dept. Interior, National Park Service.

Clark, S.

1974 Reconnaissance Survey of Makena Properties. Ms. 012174. Dept. Anthro., B.P. Bishop Museum. Prepared for Seibu Corporation.

Cleghorn, P.

1974 Survey and Salvage Excavations in Specified Areas of Wailea Lands, Maui. Ms.100274. Dept. Anthro., B.P. Bishop Museum. (Revised 1976)

1975 Phase II, Part 2. Archaeological Salvage Operations at Site 50-Ma-B10-1, Wailea. Ms.060175. Dept. Anthro., B.P. Bishop Museum.

Cordy, R.

1977 Kihei Flood Control Project: Archaeological Reconnaissance and Literature Search. Fort Shafter, Hawaii: U.S. Army Corps of Engineers.

1978 Archaeological Survey and Excavations at Makena, Maui. Third Increment, Seibu Golf Course: Fairways 1, 7 through 10, and 16 through 18. Ms.113078. Dept. Anthro., B.P. Bishop Museum.

Cordy R., and J.S. Athens

1988 Archaeological Survey and Excavation, Seibu Sites 1916 and 2101, Makena, Honuaula, Maui. International Archaeological Research Institute, Inc. Prepared for Seibu Hawaii, Inc., Kihei.

Cox, D.

1976 The Archaeology of Kula, Maui from Pulehu Nui Ahupuaa to Kamaole Ahupuaa, Surface Survey, Piilani Highway. Dept. of Transportation, State of Hawaii.

Dicks, A.M., and A.E. Haun

1987 Intensive Archaeological Survey and Testing, Embassy Suites Hotel Site, Wailea Beach Resort, Land of Palauea, Makawao District, Island of Maui (TMK:2-1-08:87). PHRI Report 338-082987. Prepared for Landmark Hotels and Group 70.

Dobyns, S.

1988 Archaeological Excavations in Coastal Areas of Papa'anui, Waipo, Kalihi and Kaeuhou Ahupuaa, Maui Island, Hawaii. Ms.010488. Dept. Anthro., B.P. Bishop Museum.

EISC (Environmental Impact Study Corp.)

1982 Biological and Archaeological Reconnaissance TMK 2-2-02: Portion of 42, Kihei, Maui, Hawaii.

Emory, K.P., and R. Hommon

1972 Endangered Hawaiian Archaeological Sites within Maui County. Report 72-2, Dept. Anthro., B.P. Bishop Museum

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. Agriculture - Soil Conservation Service and Univ. Hawaii Agri. Experiment Station. Washington, D.C.: Govt. Printing Office.

Haun, A.E.

1978 Archaeological Phase I Survey of the Proposed Golf Course, Makena, Maui. First Increment: Fairways 11-15. Ms.082278. Dept. Anthro., B.P. Bishop Museum.

1988 Archaeological Reconnaissance Survey Maui Palisades Residential Subdivision, Lands of Kamaole, Wailuku District, Island of Maui. PHRI Report 359-031588. Prepared for United Realty, Inc.

Haun, A.E., R.S. Brown, and H.W. Smith

In prep Archaeological Inventory Survey, Keokea and Waiohuli Subdivisions, Lands of Keokea and Waiohuli, Makawao District, Island of Maui (TMK:2-2-02:55,56). PHRI Report 442-050289. Prepared for Dept. of Hawaiian Home Lands.

Hommon, R.J.

1975 Results of an Archaeological Reconnaissance Survey, Waterline Right-of-Way of the Makena Water Project (Phases I-B and II) Ms.14-72. Prepared for Archaeological Research Center Hawaii, Inc.

Jourdane, E., and A. Sinoto

1979 Archaeological Phase I Survey of Makena Surf Property, Makawao, Maui Island. Ms.072079. Dept. Anthro., B.P.Bishop Museum.

Kennedy, J.

1986 Letter Report on Preliminary Archaeological Reconnaissance of Proposed Golf Course. Prepared for Haleakala Greens Corp., Lahaina. Archaeological Consultants of Hawaii, Honolulu.

Kirch, P.V.

1969 An Archaeological Survey of the Alexander and Baldwin Property Surrounding Wailea, Kihei, Maui. Ms. Dept. Anthro., B.P. Bishop Museum.

1970 Archaeology in the Ahupuaa of Paluaea, Southeast Maui. Ms. Dept. Anthro., B.P. Bishop Museum.

1971 Archaeological Excavations at Palauea, Southeast Maui, Hawaiian Islands. Anthropology and Physical Anthropology in Oceania IV (1): 62-86.

Riford, M.

1987 Archaeological Services for Dept. of Hawaiian Homes Lands, Waiohuli and Keokea Subdivisions, Kula, Makawao, Maui. Ms.101387. B.P. Bishop Museum.

Shapiro, W.A., and A.E. Haun

1988 Archaeological Reconnaissance Survey and Limited Subsurface Reconnaissance, Murray Pacific Project Area, Land of Palauea, Makawao District, Island of Maui. PHRI Report 408-021788. Prepared for VMS Realty Partners.

Schilt, R., and S. Dobyns

1980 Archaeological Reconnaissance and Testing on Wailea Properties in the Ahupuaa of Paeahu, Makawao District, Maui Island, Hawaii. Ms.030480. B.P. Bishop Museum.

Sinoto, A.

1978 Archaeological Reconnaissance Survey of Proposed Kihei Boat Launching Ramp, Keawakapu, Maui. Ms.102378. Dept. Anthro., B.P. Bishop Museum.

Walker, A., P. Rosendahl, and A. Haun

1985 Intensive Survey and Salvage Research Excavations, Wailea Point Condominium Site, Wailea Resort, Land of Paeahu, Makawao, Island of Maui. PHRI Report 150-021285. Prepared for Wailea Point Development Company.

Walker, W.

1931 Archaeology of Maui. Ms. Dept. Anthro., B.P. Bishop Museum.

APPENDIX A

SITE DESCRIPTIONS

SITE NO: State: 1709 PHRI: T-17
SITE TYPE: Low enclosure
ELEVATION: 62 ft AMSL
TOPOGRAPHY: On a prominent natural knoll along the right bank of an ephemeral drainage channel
VEGETATION: Thick California grass, koa-haole, kiawe
CONDITION: Fair to good, north side affected by bulldozing
INTEGRITY: A portion of the site has been destroyed; the remaining feature has been modified by surveyors
PROBABLE AGE: Prehistoric with recent modifications
FUNCTIONAL INTERPRETATION: Agriculture; survey station
DIMENSIONS: Interior 2.80 m E-W by 1.70 m N-S; overall 3.90 m E-W by 3.20 m N-S by 0.60 m maximum wall height
DESCRIPTION: This site was recorded by Cordy in 1977, prior to the construction of the Kihei School. At that time, two enclosures were observed and mapped. The northwestern enclosure has since been dozed away, along with a portion of the knoll. A surveyor's datum is currently present inside the remaining enclosure. It has been recently cleared on the interior and the wall has been modified slightly.

The enclosure is consists of rough boulders and cobbles arranged in a loosely stacked oval wall, with incorporated bedrock outcrops. It is situated on the eastern crest of a small knoll, overlooking a narrow drainage channel that is c. 3.00 m below the level of the site.

The northeastern side of the enclosure is stacked up to three courses high and has an average height of 0.50 m; width is 1.15 m. The northern side is primarily natural bedrock which averages 0.34 m high from the interior side. The south and west sides are less substantial and consists of 102 courses on exposed bedrock. A small entrance path lies on the east side.

The interior area has been cleared of rock, with the exception of a small cairn of cobbles arranged around a surveyor's datum pipe, located in the center of the floor.

SITE NO: State: 1710 PHRI: T-15 *(Figure A-1)*
SITE TYPE: Enclosure
ELEVATION: 38 ft AMSL
TOPOGRAPHY: On the west side of a prominent vertical rock face, at the base of a ridge formation
VEGETATION: Thick California grass, kiawe
CONDITION: Enclosure good to fair, associated features bulldozed
INTEGRITY: Unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture or possibly temporary habitation
DIMENSIONS: Interior area 10.00 m N-S by 10.20 m E-W; overall 15.00 m N-S by 13.00 m E-W by 1.56 m maximum wall height
DESCRIPTION: This roughly square enclosure has three free-standing walls and one (east) wall that is mostly a natural rock face. The walls are consist of boulders and ~~cobbles and are generally bifaced~~ with core filling ~~of small~~ cobbles and pebbles.

The eastern portion of the south wall is 0.85 m wide and 0.9 m high on the interior side, 0.40 m high on the exterior side. The faced sides are stacked up to six courses high. At the west end of the south wall, interior height is 0.42 m and exterior height is 0.15 m. This section of the wall appears to be disturbed.

The western wall is vertically stacked and faced on the interior side, 0.65 to 0.37 m above the interior surface. The exterior side of this wall slopes outward and downhill, and is 0.90 to 0.30 m high. Overall wall width from base to base is 1.50 m; the top to the wall is 1.00 m wide. At the northwestern corner, the wall is level with the interior surface and 0.60 m above the exterior surface.

The north wall has a narrow (0.60 m) entrance in the center. Interior wall height at the entrance is 0.20 m and exterior wall height is 0.60 m. At the northeastern corner, the wall is 0.80 m high on the exterior side and 0.70 m high on the interior side.

A 3.00 m long section of the eastern wall is free-standing, the remainder consists of alignments and stacked cobbles placed in cracks or open areas along the bedrock face. This is the highest portion of the enclosure; interior height ranges from 1.56 to 1.35 m. Exterior height of the stacked portions averages 0.10 m along the top of the rock face.

The interior of the enclosure is a sloping surface, with the highest portion along the north wall. Very few partially buried cobbles are present inside. The soil consists of sandy

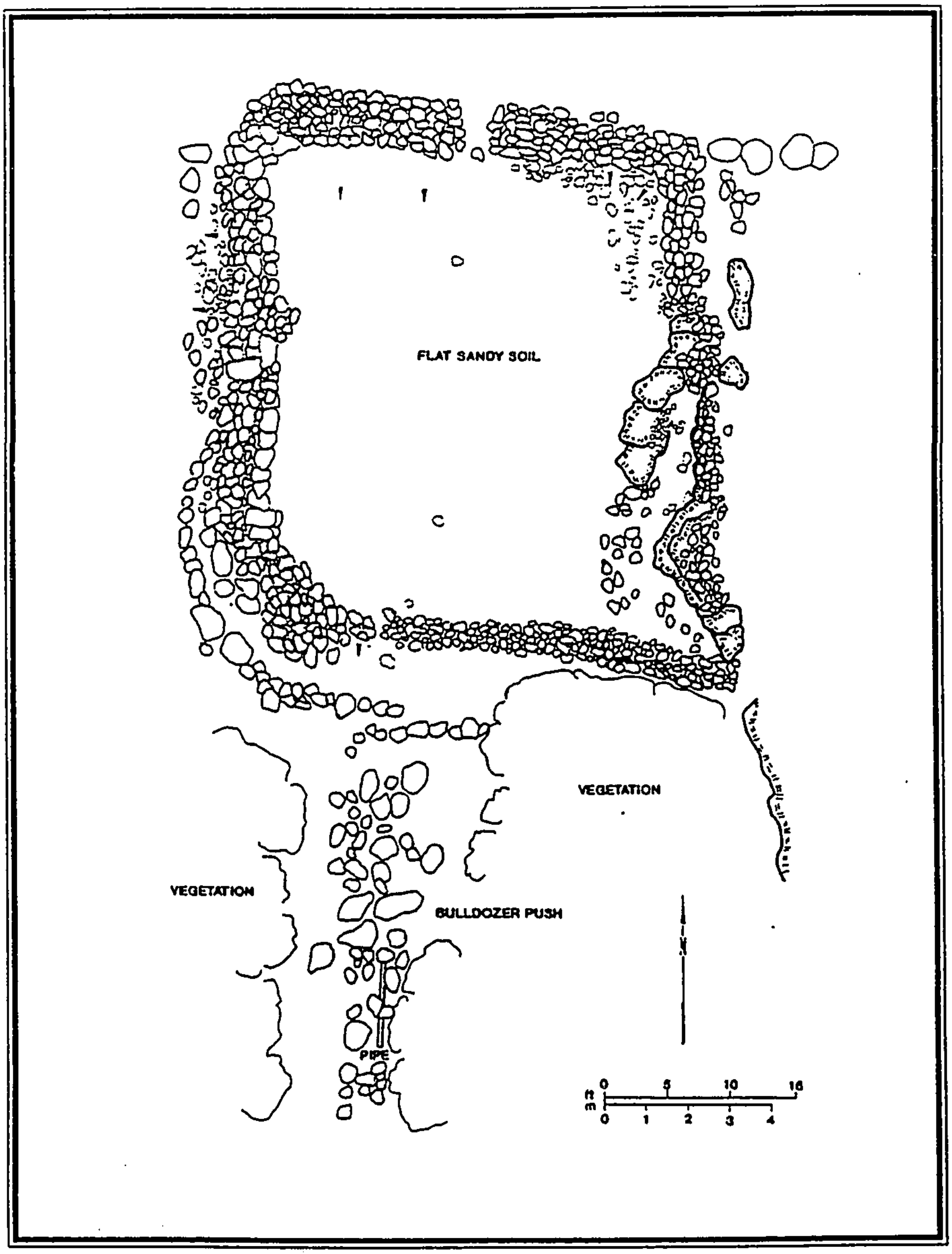


Figure A-1. SITE 1710 (T-15)

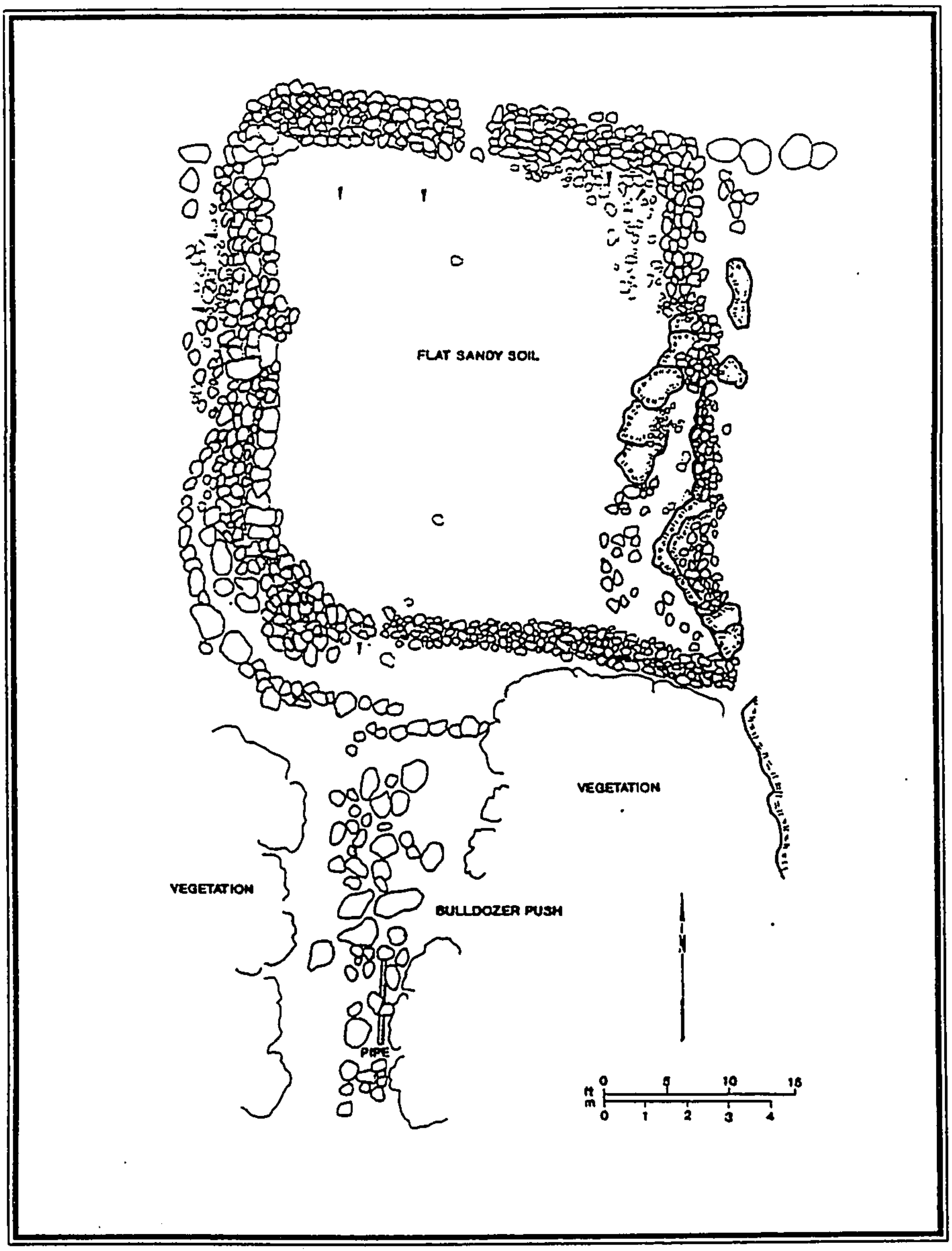


Figure A-1. SITE 1710 (T-15)

loam mixed with aeolian beach sand. No portable remains were observed on the surface inside the enclosure..

A terrace alignment is present at the base of the southwestern corner and south wall. The alignment consists of boulders and cobbles and is raised 0.50 m above the adjacent surface to the south. The area between the alignment and the enclosure wall is relatively flat, with small cleared patches.

Immediately to the south of the enclosure is a linear arrangement of bulldozed boulders and cobbles, intermixed with ceramic drainage tile. The relationship between this disturbed feature and the enclosure (if any) cannot be determined until additional vegetation clearing is conducted. It is possible that additional terraces are also present nearby.

SITE NO: State: 1711 PHRI: T-3 *(Figure A-2)*
SITE TYPE: Complex (2 features)
ELEVATION: 53 ft AMSL
TOPOGRAPHY: Relatively level coral pan, slight western exposure
VEGETATION: Thick grass, burned kiawe, koa-haole
CONDITION: Fair; eroded and possibly affected by machinery
INTEGRITY: Generally unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture
DIMENSIONS: Overall site, 21.00 m NW-SE by 8.00 m NE-SW
DESCRIPTION: A low enclosure (Feature A) and a C-shape (Feature B) were identified at this site. The features are spaced 13.20 m apart on a NW-SE axis. Portable remains observed at the site include two waterworn basalt cobbles. No midden remains were identified on the surface or in the subsurface test unit.

Feature B corresponds with the previously recorded SIHP site 1710 and with EISC site 2. The enclosure was not previously recorded.

FEATURE A: Low enclosure
FUNCTION: Agriculture
DIMENSIONS: Interior, 3.80 m N-S by 3.80 m E-W; overall 4.50 m N-S by 5.00 m E-W by 0.40 m maximum wall height
DESCRIPTION: Feature A is a circular enclosure consisting of loosely stacked angular basalt and aa cobbles. The wall is stacked up to three courses high in places, and is a single course alignment along the east side. The interior area is mostly cleared of loose rubble and is leveled soil, raised slightly above the surrounding terrain. Wall height is generally higher along the exterior side, where it averages 0.30 to 0.40 m high. Along the interior side, the wall averages 0.15 m high.

A 0.50 by 0.50 m square test unit was excavated into the soil deposit inside Feature A. Two culturally sterile soil layers were identified. Layer I, from surface to 0.06 m below surface, consists of dark yellowish-brown sandy silt. Layer II, from 0.06 to 0.15 m below surface, consists of silty clay loam with sand intermixed. This layer overlies extremely gravely decomposing bedrock. The only non-matrix material recovered from the screened soil was charcoal from a burned kiawe stump located adjacent to the test unit.

Two waterworn basalt cobbles lay at the eastern side of the interior, near the lowest portion of the wall. The stones are partially buried and scarred from what appears to be a bulldozer track.

FEATURE B: C-Shape
FUNCTION: Probable agriculture
DIMENSIONS: Interior, 2.00 m N-S by 1.50 m E-W; overall, 3.00 m N-S by 3.50 m E-W by 0.40 m maximum wall height
DESCRIPTION: Feature B is a C-shaped wall which nearly forms a small enclosure. The wall is built up on the north side, and opens to the south, with a 1.00 m wide opening. The wall consists of aa cobbles and small angular basalt boulders loosely stacked up to three courses high. Width of the wall is greatest at the northern side, where it ranges from 1.00 to 0.50 m wide.

A deposit of loamy sand occurs within the wall, and covers an area 1.50 m in diameter in the center of the feature. The deposit was probed and found to be c. 0.15 m thick. No evidence of cultural remains could be located on the surface or in the upper layer of the deposit. Loamy sand also occurs immediately outside of the wall to the east.

SITE NO: State: 2512 PHRI: T-2 *(Figure A-3)*
SITE TYPE: Complex (5 features)
ELEVATION: 76 ft AMSL
TOPOGRAPHY: Along the crest and west-facing upper slope of a knoll, at the northern edge (right bank) of a steep drainage gulch
VEGETATION: Thick California grass, scattered kiawe
CONDITION: Affected by slope erosion
INTEGRITY: Original construction altered by erosion
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture, possible habitation or shrine
DIMENSIONS: Overall site, 15.00 m N-S by 14.00 m E-W

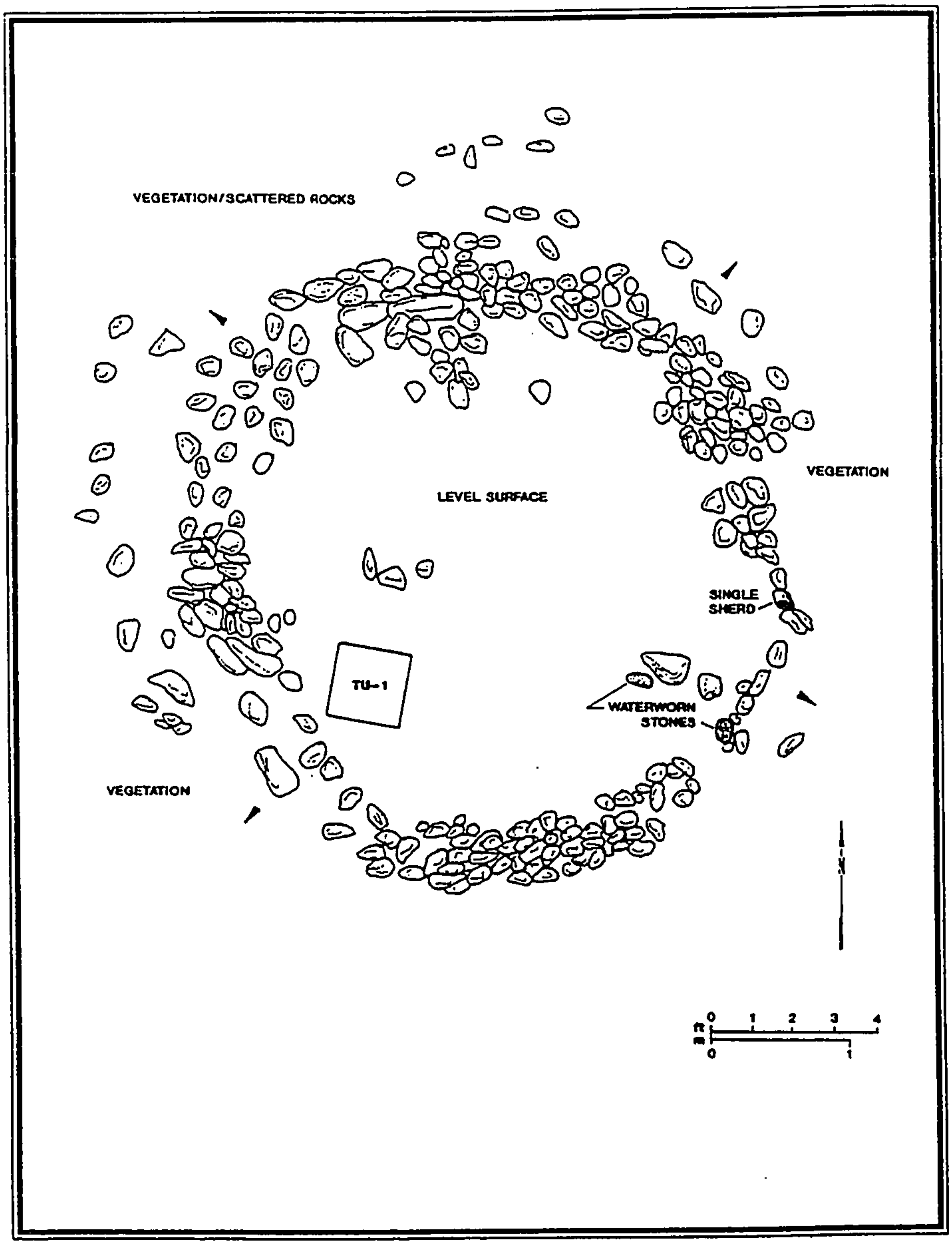


Figure A-2. SITE 1711 (T-3)

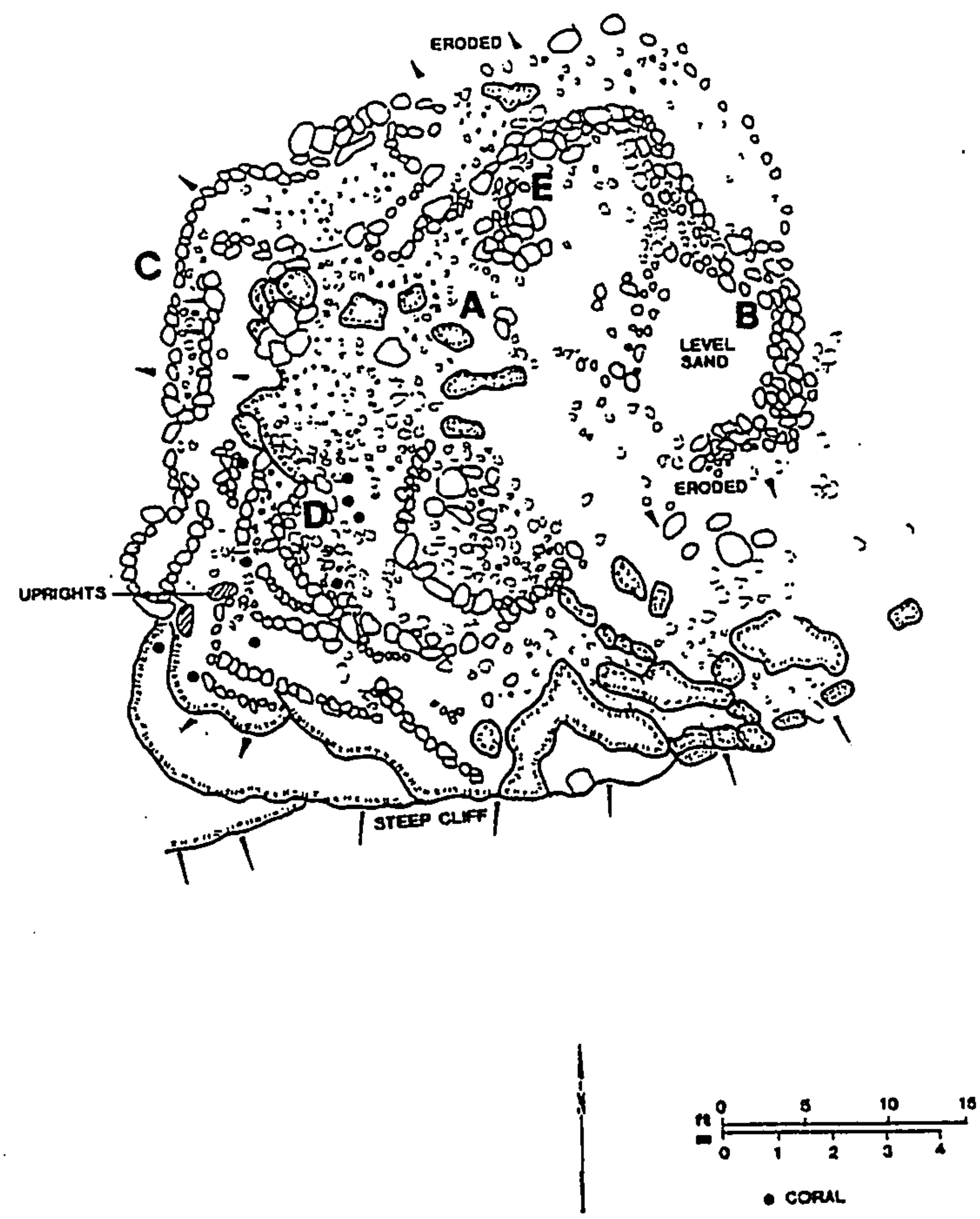


Figure A-3. SITE 2512 (T-2)

DESCRIPTION: This complex consists of a low, eroded platform (Feature (A) that has a small enclosure (Feature B) at the southeastern corner. Two sets of terraces (Features C and D) are located below the western sides of the platform, along the slope of the knoll. A small rock mound (Feature E) is present on the platform.

The drainage gulch adjacent to the site has vertical, rock-faced sides. The streambed is c. 24 ft below the level of the site. At the time of survey, two water pools were visible in the streambed from the site. This is the only location of surface water observed within the project area.

FEATURE A: Platform
FUNCTION: Habitation or shrine
DIMENSIONS: 9.00 m NE-SW by 6.50 m NW-SE by 0.90 m maximum height
DESCRIPTION: Feature A appears to have been a rectangular platform situated on the crest of a small knoll, c. 1.20 m above surrounding terrain. The perimeter is intact at the northern, western and southern corners, and along the northeast-facing side. Other sections of the perimeter have been washed out by slope erosion or possibly moved during later modifications. Intact portions of the perimeter consist of stacked boulders and cobbles that average 0.25-0.30 m in height. The western corner incorporates a bedrock face, and is 0.90 m high. The surface of the feature is level; the western half is covered with small gravels and the eastern half is dark reddish-brown gravely silt loam, leveled in places.

A small D-shaped terrace is present at the southern corner of the platform. This terrace is defined by a curved perimeter alignment along the west side, which raises the surface 0.15 m above the surrounding platform surface. The small terrace surface is littered with boulders and cobbles, some of which appear to be disturbed.

Downslope from the platform on the northern and southeastern side is a scattered deposit of small gravels and sparse fragments of Cypraeidae shell that appear to have washed off the platform. A considerable amount of soil also appears to have eroded from the top of the feature.

Three pieces of branch coral are present at the southwestern edge of the platform, adjacent to the Feature D terraces, which contains additional pieces of coral..

FEATURE B: Low enclosure
FUNCTION: Possible agriculture
DIMENSIONS: Interior area 2.90 m N-S by 2.40 m E-W; overall 4.20 m N-S by 4.10 m E-W by 0.30 m maximum wall height
DESCRIPTION: Feature B is situated at the eastern corner of Feature A, and may represent a later modification to the original structure. The eastern wall of Feature B connects with the platform perimeter at the northern end of the enclosure. The southern side of the enclosure is also the southeastern side of the platform. Portions of the enclosure wall are up to 0.70 m wide and consist of two parallel boulder alignments with core filling. Other portions of the wall are loosely piled cobbles and boulders, or a single alignment of boulders.

The interior of the enclosure is cleared of all stones, and consists of level, light reddish-brown sandy loam with little to no gravel. The soil here contrasts with the soil present on most of the adjacent features. No portable remains were observed inside the enclosure. The interior surface is raised slightly above the platform surface and the adjacent ground to the east.

No opening is apparent in the low wall. The western side is in poor preservation, and the interior surface is nearly level with the top of the wall along this side.

FEATURE C: Terrace
FUNCTION: Agriculture/landscaping
DIMENSIONS: 8.90 m N-S by 1.50 m E-W by 0.30 m maximum height
DESCRIPTION: Feature C is a long, narrow terrace situated along the western slope of the knoll, immediately downslope from the Feature A platform. The terrace may have extended around the northern base of the platform at one time; this area is presently very eroded and only traces of a possible perimeter are currently discernable. The terrace riser (along the downhill side) is defined by aligned boulders and stacked cobbles. The back of the terrace (uphill side) is defined by a vertical bedrock face with stacked boulders and cobbles on the north end, and by the Feature D terraces on the south end.

Most of the interior surface area of the terrace is cleared of surface stone and leveled, with dark reddish-brown silty loam soil. No portable remains were observed on this terrace.

FEATURE D: Terraced slope
FUNCTION: Agriculture/landscaping; possible shrine
DIMENSIONS: 7.00 m NW-SE by 4.00 m NE-SW by 1.02 m maximum height

DESCRIPTION: At the southern end of Feature C, immediately upslope, is a series of small semicircular alignments arranged in five levels along a relatively steep portion of the knoll slope. The upper level of the feature is a small soil flat (2.00 by 0.50 m) adjacent to and just below the platform (Feature A) surface. The perimeter for this level is raised 0.20 m above the lower level to the west, and consists of cobbles and branch coral heads. A narrow flat is present around the base of this perimeter (3.00 by 0.30 m), which is defined by aligned cobbles 0.35 m above the adjacent, lower level. A single large branch coral head is incorporated into this riser.

A third soil flat (3.00 by 0.80 m) is present below the narrow terrace. This level is raised 0.32 m above the level below. At the northern end of this flat are two positioned upright slabs, both of which are 0.60 m high. The slabs are 0.40 m apart and define the southern end of a fourth small soil flat, which is raised 0.22 m above the Feature C terrace. Coral is scattered around the uprights and on the lower level soil flats. The lower terrace alignments are positioned on exposed bedrock.

FEATURE E: Rock mound
FUNCTION: Indeterminate/possible clearing pile
DIMENSIONS: 1.50 m NE-SW by 1.20 m NW-SE by 0.20 m maximum height
DESCRIPTION: This low rock mound (or pile) is located near the center of the Feature A platform, along the northwestern side. It consists of loosely piled boulders and cobbles, and is situated along the western edge of the cleared portion of the platform surface. The feature may represent a clearing pile; as such, it would probably be a later modification to the original platform.

SITE NO: State: 2513 PHRI: T-4 ***(Figure A-4)***
SITE TYPE: Low enclosure
ELEVATION: 88 ft AMSL
TOPOGRAPHY: On relatively flat, broad terrace, c. 25.00 m from highway
VEGETATION: Thick California grass, dead kiawe
CONDITION: Fair to good, some erosion damage and wall displacement
INTEGRITY: Generally unaltered; evidence of bulldozing nearby
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture
DIMENSIONS: Interior, 2.70 m N-S by 2.00 m E-W; overall, 4.30 m N-S by 3.40 m E-W by 0.35 m maximum wall height
DESCRIPTION: This roughly oval-shaped enclosure consists of loosely piled basalt cobbles and boulders. Portions of the perimeter consist of a single course alignment, and portions are piled up to four courses high. The perimeter incorporates exposed bedrock in places, and the lower course of the wall is partially to almost completely buried. Maximum wall height (0.35 m) is on the interior side and the northwestern corner. Maximum exterior wall height is 0.25 m. Wall width averages 0.60 to 0.70 m.

The interior of the enclosure is level and generally cleared of rubble, except for a small concentration partially buried cobbles near the center and scattered surface cobbles. The interior surface is depressed c. 0.05-0.10 m below the surrounding terrain outside the wall.

A 0.50 by 0.50 m square test unit was excavated at the northwestern end of the enclosure, where the soil deposit was determined by probing to be deepest. Soil here was also darker that other soil inside the enclosure. This difference was later determined to be the result of tree burning.

Three culturally sterile soil layers were identified in the test unit. Layer I, from surface to 0.03 m below surface, is black silty loam. Layer II, from 0.03 to 0.07 m below surface, is a strong reddish-brown gravely silty loam.

Layer III, from 0.07 to 0.21 m below surface, is dark brown gravely silty clay loam. The size and density of rock inclusions increases to cobble size in this layer, beginning at 0.10 m below surface. Layer II overlies generally impenetrable decomposing bedrock. No portable remains were recovered from the screened soil.

SITE NO: State: 2514 PHRI: T-6 ***(Figure A-5)***
SITE TYPE: Platform
ELEVATION: 70 ft AMSL
TOPOGRAPHY: On a flat-topped knoll along the edge of a natural terrace, overlooking a broad drainage area
VEGETATION: Extremely thick California grass, sparsely scattered kiawe
CONDITION: Fair to good, affected by erosion
INTEGRITY: Unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Possible habitation
DIMENSIONS: Platform surface 4.50 m N-S by 4.00 m E-W; overall, 10.00 m E-W by 9.00 m N-S by 1.80 m maximum height
DESCRIPTION: The platform is situated on a level knoll and incorporates natural bedrock outcrops present along the slope and crest of the knoll. The perimeter consists of aa boulders and vesicular pahoehoe boulders and cobbles. The western side is terraced, and extends horizontally 5.25 m out from the platform surface. The eastern side is vertically stacked, with a maximum width of 0.75 m.

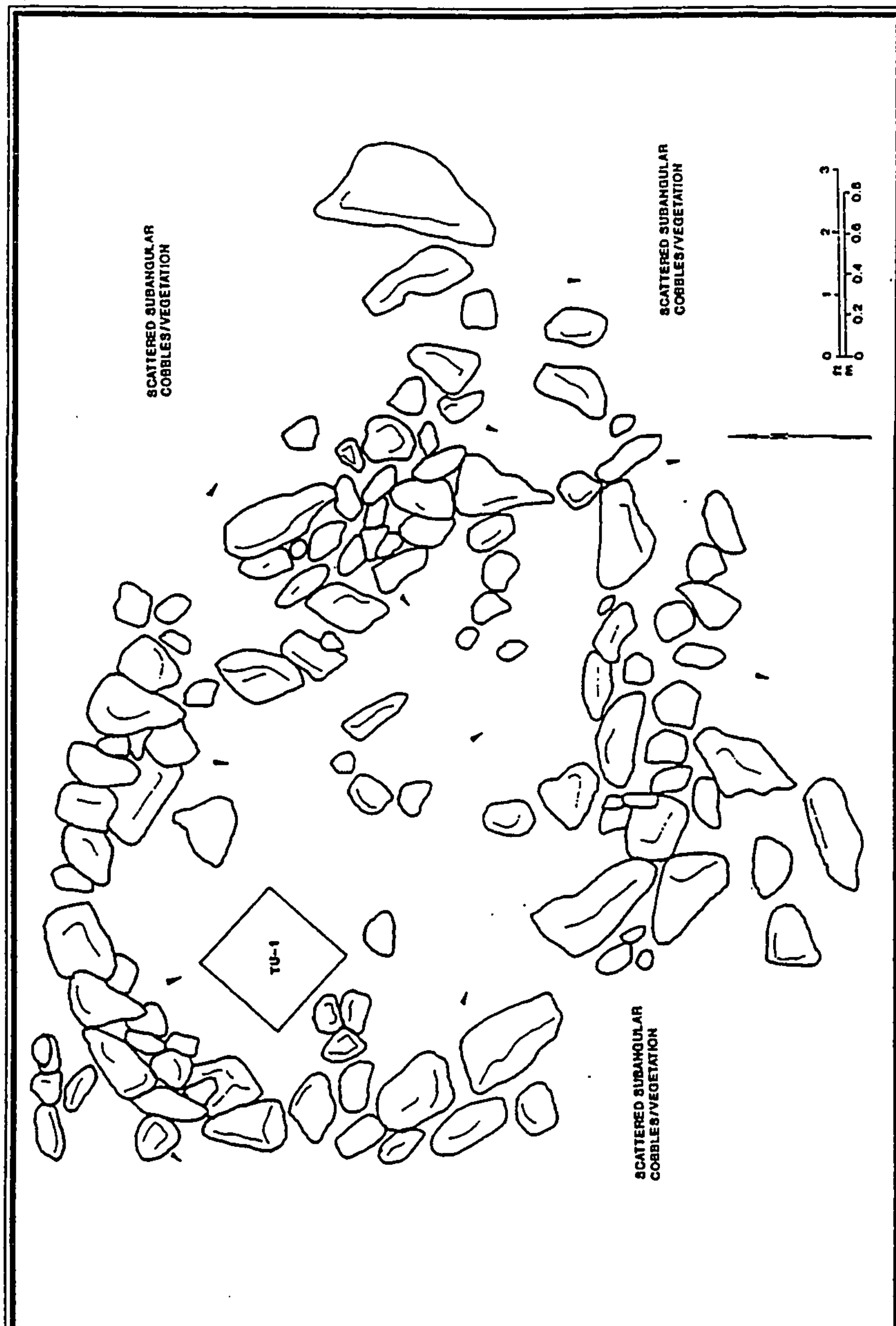


Figure A-4. SITE 2513 (T-4)

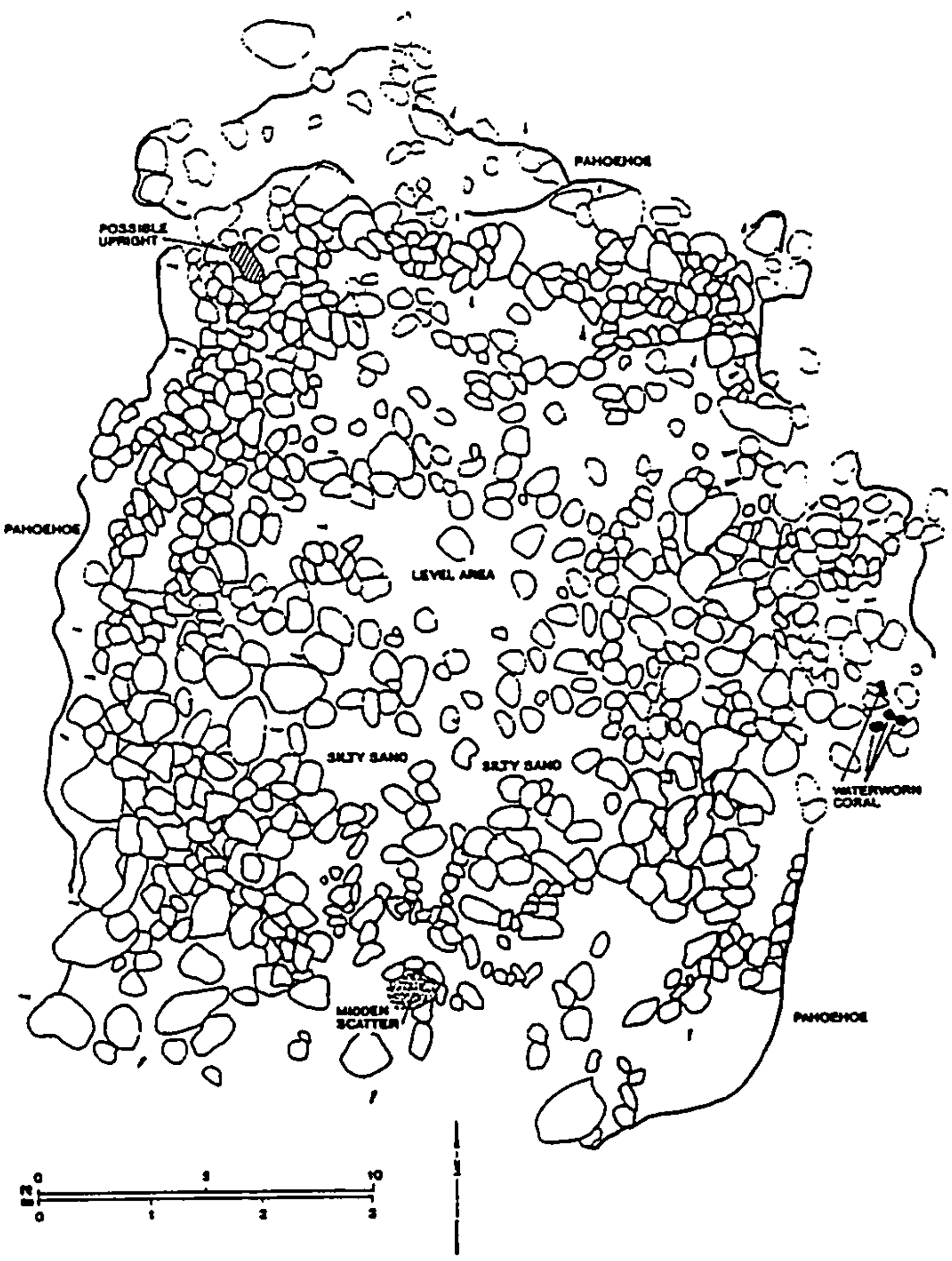


Figure A-5. SITE 2514 (T-6)

The platform surface is level, but irregular, due to protruding, partially buried stones. No pavement is evident. Sparsely scattered Cypraeidae shell fragments are present on the platform, in addition to several waterworn basalt pebbles. Pockets of reddish-brown sandy loam are present on and adjacent to the platform.

Additional terrace alignments may well be present along the natural terrace slope, to the north and south sides of the platform. These features will only be identified through extensive vegetation clearing.

SITE NO: State: 2515 PHRI: T-7
SITE TYPE: Modified outcrop
ELEVATION: 80 ft AMSL
TOPOGRAPHY: On a south-facing knoll, along the edge of a natural terrace
VEGETATION: Thick California grass
CONDITION: Fair
INTEGRITY: Questionable, in area of considerable dozer disturbance
PROBABLE AGE: Indeterminate
FUNCTIONAL INTERPRETATION: Indeterminate
DIMENSIONS: 4.00 by 4.00 m
DESCRIPTION: This site consists of two very minor rock alignments arranged on and adjacent to natural bedrock outcrops. The westernmost alignment is 1.00 m long and consists of a large boulder and two cobbles. The eastern alignment is 2.54 m long, and is located 3.5 m from the former. Numerous loose boulders and cobbles are scattered on the surface in this area, suggesting the former presence of additional surface features that have been disturbed. The alignments are probably the remnants of a more complex feature or features. Soil on the site is reddish-brown silty loam. No portable remains were observed on the surface.

SITE NO: State: 2516 PHRI: T-8 ***(Figures A-6 and A-7)***
SITE TYPE: Complex (2 features)
ELEVATION: 62 ft AMSL
TOPOGRAPHY: On a low, protected flat at the base of a steep, west-facing slope
VEGETATION: Thick California grass
CONDITION: Good to fair
INTEGRITY: Appears unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Temporary habitation, possible agriculture
DIMENSIONS: Overall site, 16.00 m N-S by 5.00 m E-W
DESCRIPTION: Two low enclosures were identified at this site. Feature A is a circular enclosure and Feature B is roughly rectangular. They are located 6.50 m apart, along a N-S line. Feature A is the northernmost enclosure. Subsurface midden remains were collected from Feature B.

FEATURE A: Low enclosure
FUNCTION: Agriculture
DIMENSIONS: Interior, 2.05 m N-S by 2.00 m E-W; overall 3.80 m N-S by 4.70 m E-W by 0.45 m maximum wall height
DESCRIPTION: Feature A is a doughnut-shaped wall consists of loosely piled or mounded aa cobbles. A portion of the wall (northwest side) is stacked up to four courses high, but is not formally faced. This section has the highest exterior wall height (0.45 m). Average exterior wall height is 0.10 m, and average interior wall height is 0.20 m. Width of the wall varies from 0.90 to 1.40 m.

The interior area is level and free of surface stones, however, numerous buried stones are slightly protruding. Reddish-brown silty loam that is slightly darker than exterior soil is present inside the feature. No portable remains were found inside, however, two Cypraeidae fragments were observed outside, along the adjacent hillside to the east.

No obvious opening is present in the wall, however, there is a 2.00 m wide section at the south side that consists of a partially buried alignment with few surface stones. This section of the wall is considerably narrower than other sections.

FEATURE B: Low enclosure
FUNCTION: Temporary habitation
DIMENSIONS: Interior 4.80 m N-S by 2.70 m E-W; overall 6.00 m N-S by 4.40 m E-W by 0.40 m maximum wall height
DESCRIPTION: This enclosure is roughly rectangular in plan view, with the major axis oriented N-S. The wall consists of stacked cobbles and a single course of boulders turned on edge. Portions of the wall appear to have been double alignments (possibly bifaced) with core filling. Maximum wall height (0.40 m) is on the exterior side of a large boulder set on edge. This boulder is located at the southeastern corner of the wall, where four large boulders are concentrated. A 1.75 m wide opening is present in the center of the west side of the enclosure. Large boulders are set on end at both sides of this opening.

The interior area is flat and cleared of nearly all surface stones; no buried stones are indicated under the leveled soil floor. A 0.50 by 0.50 m square test unit was excavated near the center of the enclosure. Three soil layers were encountered, one of which (Layer II) contained cultural remains.

Layer I extends from the surface to 0.10 m below surface and consists of dark reddish-brown silty clay loam with a moderate amount of pebble-size gravels. Layer II

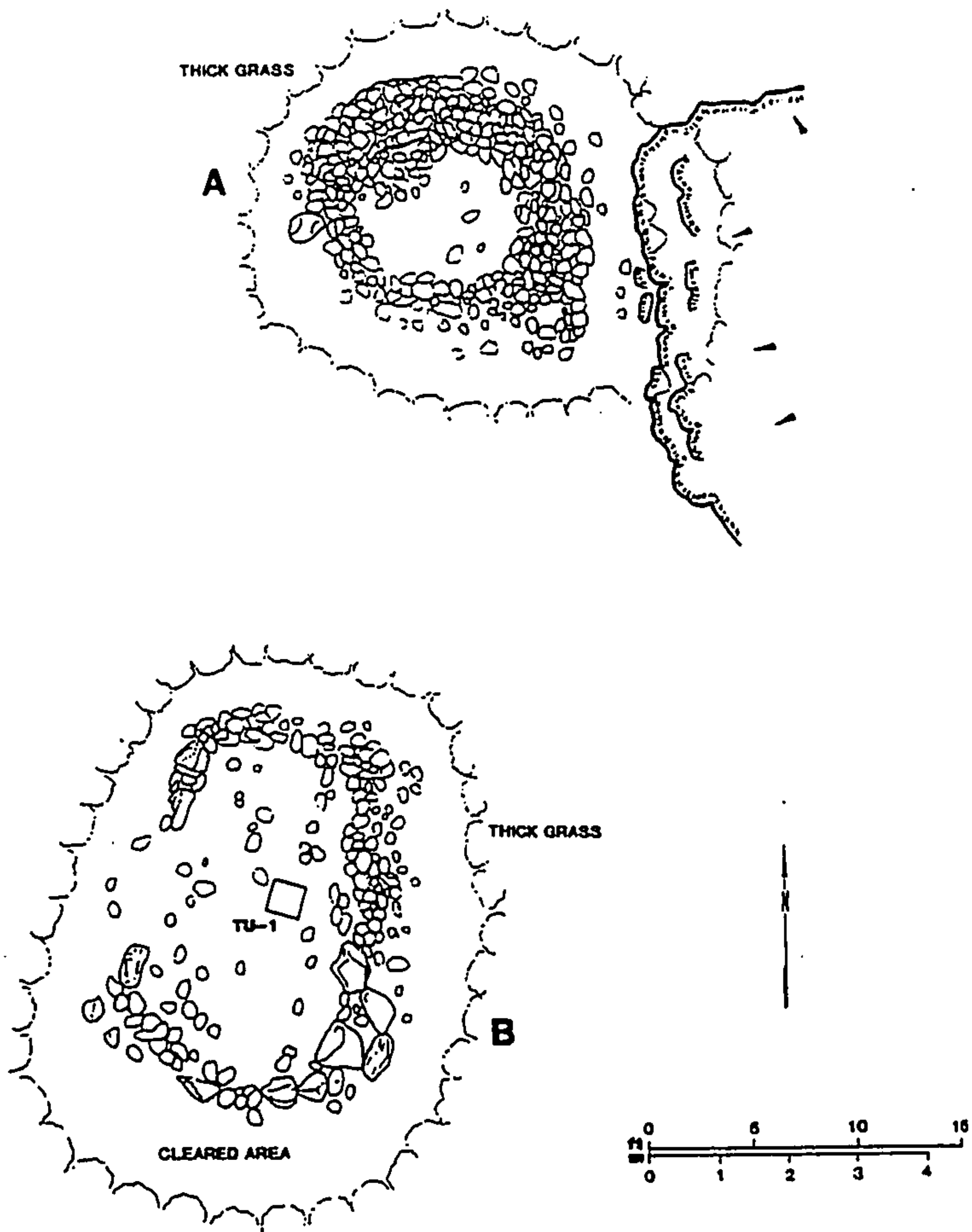


Figure A-6. SITE 2516, FEATURES A AND B (T-8)

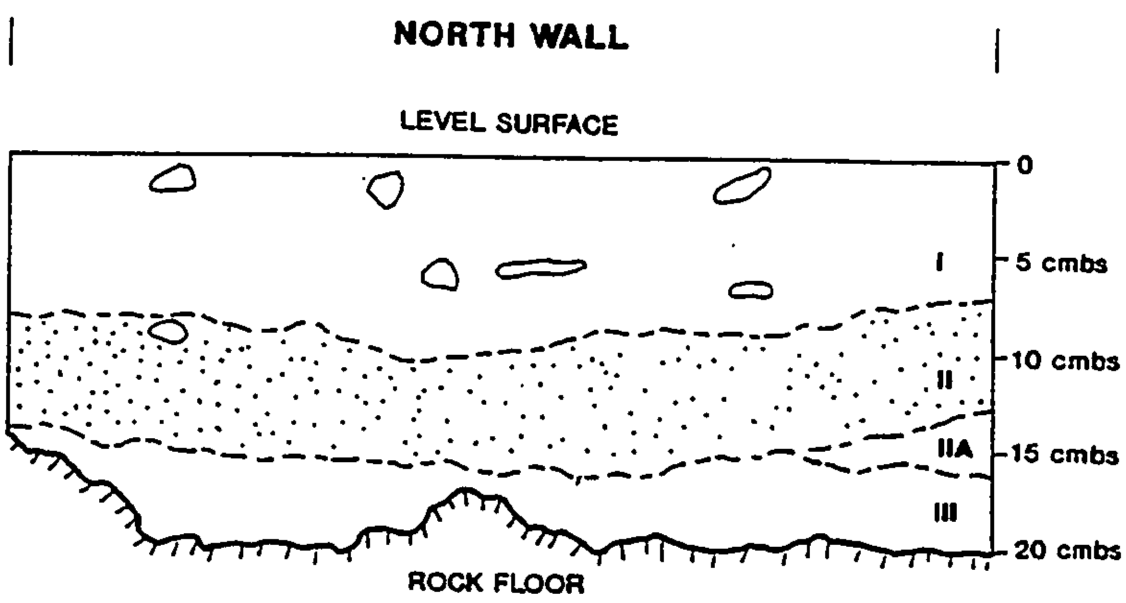


Figure A-7. SITE 2516, FEATURE B, TEST UNIT. NORTH WALL PROFILE.

extends from 0.10 to 0.19-0.21 m below surface and consists of dark reddish-brown silty clay with very few pieces of gravel. The boundary between Layers I and II is very diffuse, as is the boundary between Layers II and III. Layer III extends from 0.19-0.21 to 0.26 m below surface and consists of reddish-brown silty clay with densely packed large pebbles and small cobbles. This layer overlies impenetrable decomposing bedrock.

Portable remains recovered from screened Layer II soil include minute basalt and volcanic glass waste flakes (one of each), wood charcoal, Echinoidea, Crustacea, Cypraeidae, and *Brachidontes c.* (quantities tabulated in subsurface findings section). All of the recovered portable remains are less than 1/4 inch in size. A single minute piece of Crustacea was recovered from the Layer III soil.

SITE NO: State: 2517 PHRI: T-9
SITE TYPE: Midden scatter
ELEVATION: 82 ft AMSL
TOPOGRAPHY: Along the gently sloping west face of a broad, shallow drainage area, c. 50.00 m upslope from Site T-8.
VEGETATION: Thick California grass, scattered kiawe
CONDITION: Poor, eroded
INTEGRITY: Original condition and nature indeterminate
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Habitation
DIMENSIONS: 20.00 m N-S by 20.00 m E-W
DESCRIPTION: The site consists of a very sparse surface scatter of Cypraeidae and Conidae shell fragments. No definable area of concentration could be determined within the site boundaries. The surface here is deflated and nearly all soil has been washed away. It is very unlikely that subsurface deposits are present, and impossible to determine if the surface materials represent primary or secondary deposition.

SITE NO: State: 2518 PHRI: T-10 *(Figure A-8)*
SITE TYPE: Complex (4 features)
ELEVATION: 96 ft AMSL
TOPOGRAPHY: Along the crest and upper slopes of a linear ridge
VEGETATION: Thick California grass
CONDITION: Fair to poor, portions affected by bulldozing
INTEGRITY: Original site area indeterminate
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture
DIMENSIONS: 15.00 m E-W by 7.80 m N-S
DESCRIPTION: The site is currently comprised of two terraces (Features A and B), a rock pile (Feature C), and and alignment (Feature D). The eastern portion of the ridge is within the Piilani Highway corridor, and has been bulldozed flat. Portions of the site to the west of the corridor are also bulldozed, particularly the northern slope of the ridge.

FEATURE A: Terrace
FUNCTION: Agriculture
DIMENSIONS: 6.90 m N-S by 3.5 m E-W by 1.38 m overall height
DESCRIPTION: Feature A is a stepped terrace situated around the western point of the ridge, near the base of the relatively steep upper slope section. It is parabolic in plan view, and is 6.90 m across the widest (east) portion. The retaining wall/alignment is most distinct on the south slope, where boulders were used with existing bedrock outcrops in construction of a section 3.50 m long. This section forms an upper level that is 0.68 m above the next stepped surface. There is a circular (1.10 m in diameter) cleared soil flat behind this section of the riser.

Below the upper level is a second step, formed by a curved alignment of cobbles and small boulders. This alignment is 1.50 m long and defines a semicircular flat 0.40 m wide. It is 0.10 m above the next stepped surface. Below this level is an eroded step, defined by aligned cobbles and patches of exposed bedrock raised 0.05 m above adjacent ground. The surface behind this alignment is washed out and consists of gravely silt loam with scattered cobbles. Overall length of the alignment is 5.0 m. The lowest terrace step is also eroded. It is formed by a curved alignment 3.50 m long and 0.10 to 0.16 m high.

FEATURE B: Terrace
FUNCTION: Agriculture
DIMENSIONS: 4.50 m E-W by 2.00 m N-S by 0.60 m maximum height
DESCRIPTION: Feature B is a stepped terrace consisting of aligned boulders along the south slope of the ridge. The upper level is located near mid-slope; the back is defined with exposed bedrock and the contained soil flat is 1.30 m wide. At the eastern end of the step is a small pile of large cobbles; these are placed on the retaining boulders.

The lower level is defined with aligned cobbles and two boulders set on edge, located at the east and west ends of the step. The soil flat here is 0.30 m wide and 3.60 m long. The central portion of the retaining alignment has washed downslope.

FEATURE C: Rock pile
FUNCTION: Agriculture
DIMENSIONS: 1.10 m E-W by 0.78 m N-S by 0.60 m maximum height

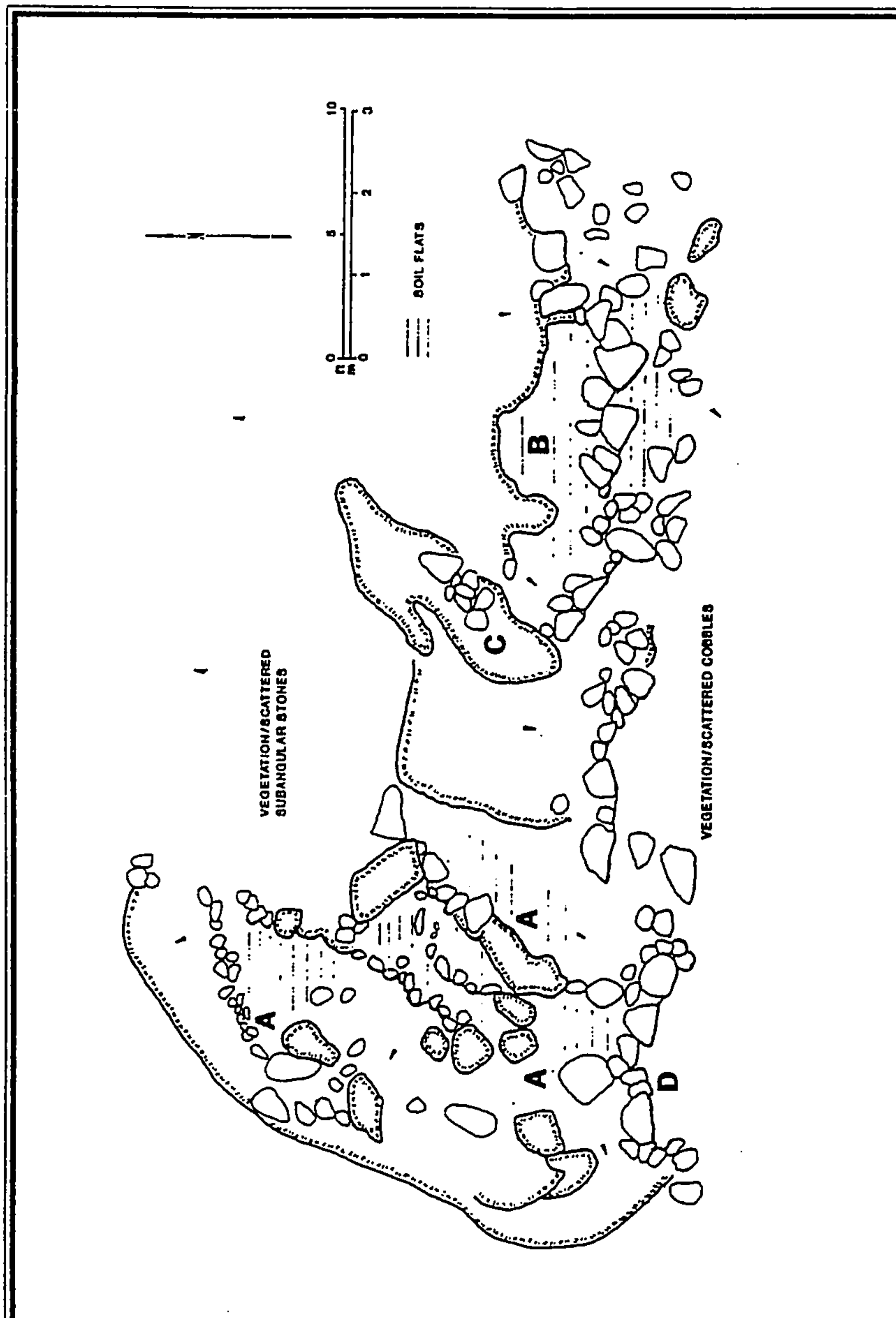


Figure A-8. SITE 1710 (T-15)

DESCRIPTION: Feature C consists of about six boulders and large cobbles stacked against the south side of a naturally upright bedrock formation. The pile is located on the top of the ridge, near the center of the site. Little to no soil is present in this area. The pile may represent an accumulation of rocks cleared from the adjacent terraces.

FEATURE D: Alignment
FUNCTION: Agriculture
DIMENSIONS: 2.17 m E-W by 0.50 m N-S by 0.45 m maximum height
DESCRIPTION: This alignment extends southwest from the south end of the Feature A terrace. It is comprised of nine large cobbles and a boulder, all of which are set on the ground surface. Portions of the alignment are on exposed bedrock.

SITE NO: State: 2519 PHRI: T-11
SITE TYPE: Terrace
ELEVATION: 70 ft AMSL
TOPOGRAPHY: Along the upper west-facing slope of a knoll, situated at the edge of a natural terrace, overlooking a small drainage basin
VEGETATION: Thick California grass, scattered kiawe
CONDITION: Good to fair
INTEGRITY: Appears unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture
DIMENSIONS: 7.5 m E-W by 5.0 m N-S (partial)
DESCRIPTION: This site consists of a stepped terrace system constructed around the contours of a natural terrace and knoll. Three levels were identified at the time of this survey, and it appears that additional levels are present, obscured by vegetation. The lower level contains a triangular, rock-filled terrace 0.15 m high, adjacent to a narrow drainage channel (possibly artificial). This terrace is 3.00 m long and 1.80 m wide. The two upper levels consist of aligned cobbles and small boulders; narrow soil flats are present immediately behind (upslope) the risers.

Additional vegetation clearing is needed in order to determine the extent and structure of this site. It may adjoin Site T-14, currently located c. 20 m to the north.

SITE NO: State: 2520 PHRI: T-12 *(Figures A-9 and A-10)*
SITE TYPE: Complex (4 features)
ELEVATION: 64-70 ft AMSL
TOPOGRAPHY: On a series of small rises along the edge of a natural terrace, overlooking a broad drainage basin
VEGETATION: Thick California grass, scattered burned kiawe
CONDITION: Good to fair; eroded
INTEGRITY: Unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture
DIMENSIONS: Overall site 24.50 m E-W by 6.00 m N-S
DESCRIPTION: Three rock-filled terraces with surface rock piles (Features A, B, C) and a rock pile (Feature D) were identified at this site. Features A and B are located at the highest, eastern end of the site, within 0.50 m of one another. Feature C is located 6.00 m west of Feature A, and Feature D is 18.50 m west of Feature C. All features follow the edge of a well-defined terrace face that drops vertically c. 0.50 m along the southern face. The area is eroded, and all features are deflated and washed out.

FEATURE A: Rock-filled terrace
FUNCTION: Agriculture
DIMENSIONS: 2.00 m E-W by 1.35 m N-S by 0.35 m maximum height
DESCRIPTION: This terrace has a perimeter of partially buried aligned boulders, and is filled with rocks and soil. The retaining alignment incorporates exposed bedrock and appears to define a filled area that is mostly below the surrounding bedrock surface. A concentration of cobbles 0.90 m by 0.80 m by 0.30 m high is located inside the retainer. The base of the concentration is partially buried, and upper stones are loosely piled on the surface of the buried rocks.

A 0.05 by 0.05 m test unit was excavated into the rock concentration of Feature A. Two layers of culturally sterile soil were encountered. Layer I consists of very loose, very dark reddish-brown loam that extends from the surface to 0.10 m below surface. This soil layer is present with the rock fill. Layer II consists of reddish-brown silty clay loam with large amounts of pebble-size gravel. This layer extends from 0.10 to 0.27 m below surface, and overlies a layer of densely packed cobbles and boulders in a matrix of decomposing bedrock.

At the Layer I/II interface is a very thin lens of what appears to be an old duff deposit. This probably represents the original ground surface, prior to construction of the terrace. No portable remains were recovered from screened soil.

FEATURE B: Rock-filled terrace
FUNCTION: Agriculture
DIMENSIONS: 1.90 E-W by 1.50 N-S by 0.35 m maximum height
DESCRIPTION: Feature B is a rock-filled terrace very similar in construction to Feature A. The perimeter consists

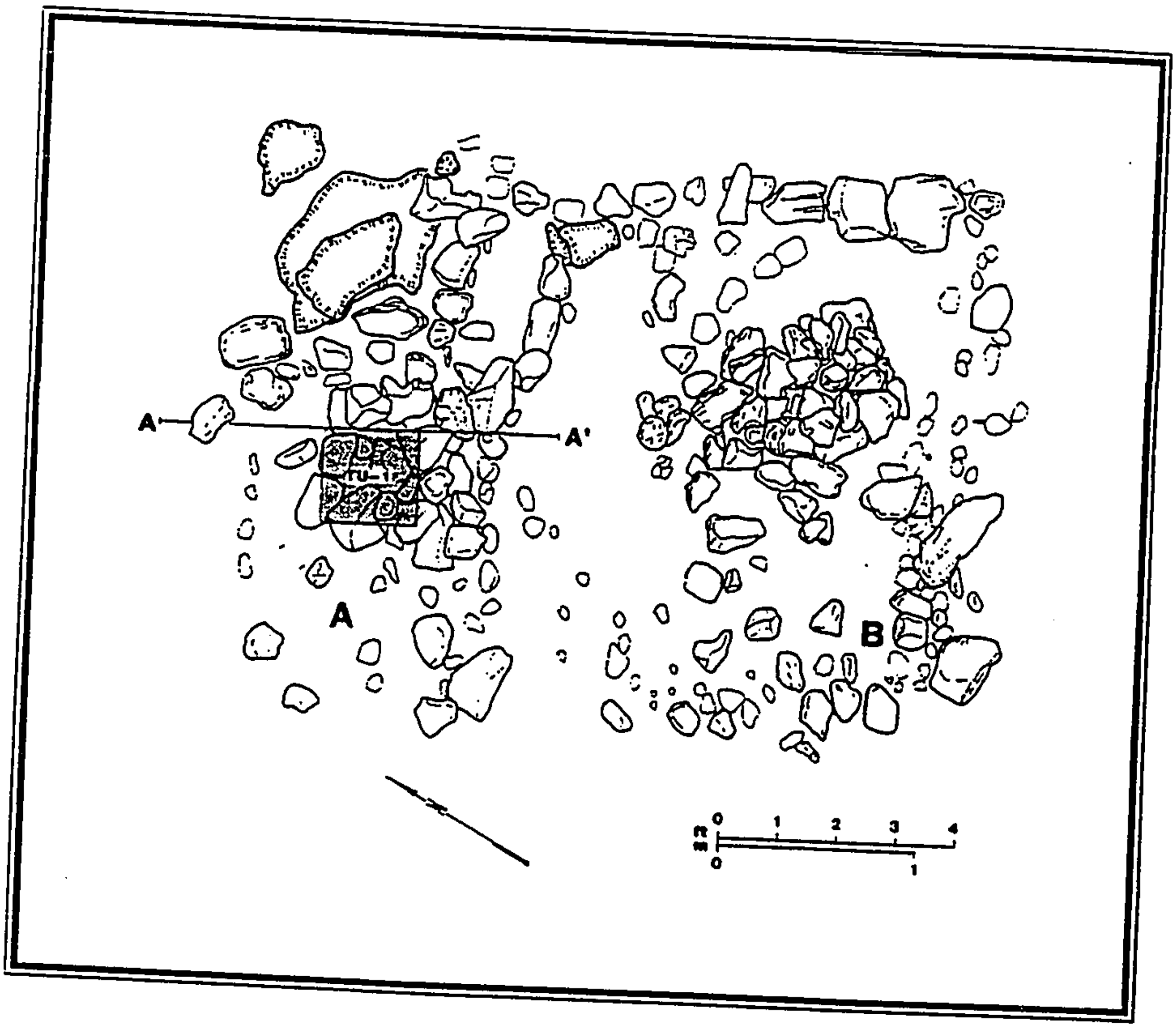


Figure A-9. SITE 2520, FEATURES A AND B (T-12)

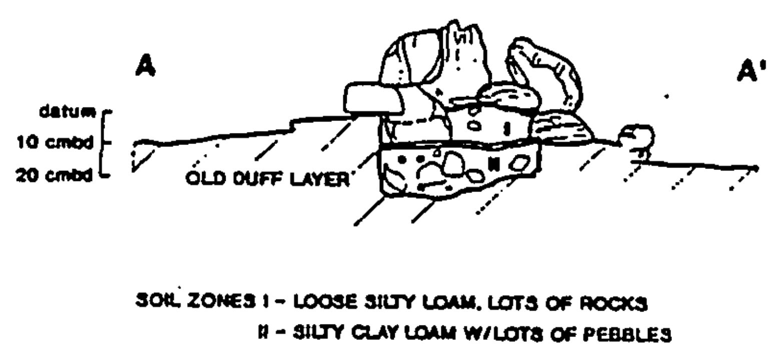


Figure A-10. SITE 2520, FEATURE A, PROFILE of partially buried boulders and cobbles and the corners are distinctly squared. The rock concentration on this terrace is more formalized than the Feature A concentration, and it has the appearance of a cairn. Two sides of the cairn are faced, two to three courses high. This feature also incorporates exposed bedrock.

FEATURE C: Rock-filled terrace
FUNCTION: Agriculture
DIMENSIONS: 1.20 m N-S by 1.04 m E-W by 0.33 m maximum height
DESCRIPTION: This terrace is square to rectangular in plan view, with retaining alignments along the east, south and west sides. Most of the south side is defined by exposed bedrock; the east and west perimeter stones are partially buried cobbles and small boulders. A linear pile of cobbles and small boulders is present in the center of the terrace. It is 0.90 m long by 0.40 m wide. Immediately to the west of Feature C is a drainage channel that has washed soil down the natural terrace slope.

FEATURE D: Rock pile
FUNCTION: Agriculture
DIMENSIONS: 1.50 m N-S by 1.00 m E-W by 0.25 m maximum height
DESCRIPTION: Feature D is a circular pile of large and small cobbles, situated around the burned stump of a kiawe tree. The pile is at the south edge of a natural terrace face that is extremely eroded and deflated. Immediately to the south of the pile is a shallow run-off channel.

SITE NO: State: 2521 PHRI: T-13
SITE TYPE: Midden scatter
ELEVATION: 50 ft AMSL
TOPOGRAPHY: On a flat lowland terrace, overlooking a broad drainage basin
VEGETATION: Thick California grass, immature kiawe
CONDITION: Surface is eroded and deflated; bulldozing also likely
INTEGRITY: Questionable
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Temporary habitation
DIMENSIONS: 21.00 m in diameter
DESCRIPTION: The site consists of a sparse scattering (c. 20 pcs.) of Cypraeidae and Conidae shell fragments, with c. 14 small pieces of broken coral and one waterworn pebble. Very little soil is present on the site, which is mostly exposed bedrock. The surface appears as though it was bulldozed some time ago. No concentrations of portable remains were observed and there is a very limited possibility of subsurface deposits. The material present may be a secondary deposit; the area is badly eroded in addition to being machinery disturbed.

SITE NO: State: 2522 PHRI: T-14
SITE TYPE: Complex (2 features)
ELEVATION: 70 ft AMSL
TOPOGRAPHY: On the west-facing edge of a prominent terrace ridge formation, along the left bank of an ephemeral drainage channel
VEGETATION: Thick California grass, dead kiawe
CONDITION: Some disturbance and erosion is evident
INTEGRITY: Generally unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture, possible temporary habitation
DIMENSIONS: Overall site 7.5 m E-W by 6.0 m N-S
DESCRIPTION: A box C-shape (Feature A) and a terrace (Feature B) were identified at this site. The two features are immediately adjacent to one another, with Feature B to the east side of Feature A. It appears that additional hillside terracing is present at the site, obscured by vegetation. This site may be connective with Site T-11, located c. 20.0 m to the south on the same ridge formation.

FEATURE A: Box C-shape
FUNCTION: Agriculture or temporary habitation
DIMENSIONS: Interior area 2.60 m NW-SE by 1.40 m NE-SW; overall 4.40 m NW-SE by 2.80 m NE-SW; maximum wall height 0.30 m
DESCRIPTION: This feature consists of a straight-sided, square-cornered C-shape, which opens to the south side. The walls consist of loosely stacked cobbles set in parallel alignments an average of 0.50 m apart. The walls are filled with additional cobbles; no faced portions are present. The east and west sides incorporate exposed bedrock, and the two corners are squared. Maximum wall height is at natural bedrock areas; the stacked portions average 0.15 m in height (2-3 courses). The interior area is level and generally cleared of loose rubble, with a few cobbles scattered on the surface. The soil deposit appears to be at least 0.10 m thick in places; no portable remains were observed in or around the feature.

FEATURE B: Terrace
FUNCTION: Agriculture
DIMENSIONS: 3.00 m N-S by 3.00 m E-W
DESCRIPTION: Feature B abuts Feature A along the east wall, where exposed bedrock is present. It is a rock-filled terrace with perimeters defined by large aligned cobbles. It is triangular in plan view, with the broad side adjacent to Feature A and the point to the northeast. The surface of the terrace is level with the tops of the perimeter stones and

consists of rough cobbles and pebbles. A second terrace may be present to the northwest; additional vegetation clearing is necessary in order to determine the actual extent of the site.

SITE NO: State: 2523 PHRI: T-16 *(Figure A-11)*
SITE TYPE: Complex (2 features)
ELEVATION: 80 ft AMSL
TOPOGRAPHY: On a low knoll at the western edge of a high terrace
VEGETATION: Thick California grass, burned kiawe
CONDITION: Fair, eroded
INTEGRITY: Generally unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Agriculture
DIMENSIONS: Overall site 10.00 m NW-SW by 4.0 m SE-NW
DESCRIPTION: Two C-shape walls (Features A and B) were identified at this site. The features are 3.00 m apart on an northeastern axis, with Feature B to the northeast. Feature A is on the crest of the knoll, c. 1.00 m above Feature B, which is situated on a relatively level portion of the natural terrace.

FEATURE A: C-shape
FUNCTION: Agriculture
DIMENSIONS: Interior, 1.60 m in diameter; overall 4.00 m N-S by 3.40 m E-W by 0.45 m maximum wall height
DESCRIPTION: This C-shape consists of cobbles and small boulders, arranged so as to incorporate exposed bedrock. The highest portion of the wall is along the north side, where five large, partially buried boulders naturally occur. The east side of the wall is the most artificially built up portion of the feature. It consists of loosely stacked cobbles, up to three courses high, with an average width of 0.80 m. The wall opens to the south; the opening is 1.60 m across. The interior area consists of soil-fill with partially buried cobbles and pebbles.

A 0.50 by 0.50 m square test unit was excavated in the center of Feature A. Three culturally sterile soil layers were identified. Layer I consists of dark reddish-brown silty loam with black silty motling; it extends from surface to 0.05 m below surface. Layer II consists of brown sandy silt loam and is 0.03 m thick. Layer III is 0.10 to 0.12 m thick and consists of dark brown silty clay loam with scattered cobbles and pebbles; rock density increases in the lower 0.06-0.08 m of this layer, and becomes impenetrable at the base of excavation, 0.20 m below surface.

FEATURE B: C-shape
FUNCTION: Agriculture
DIMENSIONS: Interior 2.80 m NE-SW by 1.50 m NW-SE; overall 3.50 m NE-SW by 4.50 m NW-SE by 0.47 m maximum wall height
DESCRIPTION: Feature B consists of small boulders and cobbles loosely stacked on partially buried bedrock. The wall opens to the south, with a 1.30 m wide opening. Most of the wall is stacked two courses high, with the exception of a small faced section three courses high, at the southeastern side, near the corner. Interior wall height here is maximum for the feature. Average interior wall height is 0.26 m and average exterior wall height is 0.15 m. The corners of this feature are more squared than the Feature A wall, and it is more formally constructed. The interior area is leveled soil that is generally cleared of rubble.

A straight alignment of cobbles extends to the southeast from the eastern corner of the wall. This alignment is 1.30 m long and averages 0.30 m wide. No portable remains were observed in or around the feature.

SITE NO: State: 2524 PHRI: T-18
SITE TYPE: Rock pile
ELEVATION: 58 ft AMSL
TOPOGRAPHY: On a pahoehoe flat with calcareous deposits; no soil present
VEGETATION: Very sparse 'ilima, some California grass
CONDITION: Good
INTEGRITY: Looks unaltered
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Indeterminate
DIMENSIONS: 1.40 m N-S by 0.74 m E-W by 0.50 m maximum height
DESCRIPTION: The site consists of a linear pile of pahoehoe cobbles, situated along a surface fold in the pahoehoe mantle. The pile is stacked a maximum of three courses high and is comprised of approximately 24 stones. A naturally collapsed blister is located nearby, which is the probable source of the cobbles.

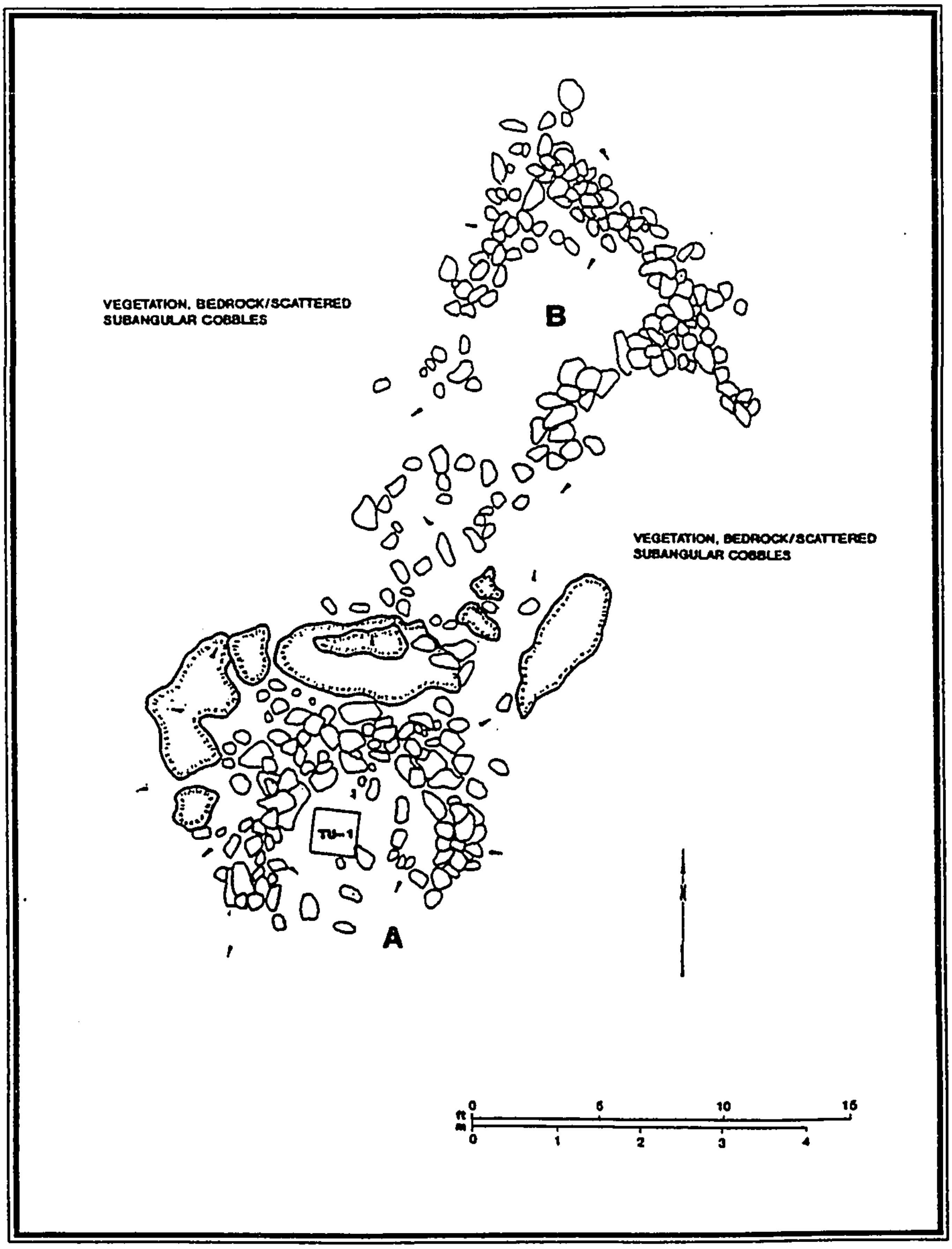


Figure A-11. SITE 2523 (T-16)

APPENDIX B

LIMITED HISTORICAL DOCUMENTARY RESEARCH

by Helen Wong Smith, B.A.

The ahupua'a of Keokea and Waiohuli are in the Makawao District (Kula), Island of Maui. Makawao can be translated: "Watchful eyes of Wa-o" (timeless or eternity). Sterling (n.d.) notes that "Makawao includes the ancient districts of Hamakualoa and Hamakauapoko..." For this reason, historical citations regarding Hamakuapoko and Hamakualoa are included within this report.

This report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. Much information was obtained from the files of the Maui Historical Society, which houses the personal notes of E. Sterling and I. Ashdown. The information in this report is organized into five sections: Early Historical Accounts, Heiau in the subject ahupua'a, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

EARLY HISTORICAL ACCOUNTS

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Areal descriptions usually concern the atmosphere or weather. Ashdown (n.d.) writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest." The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "'ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain."

A passage in Edward G. Beckwith's Journal of a Tour on Maui, also speaks of the unusual Makawao rain (Sterling n.d.):

> We noticed a peculiar meteorological phenomen through the whole ride. The trade wind which blows from the ocean across the Northwestern slope of Haleakala, is highly charged with vapor, which is condensed by the cool mountian air, and falls in abundant rains over the region of Makawao. Along the west side of the mountains about half way to the summit, lay a long line of cumulo stratus clouds, and between this and the nimbus there was but little space. The former lay along side of the mountain, apparently immovable, while the latter would advance and recede, now coming very near and coquettishly scattering its shining rain-drops beneath the very head of immovable cumulus, and now retreating as though afraid of its more dignified companion. While mentioning this latter peculiarity to a gentleman this evening, he remarked that it was this feature of the clouds which gave the place its name - Makawao, Mako=to be afraid, wao=a cloud (HMCS June 5, 1854). [Sterling notes that this is incorrect, that "afraid translates maka'u and ao is cloud. Pukui et al (1974) indicates the literal translation of Makawao is "forest beginning."

The Sterling and Ashdown manuscripts also provide these two descriptions of Makawao. Sterling's description is somewhat poetic; Ashdown's description is curiously intermixed with what may be a legend:

> "O native sons of those sections, the ones who watch for the dancing (haa) of the naked ones (olohe) on the plains of Kama'oma'o, where the iwa birds dwell in the ukiuku rain of Makawao..." S. W. Nailiili "E noho ana oe e oe ehoolono iki mai ana" Ke Au Okoa, Nov. 6, 1865, Hamakuapoko and Hamakualoa (Sterling n.d.).

> In the area of Wahine'oma'o (now called the "Baseball Park" above the modern Poli-Poli camp) and nearby Lua-ma-ma-ne, was a structure said to be for bird catching ceremonies because that region was full of birds. The 'Oma'o bird is known as the Hawaiian Thrush, and they were plentiful and provided green feathers. The Woman of 'Omao' dwelt at Mamane and she was called Mamao because she was of such very high rank. She was so sacred that others must keep their distance. A handsome lesser chief fell in love with her beauty and tried to win her. Of course this was kapu. Her heart was heavy with the knowledge that because he came near to her shadow he had to be punished. A high priest conducted ceremonies of purification at the temple there and revived happiness. Today the Mamane trees are stunted and soon the foreign trees such as California Redwood, Norfolk Pines and others will be replacing the former green verdure (Ashdown 1971:46).

In 1873, Isabella Bird toured the Hawaiian Islands and wrote of her experiences to her sister back home in Edinburgh. These are her impressions of Makawao:

> It is very pretty here, and I wish all invalids could revel in the sweet, changeless air. The name signifies "ripe bread-fruit of the gods." The plantation is 2000' above the sea, and is one of the finest on the islands; and owing to the slow maturity of the cane at so great a height, the yield is from 5 to 6 tons an acre. Water is very scarce; all that is used in the boiling-house and elsewhere has been carefully led into concrete tanks for storage, and even the walks in the proprietor's beautiful garden are laid with cement for the same purpose. He has planted many thousand Australian eucalyptus trees on the hill-side in the hope of procuring a larger rainfall, so that the neighbourhood has quite an exotic appearance. Below, the coast is black and volcanic-looking jutting into the sea in naked lava promontories, which nature has done nothing to drape (Bird 1974:228).

Early accounts which mention Makawao in relation to early historical events include those by historians Kamakau and Fornander:

> When Kekaulike heard that Alapa'i, the ruling chief of Hawaii was at Kohala on his way to war against Maui, he was afraid and fled to Wailuku in his double war canoe named Ke-aka-milo. He sailed with his wives and children..., his officers, war leaders, chiefs, and fighting men, including warriors, spearmen, and counselors. Some went by canoe and some overload, and the fleet landed at Kapa'ahu at the pit of 'Aihako'ko in Kula [old name for Makawao]. Here on the shore the chiefs prepared a litter for Kekaulike and bore him upland to Haleki'i in Kukahua (Kamakau 1961:69).

> Ke-a-ulu-moku was another celebrated man of Kalaniopu'u's day. His father was the great chief Kau-ua-kahi-akua-nui, son of Lono-maka'i-honua and Kaha-po'ohiwi, but his mother belonged to Naohaku in Kohala. He was celebrated as a composer of war chants, chants of praise, love chants, prophetic chants, and genealogical chants. When he went back to Hawaii with Kalaniopu'u he was homesick for the two Hamakua districts of Maui [Hamakua is within Makawao District] here he had lived with Kamehameha-nui and Kahekili. His love for the place found expression in a chant he composed, of which the following is an excerpt:

Aloha, Aloha	Affectionate longing, ibid
Aloha wale o'u maku-a la	Affection for my (foster) parents,
e o'u makua,	my parents,
Aloha wale o'u makua	Affection for my parents
Mai na 'aina Hamakua,	Who belong to Hamakua,
He mau 'aina Hamakua elua,	The two districts of Hamakua
No'u mua kaikua'ana i noho ai	Where my elder brothers live.
He ala pali na'u he mau ali'i ia	My hillside trails are theirs to rule (Kamakau 1961:112).

> During the fleeing of Kekaulike, Kahekili was carrying on the war on Oahu and suppressing the revolt of the Oahu chiefs, (Kamakau dates this 1785) a serious disturbance on Maui had occurred which gave him much uneasiness. It appears that he had given the charge of his herds of hogs that were running in the Kula district and on the slopes of Haleakala to a petty chief named Kukeawe. This gentleman, not satisfied with whatever he could embezzle from his master's herds, made raids upon the farmers and country people of Kula, Honuaula, Kahikinui, and even as far as Kaupo, robbing them of their hogs, under pretext that they belonged to Kahekili. Indignant at this tyranny and oppression, the country people rose in arms and a civil war commenced. Kukeawe called the military forces left by Kahekili at Wailuku to his assistance; a series of battles were fought, and finally Kukeawe was killed at Kamaole-i-kai, near Palauea, and the revolted farmers remained masters of the situation (Fornander 1969:228).

> This uprising of the country people was called the "Battle of the pig-eating Ku-keawe" ('Aipua'a-a-Ku-keawe) (Kamakau 1961:142).

HEAIU IN KEOKEA AND WAIOHULI

Three major heiau are present in Keokea ahupua'a, ma uka of the project area—Molohai, Papakea, and Kaumiumimua heiau. Molohai heiau, situated at an elevation of 2,275 feet above sea level, was initially described by Walker (n.d.), who described 26 heiau in the Kula region of which Molohai is the fourth largest. Walker about 1930 listed Molohai heiau as being 65 by 90 ft and constructed of rough a'a.

Walker surmised that the heiau was probably originally L-shaped; however, this could not be determined definitely, as the heiau had deteriorated and portions of it had been rebuilt as a modern wall. According to Walker, the front of the heiau was double terraced, and within it were a large court and a platform, set off by a low wall. In 1973, the Historic Sites office recorded the heiau as including narrow, terraced platform steps along the walls, three stone mounds, an alignment of stones, and a rectangular platform. Due to its size and good condition, Molohai heiau has been placed on the State Register of Historic Places.

Papakea heiau is situated mauka of Molohai at an elevation of 2,300 ft above sea level. Walker (1931) describes the heiau as "an open platform of a'a construction 45'x88'...the front double-terraced to a height of 4'...some coral seen but no pebbles." While surveying the heiau in 1973, a Historic Sites office archaeologist was told by a local informant that a house and cistern once stood on the site. The archaeologist and informant surmised that rocks from the heiau were utilized in constructing the cistern and that Walker's measurement of the heiau excluded the property line of the house. Ashdown (1971:46) cites this heiau as a fishing shrine. This is questionable due to its location far inland.

Kaumiumimua heiau, according to M. Riford (1987), is situated makai of Papakea, on a large gully overlooking Ma'alaea Bay. In 1931, Walker commented that the heiau had been much disturbed and that the remains of a platform were present in the northern corner and near the entrance. A survey of the heiau by the Historic Sites office in 1973 indicated that the east and south walls evidence two and possibly three separate construction periods. At one time, two heiau were located along the coast at Kelepolepo. At Koieie, was Kalaihi Heiau "which is now on Kaonoulu ranch land" (Cox 1976:14). Another heiau was Kealalipoa Heiau, once located in back of the Mormon Church property.

Ashdown (1971:46) mentions other heiau in Keokea and Waiohuli—Ho'ola and Ho'oula Ua heiau in Keokea and Kaimupeelua heiau in Waiohuli. Ho'ola heiau (Health temple) is situated just behind the Kula Sanatorium. Ashdown writes, "Ho'oula Ua heiau," a place for praying and offering gifts to bring rain." She also writes, "long before the forest was denuded...near Polipoli Spring area, there was farm where 'awa was cultivated and there stood a temple to Lono." Kaimupeelua heiau is located in the Waiohuli ahupua'a. Although the heiau originally measured 17 by 25 meters, much of it has been reduced to rubble by cattle (Historic Sites Register 1973).

Other heiau mentioned by historic writers in the Makawao district include Kailua heiau (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu), Po'onahoehoe and Mana heiau. The latter heiau is now part of a modern cemetery (Ashdown 1971:57).

LAND COMMISSION AWARDS

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. Of Keokea it was noted, "the above land belongs to the King, and he'e is the tabu fish" (Silva IN Miura 1982). The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Great Mahele concerning trial fee ownership runs. Kuykendall (1968:283) recounts the reasons for such trial fee ownership runs:

> It will be remembered that the year 1845, during which the new land law was written and in part enacted, was disturbed by an anti-foreign agitation, accompanied by a rather pointed suggestion that lands be given or sold to the common people and that the legislative committee, in its reply to the petitions of the people, approved the idea of selling land to Hawaiian subjects. This was directly in line with suggestions contained in Dr. Judd's report as minister of the interior, and there were frequent allusions to the subject in the proceedings of the legislature. The agitation among the people probably hastened the decision of the goverment to make an experimental beginning without waiting for the new law to go into operation. The places selected for the experiment were the Makawao district of Maui and Manoa valley on Oahu.
>
> During the King's tour of Maui in December, 1845, and January 1846, the party visited Makawao and it was announced that the entire district, with the exception of McLane's plantation, was to be offered for sale to the people in fee simple. Rev. J.S. Green, pastor of the Hawaiian church at Makawao, undertook to manage the business of selling the land. In afterwards relating his experience in connection with the project, Green said he called the people together, showed them his instructions from the goverment, and explained the plan to them.
>
> A few of them purchased at once, others had less confidence that lands thus purchased would be

secure, but soon abandoned their scruples, while others still could not for a long time, be persuaded that there was not some catch about it—some design to enrich the chiefs at their expense. But nearly all of these were finally talked out of their suspicions & took up each a small piece of land. *letter in Polynesian, July 14, 1849.

Another missionary, Rev. Richard Armstrong, assisted the enterprise by making surveys. The land was sold at $1 per acre, and nearly a 100 parcels were taken up, most of them ranging from 5 to 10 acres. Altogether about 900 acres were purchased by the people of the district.

In a search of LCAs granted in Keokea and Waiohuli, Silva (IN Miura 1982) *determined the general trend of land* use. While specific LCA testimonies for the project area were not located, testimonies for other sections of these ahupua'a show a consistent use pattern for the region: "... at Keokea, from the mountain to the Kula there are two mala (larger garden area) of Irish potatoes, one kula (smaller garden)" (LCA 6415). At Waiohuli, from the mountains to the Kula, there are seven mala of taro, one mala of Irish potatoes, and one houselot" (LCA 6414). The bulk of the parcels is designated as kula land and houselots (Riford 1987). Kula land is described by Handy and Handy (1972:510) as "open country, or plain, as distinct from valley...and has often been used as a term to distinguish between dry, or 'kula land' and 'wet-taro land'". As indicated in Kuykendall's account, kula plots were cultivated for personal use, but many tenants were involved in ranching and cash crops.

LAND USE AND TENURE

In their discussion of Hawaiian sweet potato planting techniques, Handy and Handy (1972) mention the Kula area of Maui and describe it as "[w]here potatoes are planted in crumbling lava with humus, as on eastern Maui and in Kona, [in] Hawaii the soil is softened and heaped carelessly in little pockets and patches using favorable spots on slopes...[r]ocky lands in the olden days were walled up all around with the big and small stones of the patch until there was wall (kuaiwi) about 2' high" (Handy and Handy 1972:131).

Handy (1940:161) also mentions Kula in his early work entitled The Hawaiian Planter:

KULA was always an arid region, throughout its long, low seashore vast stony kula lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed. So far as I can learn Kula supported no Hawaiian taro, and the fisherman in this section must have depended for vegetable food mainly on poi brought from Waikapu and Wailuku across the plain to supplement their sweet potato staple diet.

Kuykendall (1968:313) writes of the time when Kula crops turned from subsistence crops to commodities:

...Before that time the whalers had created a limited market for fresh vegetables, fresh meat, and fruit; the great increase in the number of whaleships after 1840 caused a corresponding increase in the demand for such products of the soil. In bulk and value, potatoes (sweet and Irish) ranked first in this traffic. In the early days only sweet potatoes had been obtainable at the islands, but after 1830, if not sooner, cultivation of the Irish potato was taken up and during the 1840s and 1850s became of great importance. It was shortly before 1840 that Irish potatoes were first raised in the Kula district, which proved to be so well adapted to them that it soon came to be called the "potato district." Jarves describes the region as it appeared to him in July 1846:

It ranges along the mountain (Haleakala) between 2000 and 5000 feet elevation, for the distance of 12 miles. The forest is but partially cleared, and the seed put into the rich virgin soil. The crop now in the ground is immense. The fields being all in blossom have a fine appearance, spreading as they do, over the broad surface of the mountain.

From this upland region the potatoes were carried down to the shore and taken to Lahaina or were sold directly to ships which called at Kalepolepo. In the spring of 1847 it was estimated that the crop would amount to 20,000 barrels...In 1854, G.D. Gilman estimated that the local Hawaiian market, including whaleships, could be depended on to consume about 20,000 barrels of Irish potatoes.

The influx of gold seekers together with the comparative neglect of agriculture in California created a demand for potatoes and other vegetables, as well as for sugar, molasses, and coffee, which began to be felt strongly in 1847, but the potato "boom" commenced in the fall of 1849. At the beginning of November a correspondent wrote from Maui to the Polynesian:

> The call for [potatoes] is loud and pressing, as some vessels bound for California have taken as many as 1,000 barrels each. The price is high, and the probablity is that the market can not be supplied this autumn. Kula, however, is full of people. Strangers from Wailuku, Hakamakua, and Lahaina are there preparing the ground and planting, so that if the demand from California shall be as urgent next spring as it is now the people will reap a rich harvest...They often repeat the saying of a foreigner, who after visiting the mines of California, came back to Maui quite satisfied, and said to his neighbors at Waikapu, "California is yonder in Kula. There is the gold without the fatigue and sickness of the mining country."

The foreigner's remark caught the fancy of the Hawaiians and they were soon referring to Kula as "Kalifonia" or "Nu Kalifonia" and working with great diligence to extract the wealth from the rich pay dirt on the slopes of Haleakala. To encourage the spirit of enterprise which had been thus awakened among the native people, the privy council voted to have the government lands in Kula surveyed and divided into small lots of from 1 to 10 acres and offered for sale to the natives at a price of $3/acre (see page 5 of this report) (1968:321).

C. Speakman, in his book entitled MOWEE also mentions the fervor of cash-cropping:

> During the gold rush, hundreds of Hawaiians were going into business for themselves on Maui-growing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Califoni, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man. The potato boom was short lived, and, when the prices dropped, the Hawaiians lost interest. Perhaps the problem was that Hawaiians did not share the white man's concept of time (1978:116).

The Chinese were among those who took advantage of this agricultural opportunity. During the 1840s, Chinese farmers leased lands in Kula. Their initial success motivated many Chinese to move to that region and lease land for farming. They moved from places such as Makawao, Paia, and Wailuku on Maui, Kohala on the Big Isle, and from Honolulu. Some went to Kula directly from China. The vast majority of Chinese, about 95%, were Hakkas from Kwangtung Province. During the 1840s, most Kula Chinese acquired their farmland by lease or deed from the haole ranchers or Hawaiian homesteaders. Much of this land was owned by the Hawaiian govenment, which leased it to the ranchers, who in turn subleased it to the Chinese. In some cases, the farmers made their lease payments in farm produce, in lieu of monetary transaction. One family which leased land from Ulupalakua Ranch paid five bags of corn for every acre of land they farmed (Interview, Willie Fong IN Mark 1975). Although by the mid-1850s, the demand for Kula potatoes had diminished, the Chinese population continued to grow. By between 1880 and 1910 approximately 80 Chinese families had moved to Kula; by 1900 there were some 700 Chinese living there. For a period of 30 to 40 years, Kula supported a thriving community which included Chinese and English schools, Christian churches, a Hung Men society, gambling joints and opium dens, general stores, and dozens of operating farms and cattle ranches (Mark 1975).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. When the Hawaiian market showed no demand for corn, the farmers used the corn to raise pigs, ducks and chickens, and marketed the animals instead. When the corn, potatoes, and other crops were harvested, they were packed and transported on mule teams or wagons to Kahului and Makena harbors, and were then shipped to Honolulu. Those who lived in the southern districts of Keokea and Kamaole usually brought their produce to the Makena landing. Most of Kula's produce, poultry, and beef was sent to two or three markets in Honolulu Chinatown, including Wing Hong Yuen and Sing Loy. The two stores, in turn, supplied Kula's general stores with Chinese dry goods and staples such as rice, flour, sugar, and canned milk (Mark 1975).

Early farming in Kula was adapted to the topography. In planting crops, rather than terracing the land, the farmers followed the natural contour of the land and depended on moist air and rainfall rather than irrigation. Until 1905, there was little water piped into the area, and during droughts—which occurred every several years—the farmers had to pack barrels of water on mules from Polipoli Springs, or from the beach or Olinda, both about 8 miles away (Mark 1975). An article in newspaper The Honolulu Advertiser points out the changes in the topography in Kula and its affect on the water supply:

Before 1850 Kula was supplied with moisture naturally through the existence of a large forest. "That forest was cut down when land was cleared in Kula to open farm plots in 1850. This was in answer to the demand for food in California during the gold rush....by ranchers clearing for pasture." Secondary result of clearing forests was destruction of existing fresh water ponds in Kihei on the Maaloaea (sic) Bay coast below Kula. When forest was cleared, water was free to rush down the mountains carrying soil from Kula and filling with mud, the ponds for which Kihei was once famous. Meanwhile Kula is dependent on pipe from Waikamoi watershed (Korte 1962 A:15).

By the 1880s the lower Kula sections, such as the project area, had largely become pasture for the booming cattle industry. Leases on large sections of crown land were leased for grazing acreage (Silva IN Miura 1982). In 1905 the Kula Pipeline was built during perhaps the worst drought in Kula history. The water source for the pipeline was discovered in Olinda, northeast of Kula. The contractor who built the pipeline was a prominent Kula resident named Shim Mook, and labor was supplied by the men and women of the area (Mark 1975).

In 1911 the Hawaiian government released a large amount of public land, and it became possible for citizens to purchase property in Kula. The sale of the land was advertised in English and Hawaiian newspapers, but word was somehow not communicated to the Chinese, whose lives these land sales would most affect. According to the Hawaiian Church Chronicle (Oct. 1911:12), the Kula Chinese "were not aware of what was taking place until the land was sold and the Hawaiians came and told them that the property belonged to them. They (Chinese) had relied on the information which they had received that the disposal of the land would not take place for a considerable time." Faced with eviction, the Kula Chinese decided determinately to remain on the land and organize themselves. Ninety-eight young residents signed a petition expressing the desire of the Chinese to be allowed to reside on certain lots their families had farmed for many years. In a letter to the Commissioner of Public Lands dated September 27, 1911, Governor Frear suggested that leases be made to occupants of unsold lots for approximately 10 years, subject to withdrawal for homestead purposes. Then, as the older children of those families reached 18 years of age, they would be able to apply for the lots as homesteads. In October 1911 the Hawaiian Church Chronicle reported that the government had promised to do so under these terms. Chinese who applied for homesteads and were granted them were given three years to improve their lot...after that period, they could apply for a "right of purchase" lease, and then buy the land outright from the government. Before this special arrangment was arrived at, however, a number of Kula farmers saw their land divided into homesteads and leased to others. These farmers, with the loss of their farmland, were forced to move out of Kula and change their livelihoods.

During the 1910s and 1920s many families left Kula for various reasons: severe drought which ruined crops and killed livestock, soil which was reaching depletion level after years of harvesting and tilling, lack of educational opportunities for children, and loss of land due to parceling homesteads. In 1918 another mass exodus occurred—some 40 families left Kula because the land they were leasing was sold to a man named Harold Rice, who intended to use the land for ranching. In the book Mowee, the author writes regarding the sale of farms to Rice: "The leases to the land had not expired, but the farmers were unaware of their right to challenge the eviction" (Speakman 1978:143). It is some of this land that Rice acquired from the farmers that made up Kaonoulu Ranch, in which the project area resides.

In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers (Project Measure Work Plan - Lower Kula Irrigation Project," Board of Water Supply, Maui County, Sept. 1971) The cash crops in Kula were no longer corn and potatoes, but a variety of vegetable and flowers produced by some 35 family-operated farms ranging in size from five to 50 acres. As of 1975, the agricultural yield of the irrigated soil was still very high (Mark 1975).

Sugar cultivation has played a major role in Honuaula and Makawao. In the spring of 1846 there were six establishments on the western slope of Mt. Haleakala manufacturing sugar and molasses (Kukendall 1968:316). Since the general vicinity of the present project area has been used historically for small farms and ranching, Kula sugar cultivation will not be discussed here.

Silva's research of inter-governmental communications indicates that the exploitation of kiawe was soon the major money maker in the area (Silva IN Miura 1982:B-2). Kiawe was initially used as cattle feed. Kiawe gathering has been the main use of the project area (Miura 1982:B-3).

A report on Kula would not be complete without some mention of Kula Sanatorium, founded for the care of tuberculosis sufferers. The sanitorium is located mauka of the project area at an elevation of 3,000 feet (The Honolulu Advertiser 9/20/85 B:3). Land for the sanatorium was requested by Bill Pogue in 1909. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost $500.00. The first permanent ward was built by W.E. Foster, former patient and Superintendent. Around 1932, the Hawaiian Homes Commission granted 100 acres to the sanitorium, and in 1937 a new sanatorium was constructed (Jones 1940).

The following general information relevant to Keokea and Waiohuli ahupua'a is from The Maui News:

3-26-04 - P. Cockett has been appointed manager of Waiohuli Cattle Ranch.

4-27-07 - On last Sunday morning, J.P. Inaina was installed pastor of the Keokea Hawaiian church in Kula. A large audience was present. Rev. I. D. Iaea preached the sermon and Rev. M. Lutero gave the right hand of fellowship. The charge to people and pastor was given by Rev. R.B. Dodge. Rev. D.N. Opunui offered the installing prayer.

12-16-32 - Formal approval of the newly acquired land in Keokea which is now being turned into a baseball park for the people of Kula, was given by the Board of Supervisors on Thursday. A resolution requesting the Commissioner of Public Lands to effect the exchange of lands between the territory and the owner was adopted by the Board. Slightly over two acres are involved in the transaction.

CONCLUSION

Kula areas in the dry intermediate zone were areas of limited use and exploitation (Cox 1976). The main service of such zones was as a transitional zone of limited exploitation between the richer areas of more intensive use ma uka and ma kai (Miura 1982 B-4). During this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. For the purposes of this report, a general overview of agricultural activities was given. If further historical documentary research is conducted for the project area, it is suggested that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; local and regional cultural (including residential sequences.

REFERENCES

Ashdown, I.

1971 Ke Alaloa o Maui, The Broad Highway of Maui.

n.d. Unpublished notes, Maui Historical Society files, Wailuku, Hawaii.

Bird, I.

1974 Six Months in the Sandwich Island. Rutland: Charles E. Tuttle Co.

Cox, D.

1976 The Archaeology of Kula, Maui from Pulehu Nui Ahupua'a to Kama'olu Ahupua'a; Surface Survey, Piilani Highlway. Dept. Tansporatation, State of Hawaii.

Fornander, A.

1969 An Account of the Polynesian Race. Rutland: Charles E. Tuttle Co.

Handy, E.S.C.

1940 The Hawaiian Planter. B.P. Bishop Museum Bulletin 161. Honolulu.

Handy, E.S.C., and E.G. Handy

1972 Native Planters of Old Hawaii: Their Life, Lore and Environment. B.P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu. (With Mary Kawena Pukui)

Jones, K., M.D.

1940 Kula Through the Years (Kula Sanatorium 30th anniversary).

Kamakau, S.

1961 Ruling Chiefs of Hawaii. Honolulu: Kamehameha Schools Press.

Kuykendall, R.S.

1968 The Hawaiian Kingdom: 1778-1854, Foundation and Transformation Vol. I. Honolulu: University Press of Hawaii.

Mark, D. M. L.

1975 The Chinese in Kula: Recollections of a Farming Community in Old Hawaii.

Miura, M.T.

1982 Biological and Archaeological Reconnaissance, TMK 2-2-02:42, Kihei, Maui, Hawaii. Environmental Impact Study Corporation.

Riford, M.

1987 Archaeological Services for DHHL Waiohuli & Keokea Subdivisions, Kula, Makawao, Maui for County of Maui, B.P. Bishop Museum. Honolulu.

Speakman, C.E., Jr.

1978 Mowee - An Informal History of the Hawaiian Island.

Sterling, E.P.

n.d. Unpublished notes, Maui Historical Society files, Wailuku, Hawaii.

Thrum, E.G.

1909 Thrum's Hawaiian Annual and Almanac. Honolulu.

1917 Thrum's Hawaiian Annual and Almanac. Honolulu

Walker, W.

1931 Archaeology of Maui. Unpublished manuscript. Hamilton Library Hawaiian-Pacific Collection, University of Hawaii at Manoa.

Appendix C

Preliminary Engineering Report and Preliminary Drainage and Soil Erosion Control Report

PRELIMINARY ENGINEERING REPORT
FOR
HALE MAHAOLU EHIKU
ELDERLY HOUSING PROJECT

KIHEI, MAUI, HAWAII
TMK: (2) 2-2-02: 73

Prepared for

Hale Mahaolu

Prepared by

Sato & Associates, Inc.
2115 Wells Street
Wailuku, Maui, Hawaii

January 26, 2004

CONTENTS

I. INTRODUCTION

The purpose of this report is to anticipate the civil requirements for the proposed Hale Mahaolu Ehiku Elderly Housing Project. In doing so, this report will evaluate existing infrastructure conditions affecting the project site and anticipate what infrastructure improvements will be needed to support development of the site.

It is not the intent of this report to establish all of the improvements that will be required for the project. Nor is this report intended to be comprehensive and complete. Only anticipated improvements based on limited discussions with County and State agencies are included.

II. PROPOSED PROJECT

A. Location

The project is located in Kihei, on the southern coast of the Island of Maui. The site is bordered by Old Welakahao Road to the North, Piilani Highway to the East, the future North-South Collector Road (Liloa Drive) to the West and existing single family residential homes to the South. The site can further be identified as Tax Map Key (TMK): (2) 2-2-02:73. See Exhibit A.

B. Project Description

Hale Mahaolu proposes to develop the 6.01 acre site for elderly housing and elderly support services. Although development of the site is planned in two or three phases, the proposed project will ultimately consist of 111 one-bedroom units and 1 three-bedroom manager's unit in structures varying from one to three stories in height. Also planned are a Senior / Community Center / Adult Day Care Center building, and an Adult Residential Care Home, see Exhibit B.

III. EXISTING CONDITIONS

A. Adjacent Land Use

The project's northern boundary is adjacent to Old Welakahao Road and the future site of Kihei Hope Chapel beyond. East of the site lies Piilani Highway with the County's Kihei Wastewater Reclamation Facility across the highway. Existing single family residential subdivisions are located south and west of the site with the future North-South collector road being immediately adjacent to the project's western boundary.

B. Topography and Soil Conditions

The majority of the site is covered with various grasses, weeds, and shrubs. A few small Kiawe and Haole Koa trees are also present. A small portion of the site has been paved and is currently being used by the County of Maui for the Kihei recycling drop off center.

The property slopes predominately mauka to makai (East to West) with elevations ranging from 78 feet to 56 feet above mean sea level. The average slope through the site is approximately 4 to 5 percent.

A May 2002 soils investigation by Island Geotechnical Engineering, Inc., indicates the site to be underlain with approximately 0.5 to 3.5 feet of granular material consisting of sand, gravel and cobbles. However, below this soil layer moderately hard to hard Basalt rock was encountered. Excavation into this rock is expected to be difficult and will require hoeramming and/or blasting for removal.

C. Flood and Tsunami Hazard

The project site is not located within any tsunami inundation areas or 100 year flood plains. According to the flood insurance rate map for the County of Maui, the site is located on land designated as Zone "C". Areas with this designation are subject to minimal flooding.

D. Drainage

Existing storm water runoff generated by the site follows the general topography of the property, sheet flowing towards low points near the west and south-west property lines. The runoff continues to flow across the North-South Collector Road and into adjacent residential subdivisions where it is intercepted by the subdivision's drainage system.

The site is not significantly impacted by runoff from offsite areas. An existing earth berm along the site's northern boundary prevents runoff from Old Welakahao Road from entering the site. Runoff from Old Welakahao Road sheet flows in the makai direction and into the adjacent residential subdivision. Due to the super elevation condition on Piilani Highway only runoff from the grassed slopes areas fronting the property enters into the site. The runoff then follows patterns described above for runoff generated on site.

An existing 61" x 84" CMP Arch culvert is located near the site's south-east corner. This culvert discharges storm runoff from areas mauka of Piilani Highway. Prior to the development of the Keala Hills subdivision, this runoff flowed down a portion of the project site as well as on lands associated with Keala Hills subdivision. As part of the development of the subdivision, a drainage culvert was constructed that diverts this water away from the site. Drainage calculations can be found in the project's Preliminary Drainage Report.

E. Roadways

Old Welakahao Road and Piilani Highway are the only paved roadways fronting the project. The corridor for the planned North-South Collector (Liloa Drive) also abuts the site's western property line but is unimproved and there is no definite date for the start of construction. The current right-of-way width for both roadways is 44 feet and the existing pavement width on Old Welakahao Road varies from 20 to 22 feet. Old Welakahao Road also has no curbs, gutters, or sidewalks.

Due to the present roadway conditions, it is anticipated that road improvements will be made a requirement for development of the site by the County of Maui. A description of those anticipated improvements can be found in the Infrastructure Improvements section of this report.

F. Water System

At present, the subject property is in a natural or undeveloped state. There are no domestic water or irrigation service laterals to the site. An 18-inch Department of Water Supply (DWS) line exists within the corridor for the North-South Collector. DWS's Central Maui Transmission line also runs through the site near its western and southern boundaries, refer to Exhibit C. The location of this line with its associated easements will impact both the project's layout and grading scheme. No buildings or structures are allowed within the easement and the Department has strict cover requirements for their waterlines. These requirements will limit the amount of cutting or filling that can be done over the waterline.

The County's reclaimed waterline originating at the Kihei Wastewater Reclamation plant, runs through Old Welakahao Road. In accordance with County Policy, reclaimed water shall be utilized for irrigation purposes.

G. Sewer System

There are no sewerlines fronting the project site although existing gravity lines exist near by in both the Wai Mahaihai and Keala Hills Subdivisions. In order for the site to support development, a new sewerline will need to be constructed from the site to either subdivision. Refer to the Infrastructure Improvement section of this report for further details.

H. Electric, Telephone, and Cable TV Service

Electric, telephone, and cable TV services are currently being provided by Maui Electric Company, Verizon Hawaii, and Oceanic Time Warner, respectively. Service to the project is available via existing overhead lines on both Old Welakahao Road and in the corridor for Liloa Drive. Overhead lines also run through the entire site near its southern property line and can be found crossing a portion of the property near its north-east corner, refer to Exhibit C. Similar to the existing waterline, the location of these overhead lines may impact the project's building layout.

IV. <u>INFRASTRUCTURE IMPROVEMENTS</u>

A. Roadways

As mentioned earlier, the project site is surrounded by existing or future roadways on three sides. Piilani Highway located along the site's eastern property line is under the jurisdiction of the State of Hawaii, Department of Transportation (DOT). Piilani Highway has access controlled restrictions which means permitted access points onto the highway is regulated by DOT. These points are usually limited to major public roadways and therefore access to the highway from the site will not be permitted nor is it recommended.

Old Welakahao Road located on the property's northern boundary falls under the jurisdiction of the County of Maui. The County at DOT's request has allowed the road's connection with Piilani Highway to be closed due to various safety concerns. During talks with the County's Department of Public Works and Environmental Management (DPWEM), the Department expressed a willingness to allow the roadway to be cul-de-sac just past the project's planned driveway entrance. However, improvements to bring the roadway to County standards mainly construction of curbs, gutters and sidewalks will be required along the property's frontage. No additional right-of-way taking is anticipated since the roadway will service only the Ehiku project.

Liloa Drive (North-South Collector Road) is also under County jurisdiction and runs along the site's western boundary. Although not yet built in the vicinity of the site, plans for construction of the roadway are currently being designed. These plans call for the future roadway to have 12 foot wide travel lanes, a 10 foot wide paved median / turning lane, and concrete curbs and gutters. The makai side of the roadway will have a 5 foot wide sidewalk and 5 foot landscape strip. While the mauka side will have a 10' wide bike / pedestrian path and landscape strip, refer to Exhibit D. Talks with DPWEM have indicated that the County will require Hale Mahaolu to construct the bike / pedestrian path and install landscaping fronting the project site. Currently plans for the Liloha Drive call for a 60 foot wide right-of-way corridor. The existing right-of-way width fronting the site is only 44 feet wide therefore, a 16 foot wide road widening strip will need to be dedicated to the County.

B. Water System

Potable water for South Maui comes from the Central Maui Water System which gets its water mainly from the Iao and Waihee aquifers. As of July 2003, the State Commission on Water Resource Management has taken control of both aquifers. In response, the County of Maui has indicated that they will stop issuing new water meters for areas served by the Central Maui System until additional water sources are made available. Due to this concern a meeting was held with Mayor Alan Arakawa to discuss the possibilities of obtaining meters for the project. The Mayor indicated that in actuality, the County has an allowance of approximately 2 million gallons per day (MGD) which has been set aside for residential type projects like the one being proposed. Water meters for these type of projects will continue to be issued until this allocation had been depleted.

Once completed the project will use approximately 69,740 gallons of water per day. This does not include water for irrigation purposes and the use of potable water for this purpose is not anticipated due to the availability of reuse water. Based on preliminary water calculations the project would require two 2-inch water meters once full buildout is completed. The current water system development fee for these two meters is $123,012.00. DWS has stated that they will not allow the project to be serviced by the existing 18 inch waterline in Liloa Drive since it is considered to be a transmission line. Therefore in order to bring water to the site, a new 12 inch waterline will need to be constructed from the existing 12 inch waterline in Kapuna Street.

Preliminary water calculations can be found in the back of this report in the Appendix.

C. Sewer System

Once fully occupied, the project will generate approximately 31,050 gallons of raw sewage per day. Sewage from the project will be treated and processed at the County of Maui's Kihei Wastewater Reclamation Plant. The project site is located in Assessment Area 6 and the estimated wastewater assessment fee for the project is $157,100.00. Preliminary wastewater contribution calculations can be found in the Appendix.

Currently there are no sewerlines in the immediate vicinity of the site. The nearest connection point for the project would be at Keala Place in the Keala Hill Subdivision or at the intersection of Kupuna and Mahina Streets in the Wai Mahaihai Subdivision. Discussions with the DPWEM's Wastewater Reclamation Division have determined that both sewer systems currently have capacity for the project. However, due to its closer location, the existing manhole at the intersection of Kupuna and Mahina Streets is the preferred connection point.

Approximately 200 linear feet of 8-inch sewerline will be required along portions of Liloa Drive and Kapuna Street to bring sewer service to the project from this manhole location. Connection to the manhole itself may be difficult due to the configuration of existing sewer laterals serving Lots 46 and 47 in the Wai Mahaihai Subdivision. Temporary disruption of sewer service to these lots is anticipated during the connection of the new sewerline to the manhole. In light of this, the developer plans to approach the owners of these lots to inform them of the above situation and try to reach an agreement that would help minimize any inconvenience.

D. Drainage

An existing 24-inch drain stub-out exists in Liloa Drive near the property's southwest boundary corner. There are no other existing County or private drainage systems in the vicinity of the property. According to the Drainage and Soil Erosion Report for Keala Hills Subdivision, prepared by Warren S. Unemori Engineering, Inc., the stub-out and the associated Keala Hills drainage system has a capacity for an additional 16.6 cubic feet per second (cfs), which was allocated for development of the site once known as the Piilani Project District. Preliminary drainage calculations indicate development of the site will generate more runoff than the allotted 16.6 cfs. Therefore, in accordance with current County drainage standards, the additional runoff above and beyond the allotted 16.6 cfs will be retained on the property. Approximately 1 acre-feet of storage will be required.

Storm water runoff from the project will be collected and conveyed via a system of grass swales, concrete drain inlets, manholes, and pipes. The runoff will then be transported to the existing drainage stub-out or to onsite retention basins and underground-perforated sub-drain systems.

As an alternative to storing the additional runoff onsite, it may be possible to connect to the County's drainage improvements for Liloa Drive. Due to the preliminary point at which the roadway's design is at, it is not known if there will be enough capacity to accommodate the project's runoff. Hale Mahaolu has also indicated that they may be willing to contribute to the cost of upsizing the roadway's drainage system in order to insure there is enough capacity. For reasons previously stated no formal negotiations have taken place at this point.

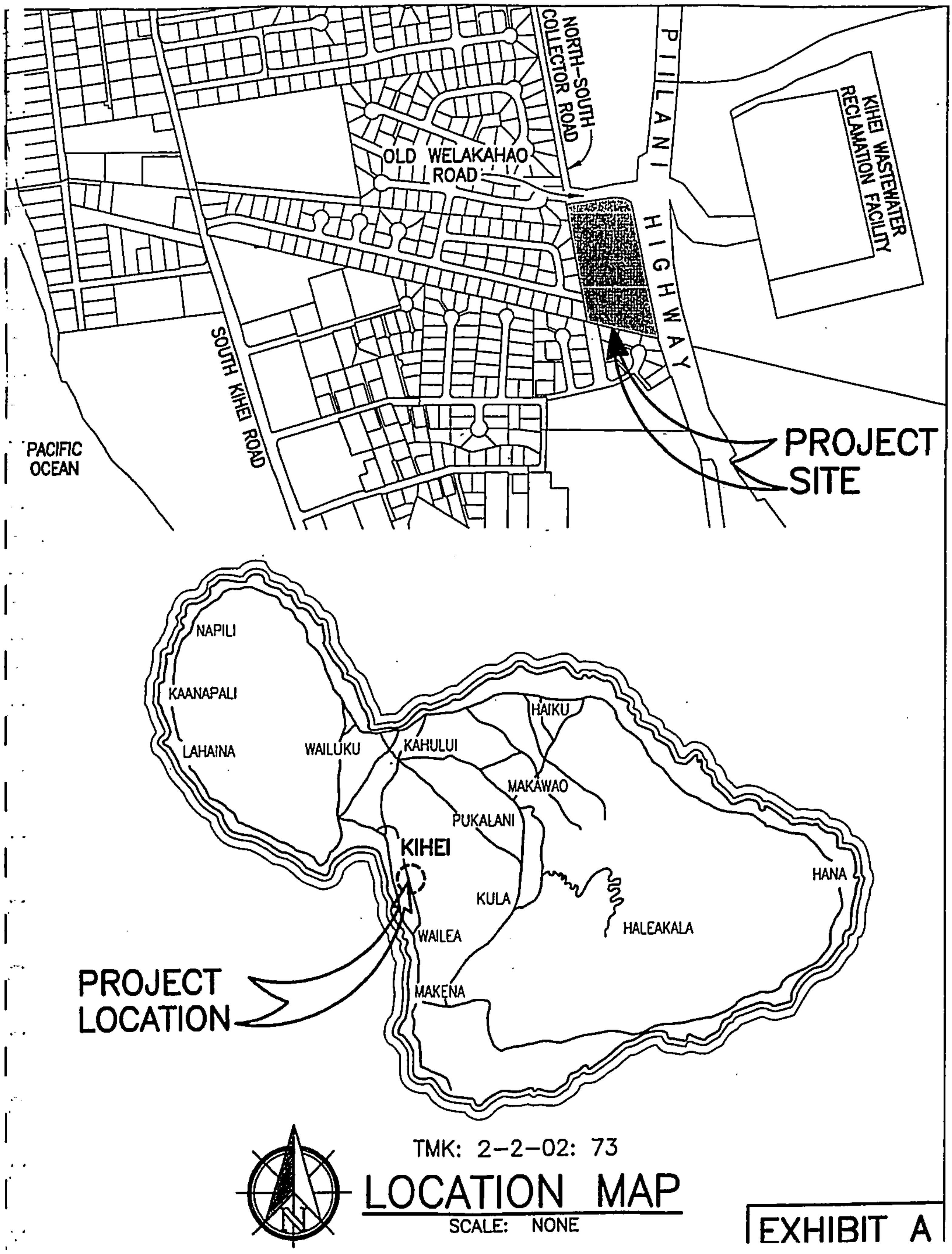
For a detailed description of the drainage conditions affecting the site, refer to the preliminary drainage report.

E. Electrical, Telephone, and Cable TV Service

As mentioned earlier, service is available via overhead lines on both Liloa Drive and on Old Welakahao Road. Service is also available from lines running through the site near its southern boundary. The County of Maui normally requires that overhead lines be relocated underground in concert with road widening improvements, i.e. construction of curbs, gutters, and sidewalks. However, since the majority of the overhead lines are not located along the property's frontage, this requirement is not anticipated at this time.

Hale Mahaolu may still want to explore the cost of relocating overhead lines running through the site to eliminate these obstructions.

EXHIBITS

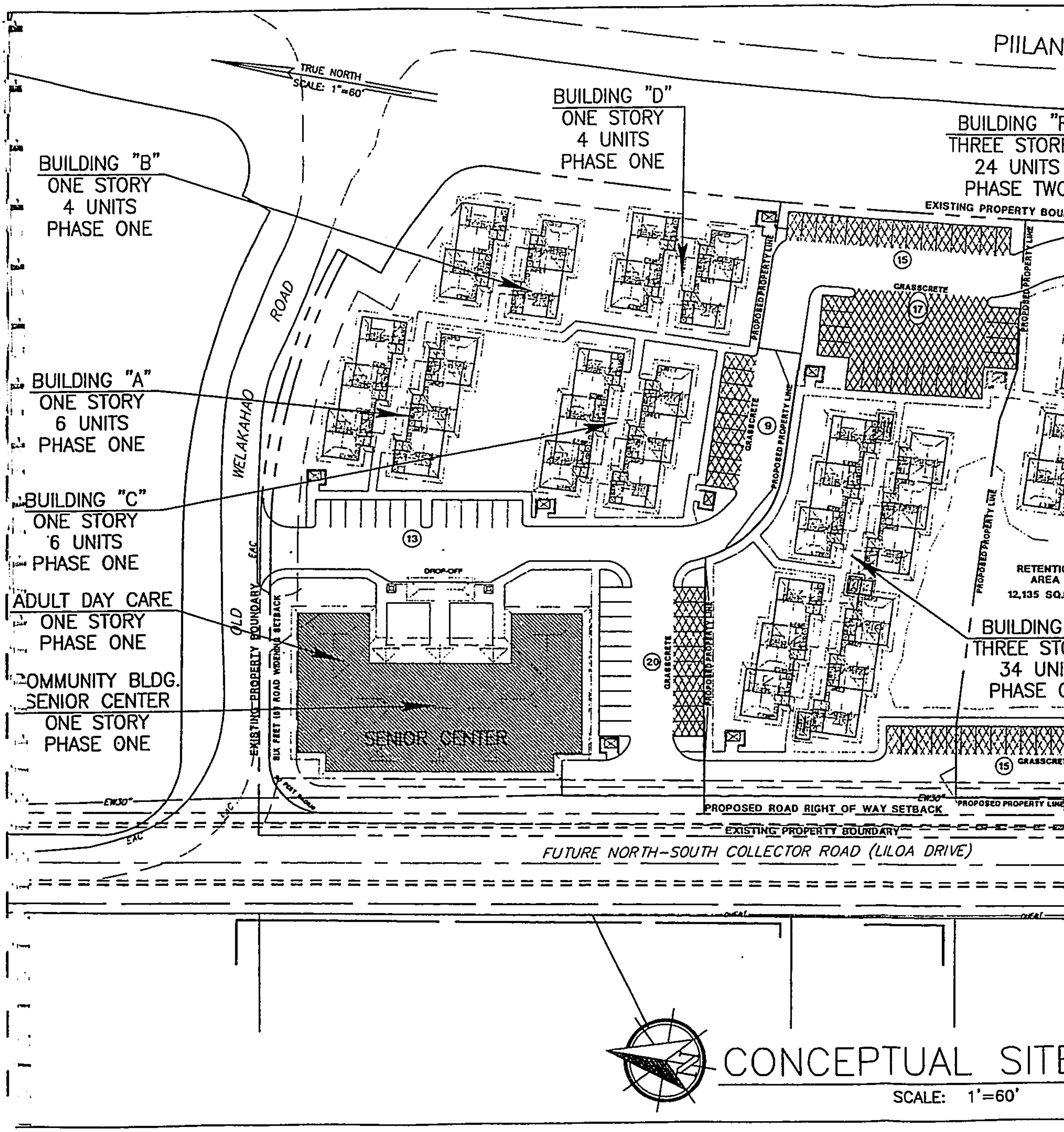


TMK: 2-2-02: 73

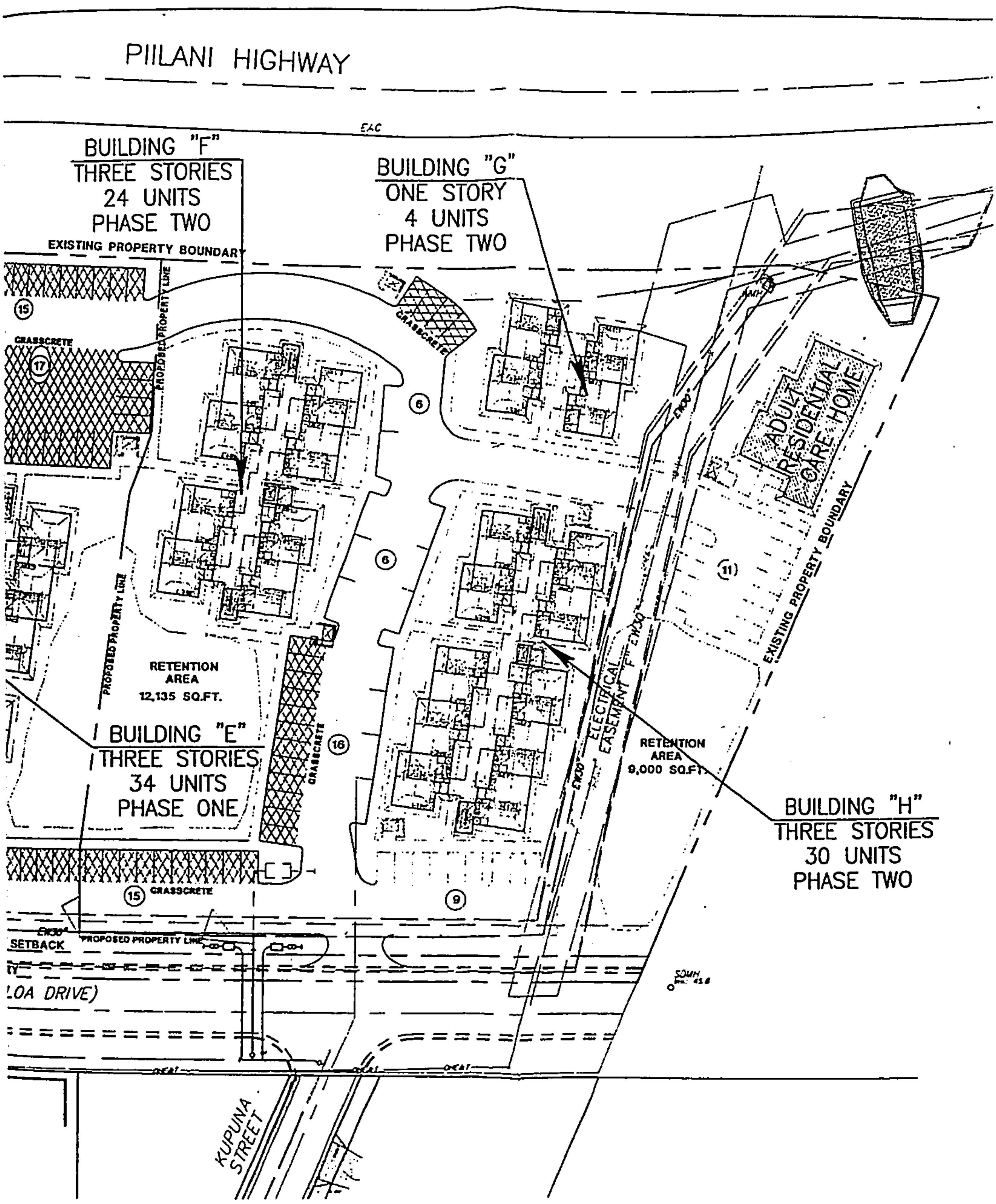
LOCATION MAP

SCALE: NONE

EXHIBIT A



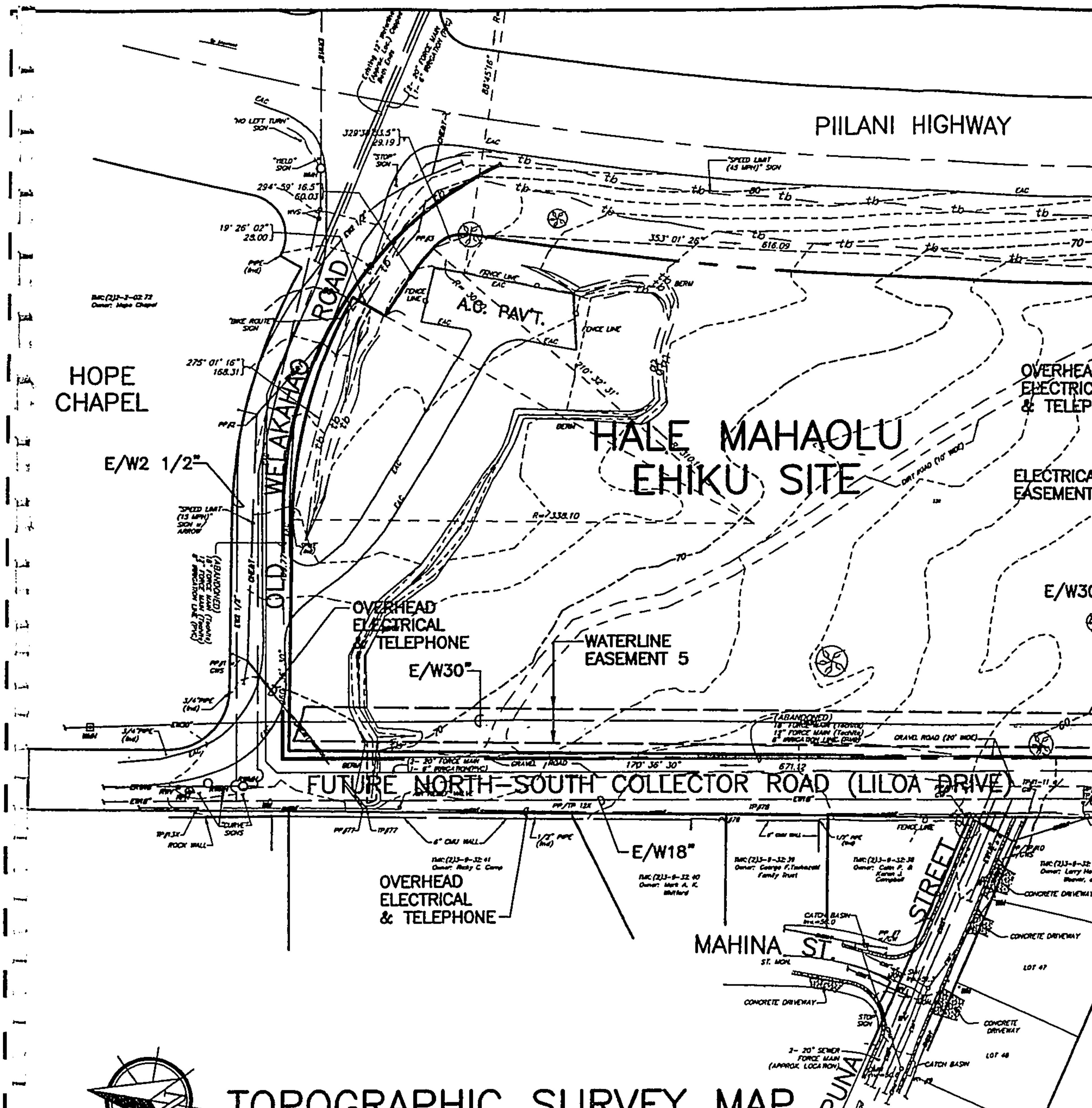
PIILAN
TRUE NORTH
SCALE: 1"=60'
BUILDING "D"
ONE STORY
4 UNITS
PHASE ONE
BUILDING "B"
ONE STORY
4 UNITS
PHASE ONE
BUILDING "A"
ONE STORY
6 UNITS
PHASE ONE
BUILDING "C"
ONE STORY
6 UNITS
PHASE ONE
ADULT DAY CARE
ONE STORY
PHASE ONE
COMMUNITY BLDG.
SENIOR CENTER
ONE STORY
PHASE ONE
EXISTING PROPERTY BOUNDARY
PROPOSED PROPERTY LINE
GRASSCRETE
OLD WELAKAHAO ROAD
DROP-OFF
SENIOR CENTER
SIX FEET (6) ROAD WIDENING SETBACK
RETENTION AREA
12,135 SQ.
PROPOSED ROAD RIGHT OF WAY SETBACK
EXISTING PROPERTY BOUNDARY
FUTURE NORTH-SOUTH COLLECTOR ROAD (LILOA DRIVE)
CONCEPTUAL SITE
SCALE: 1'=60'



TUAL SITE PLAN

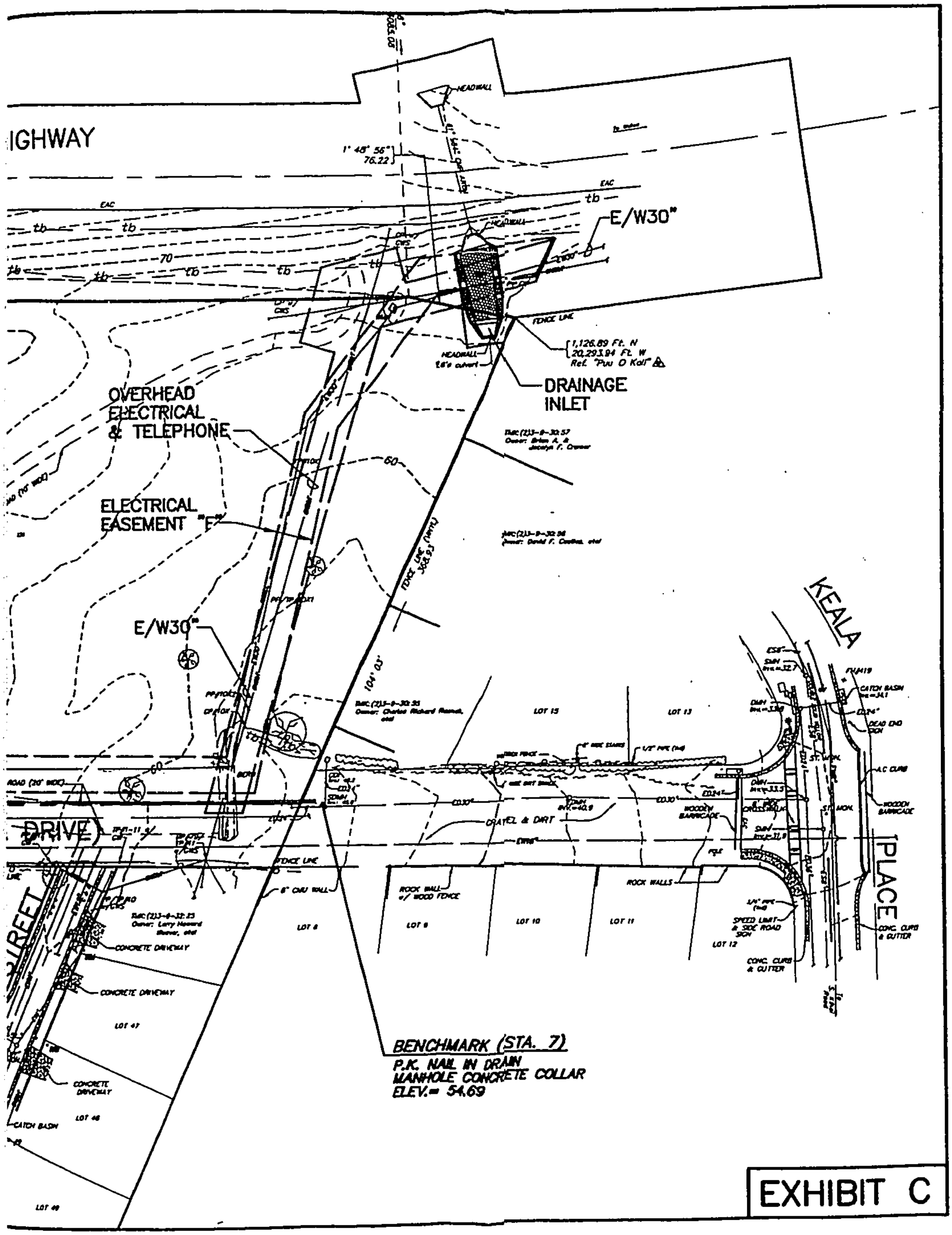
SCALE: 1'=60'

EXHIBIT B



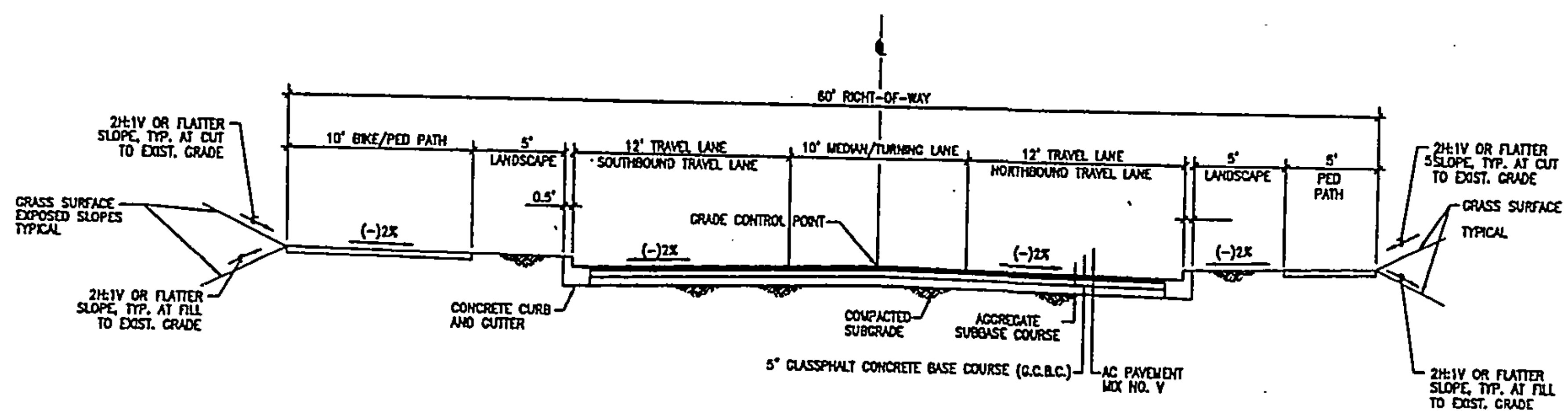
TOPOGRAPHIC SURVEY MAP

SCALE: 1"=80'



IGHWAY
E/W30"
HEADWALL
DRAINAGE INLET
1,126.89 Ft. N
20,293.94 Ft. W
Ref. "Puu O Kali"
OVERHEAD ELECTRICAL & TELEPHONE
ELECTRICAL EASEMENT "E"
E/W30"
KEALA
PLACE
DRIVE
STREET
LOT 15
LOT 13
LOT 8
LOT 9
LOT 10
LOT 11
LOT 12
LOT 47
LOT 48
LOT 49
GRAVEL & DIRT
FENCE LINE
ROCK WALLS
CONCRETE DRIVEWAY
CATCH BASIN
BENCHMARK (STA. 7)
P.K. NAIL IN DRAIN
MANHOLE CONCRETE COLLAR
ELEV.= 54.69

EXHIBIT C



PROPOSED TYPICAL ROADWAY SECTION

NOT TO SCALE

PREPARED FOR: COUNTY OF MAUI DPW and WM ENGINEERING DIVISION	FIGURE 2 NORTH-SOUTH COLLECTOR ROAD EXTENSION PROPOSED TYPICAL ROADWAY CROSS SECTIONS	Shimabukuro, Endo & Yoshizaki, Inc. Civil, Environmental & Structural Engineers

EXHIBIT D

APPENDIX

Preliminary Domestic Water Consumption Estimate

Preliminary Domestic Water Demand Calculations

Preliminary Wastewater Contribution Calculations

PRELIMINARY
DOMESTIC WATER CONSUMPTION ESTIMATE
FOR
HALE MAHAOLU EHIKU
7/1/03

Use	No. Units	No. of Users	No. Staff	Usage	Ave. Daily Demand
Elderly Housing	112			560 gal/unit	62,720 GPD
Senior Center / Community Building & Maintenance Shop	1	15	10	60 gal/person	1,500 GPD
Adult Day Care Center	1	70	12	60 gal/person	4,920 GPD
Adult Residential Care Home	1			600 gal/unit	600 GPD

Total Average Daily Consumption = 69,740 GPD

Maximum Daily Demand = 104,610 GPD

PRELIMINARY
DOMESTIC WATER DEMAND CALCULATIONS
FOR
HALE MAHAOLU EHIKU
TMK: 2-2-02:73
JULY 17, 2003

Reference: Department of Water Supply Memorandum regarding Low Flow Fixture Valves, April 27, 1995

Uniform Plumbing Code, 1991 Edition

Conceptual Site Plan, May 2, 2003

Phase I

Residential Units

Fixture Type	Quantity	Units/Fixture	Total Fixture Units
Water Closet (P)	54	1.7	91.8
Lavatory (P)	54	0.6	32.4
Shower (P)	54	1.6	86.4
Kitchen Sink (P)	54	1.6	86.4
Hose Bib (P)	48	2.0	96.0
		Subtotal	393.0

Adult Day Care

Fixture Type	Quantity	Units/Fixture	Total Fixture Units
Water Closet (P)	2	1.7	3.4
Lavatory (P)	2	0.6	1.2
Water Closet (FM)	10	5.6	56.0
Lavatory	8	1.2	9.6
Urinal	2	2.8	5.6
Service Sink (P)	1	1.6	1.6
Bar Sink (P)	1	1.6	1.6
3 Comp. Sink	1	6.4	6.4
Shower	2	3.2	6.4
Drinking Fountain	2	2.0	4.0
Hose Bib	5	2.0	10.0
		Subtotal	105.8

Senior Center

Fixture Type	Quantity	Units/Fixture	Total Fixture Units
Water Closet (P)	2	1.7	3.4
Lavatory (P)	2	0.6	1.2
Water Closet (FM)	5	5.6	28.0
Lavatory	6	1.2	7.2
Urinal	2	2.8	5.6
Shower	1	3.2	3.2
Service Sink (P)	1	1.6	1.6
Service Sink	3	3.2	9.6
Bar Sink (P)	1	1.6	1.6
3 Comp. Sink	2	6.4	12.8
Washer	4	4.0	16.0
Hose Bib	2	2.0	4.0
		Subtotal	94.2

Phase 2

Residential Units

Fixture Type	Quantity	Units/Fixture	Total Fixture Units
Water Closet (P)	58	1.7	98.6
Lavatory (P)	58	0.6	34.8
Shower (P)	58	1.6	92.8
Kitchen Sink (P)	58	1.6	92.8
Hose Bib (P)	40	2.0	80.0
		Subtotal	399.0

Adult Residential Care Home

Fixture Type	Quantity	Units/Fixture	Total Fixture Units
Water Closet (P)	8	1.7	13.6
Lavatory (P)	8	0.6	4.8
Shower (P)	8	1.6	12.8
Service Sink (P)	2	1.6	3.2
Kitchen Sink (P)	1	1.6	1.6
Washer	1	4.0	4.0
Hose Bib	4	2.0	8.0
		Subtotal	48.0

Summary

Phase	Total Fixture Units	Peak Demand (GPM)	Required Meter Size
1	593.0	145	1 - 2" Meter
2	447.0	115	1 - 2" Meter
1 & 2	1040.0	210	2 - 2" Meter

NOTE:

1. Water for irrigation purposes will be from the County's reclaimed Water System.
2. (P) - Denotes Private Use
3. (FM) - Denotes Flush Meter

PRELIMINARY DRAINAGE REPORT
for
Hale Mahaolu Ehiku
Kihei, Maui, Hawaii
TMK: (2) 2-2-02:73

Prepared by
Sato & Associates, Inc.
2115 Wells Street
Wailuku, Hawaii

January 26, 2004

PRELIMINARY
WASTEWATER CONTRIBUTION CALCULATIONS
FOR
HALE MAHAOLU EHIKU
TMK: 2-2-02: 73
AUGUST 19, 2003

Reference: County of Maui, Department of Public Works and Environmental Management, Wastewater Reclamation Division, Wastewater Flow Standards.

Conceptual Site Plan, May 2, 2003

Description: The proposed project will consist of the construction of 111 Multifamily one-bedroom elderly housing units, a three-bedroom manager's unit, a Senior Center / Community Building, an Adult Day Care Center, and a Adult Residential Care Home.

Estimated Sewer Flow:

Elderly Housing Units		
111 Units x 255 gal / unit	=	28,305 gal
Manager's Unit		
1 Unit x 255 gal / unit	=	255 gal
Senior Center / Community Building		
10 Employees x 20 gal / employee / day	=	200 gal
15 Offsite Users x 20 gal / user / day	=	300 gal
Adult Day Care Center		
12 Employees x 20 gal / employee / day	=	240 gal
70 Offsite Users x 20 gal / user / day	=	1,400 gal
Adult Residential Care Home		
1 Residential Home x 350 gal / home	=	350 gal
Total Average Wastewater Flow	=	31,050 gal

PROJECT LOCATION

This project is located in Kihei, on the southern coast of Maui. The project site is located at the southwest corner of Piilani Highway and the Old Welakahao Road intersection. This parcel is identified as Tax Map Key (TMK): (2) 2-2-002:73. See the Location Map in Appendix A.

PROJECT DESCRIPTION

This project shall utilize a 6.012 acre parcel for the construction of an elderly independent living complex. 111 one bedroom units and 1 three bedroom manager's unit are planned for this development. Also, envisioned is a senior center adult day care center building and an adult residential care home. Refer to the Conceptual Site Plan in Appendix A.

FLOOD HAZARD

Flood Insurance Rate Maps (FIRM) published by the Federal Emergency Management Agency (FEMA), panel number 150003 0265C, indicates that the project site is located within Zone C. Zone C is designated as an area which is prone to minimal flooding.

EXISTING DRAINAGE CONDITIONS

The project site generally slopes at approximately 2% to 4%. Vegetative ground cover on the site is approximately 60%. Under these conditions site generates runoff at a rate of approximately 8.49 cubic feet per second (cfs) during a 10 year 1 hour storm event.

Existing storm water generated from the site, generally sheet flows towards low points near the west and south-west property lines and then into the future North-South Collector Road. Berms constructed for the County's Recycling Drop-off Center (refer to Area 1 on the Existing Conditions Runoff Map) detains a small portion of the site's runoff during small storm events. However, during extended or heavy rainfall the amount of runoff exceeds the available storage volume and thus continues to sheet flow off the site as described above.

Refer to Appendix A for a map showing existing runoff conditions and a runoff summary.

DEVELOPED DRAINAGE CONDITIONS

Once completely developed, the site will generate runoff during a 10 year 1 hour storm at a rate of approximately 25.44 cfs. The 16.95 cfs increase is due to the greater amount of nonporous areas such as paved parking areas and driveways, roof areas, and walkways. In anticipation of the increased runoff due to development, the developer plans to incorporate open lawn areas and grassed parking areas where appropriate into the design in an attempt to keep the increase to a minimum.

PROPOSED DRAINAGE SYSTEM

Except for a 24-inch drain stubout located in Liloa Drive near the site's southwest boundary corner no County drainage system exists in the immediate vicinity of the project. According to the Drainage and Soil Erosion Report for Keala Hill Subdivision, prepared by Warren S. Unemori Engineering Inc., the stubout and the associated Keala Hills drainage system has the capacity for an additional 16.6 cfs. This additional capacity was set aside for this site back when it was referred to as Piilani Project District, since the developer at the time participated in the cost of the Keala Hill Subdivision drainage system. The County of Maui also has plans to begin construction of Liloa Drive. Although no time frame for the start of construction has been determined, there may be a possibility of draining some or all of the projects runoff into the roadway's drainage system once it has been completed.

Given the above, it is proposed to drain the site by three different methods. The first method consists of using swales and drain inlets to intercept the runoff and convey it to the existing 24-inch drainline stubout. As stated earlier, this system has the capacity for an additional 16.6 cfs. Thus this method for draining the site would be limited to that amount.

The second method will be to intercept and convey the runoff to retention areas planned through out the site, refer to the Conceptual Site Plan in Appendix A. To reduce the required depth in these retention areas perforated subdrain may also be used. This would allow the retention areas to double as open lawn space.

The third method will be to connect to the County's drainage system for Liloa Drive. Due to the preliminary point at which the roadway's design is at, it is not known if there will be enough capacity in the County's drainage system to accommodate the project's runoff. Hale Mahaolu has also indicated that they may be willing to contribute to the cost of upsizing the roadway's drainage system in order to insure there is enough capacity. For reasons previously stated no formal negotiations have taken place at this point. It is important to note, that the proposed project can comply with County drainage standards without this third method.

HYDROLOGIC DESIGN CRITERIA

Hydrologic calculations for both existing and developed conditions, were done using the Rational Method. Factors used in the calculations were taken from the County of Maui's Drainage Standards as outlined in "Title MC-15, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui."

The following factors were used:

A. **Recurrence Intervals:**

10-year, 1-hour storm I = 2"
50-year, 1-hour storm I = 2.25" (For Storage Calculations)

B. **Time of Concentration:**

Overland flow time was determined from Plate 1, using hydraulic length and slope to the intake point.

C. **Rainfall Intensity:**

Rainfall intensity (i), was determined by using Plate 2, comparing the time of concentration with the 1 hour rainfall.

D. **Runoff Coefficient:**

Runoff Coefficient (c) was determined from Tables 1 and 2. For purposes of these calculations, a weighted runoff coefficient was used for each drainage area. For purposes of this preliminary study a "C" value of 0.27 was used for existing conditions while a value of 0.70 was used for developed conditions.

A summary of the runoff calculations are attached in Appendix A.

SUMMARY

Runoff generated by the proposed development will be collected using swales and drain inlets. It is planned to pipe approximately 10 cfs of runoff to the existing stub-out on Liloa Drive, which does not exceed the 16.6 cfs allotted (see, Drainage and Soil Erosion Control Report for Keala Hills Subdivision, prepared by Warren S. Unemori Engineering, Inc.). The remaining additional runoff due to development of the site will either be stored on the site (approximately 1 acre-feet) or conveyed to the drainage system to be constructed with the Liloa Drive should capacity be available.

APPENDIX A

Hydrologic Runoff Calculations

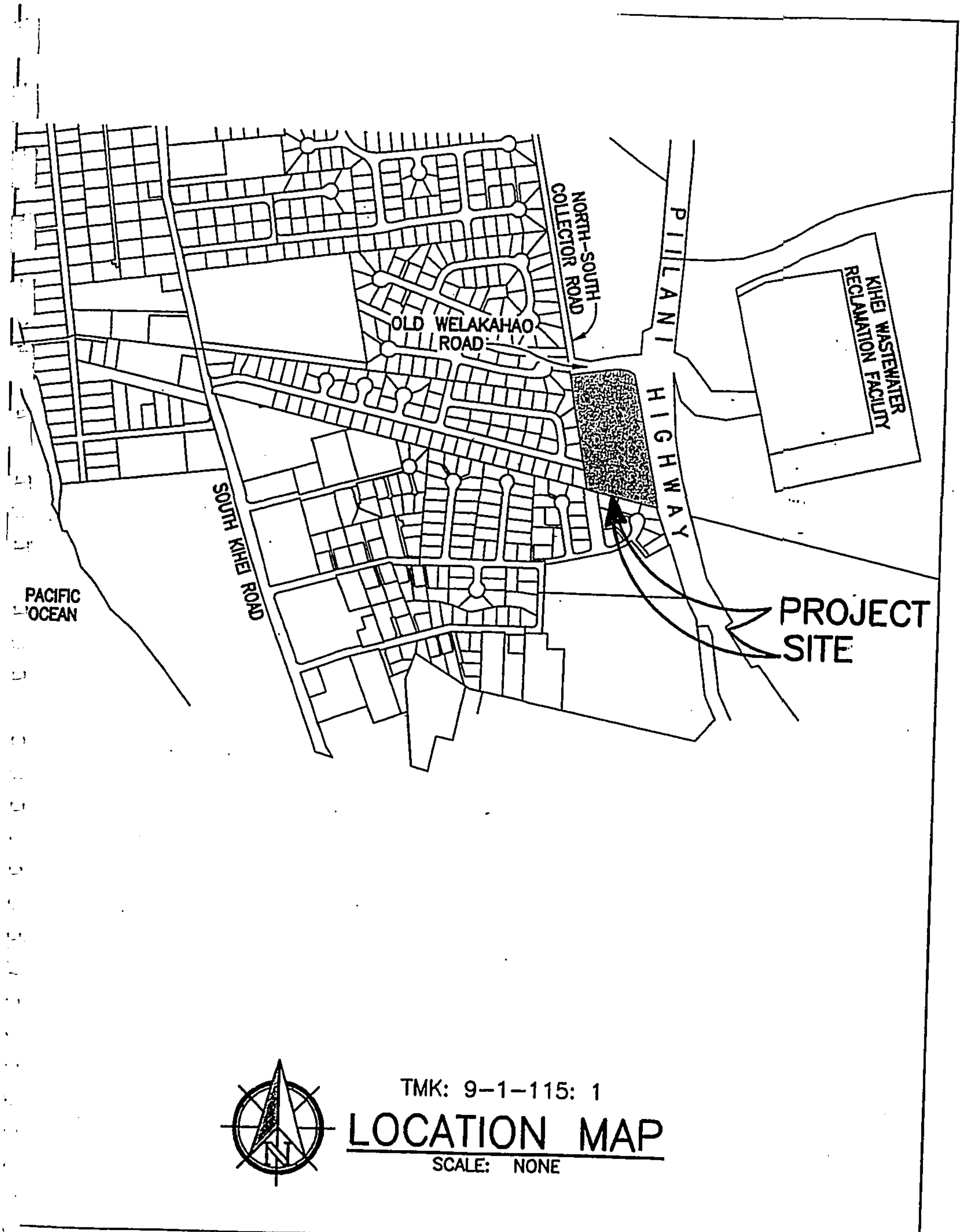
Location Map

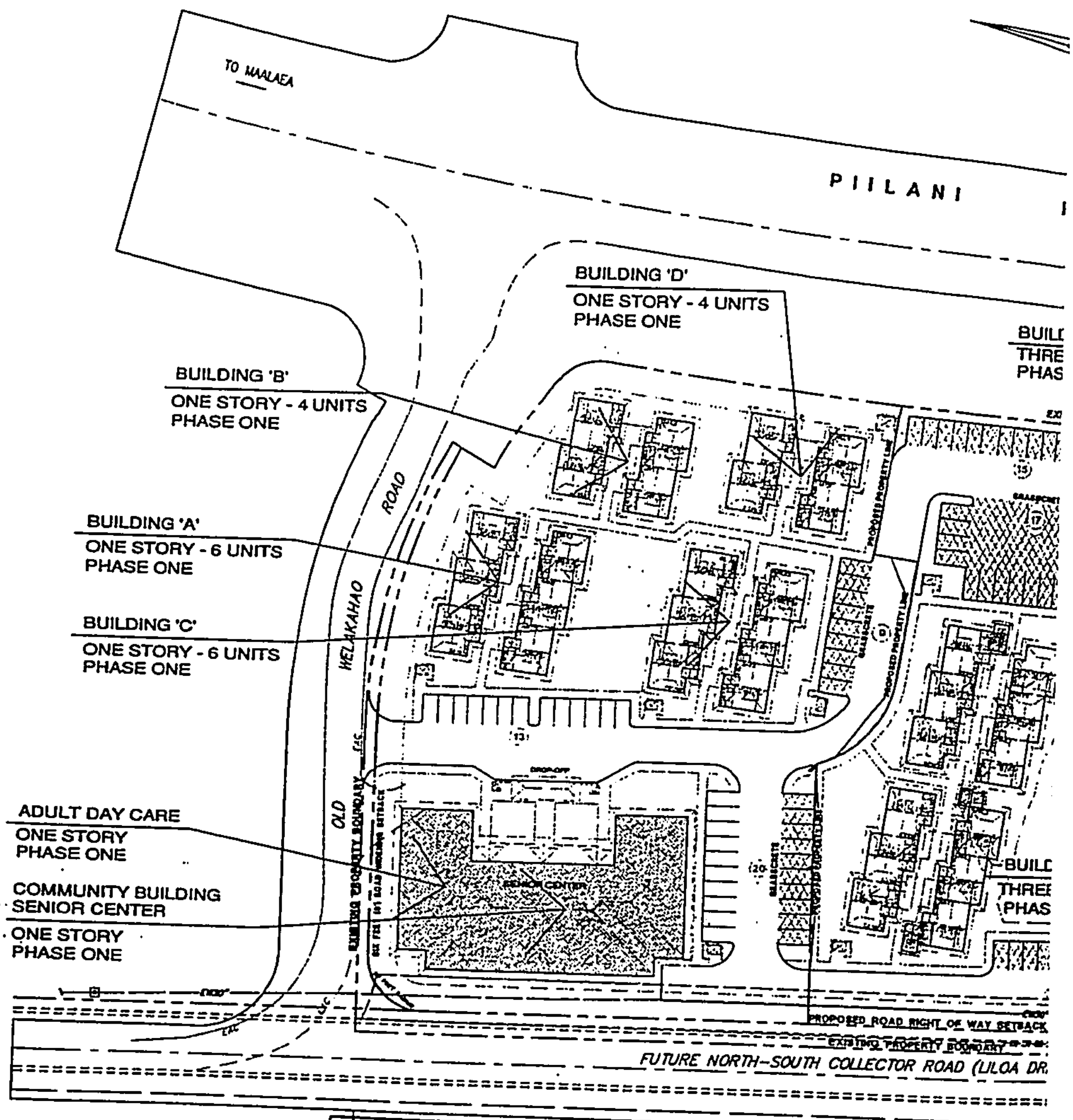
Conceptual Site Plan

Runoff Map - Existing Conditions

Runoff Summary

Storage Calculations


NORTH-SOUTH COLLECTOR ROAD
PIILANI HIGHWAY
KIHEI WASTEWATER RECLAMATION FACILITY
OLD WELAKAHAO ROAD
SOUTH KIHEI ROAD
PACIFIC OCEAN
PROJECT SITE
N
TMK: 9-1-115: 1
LOCATION MAP
SCALE: NONE

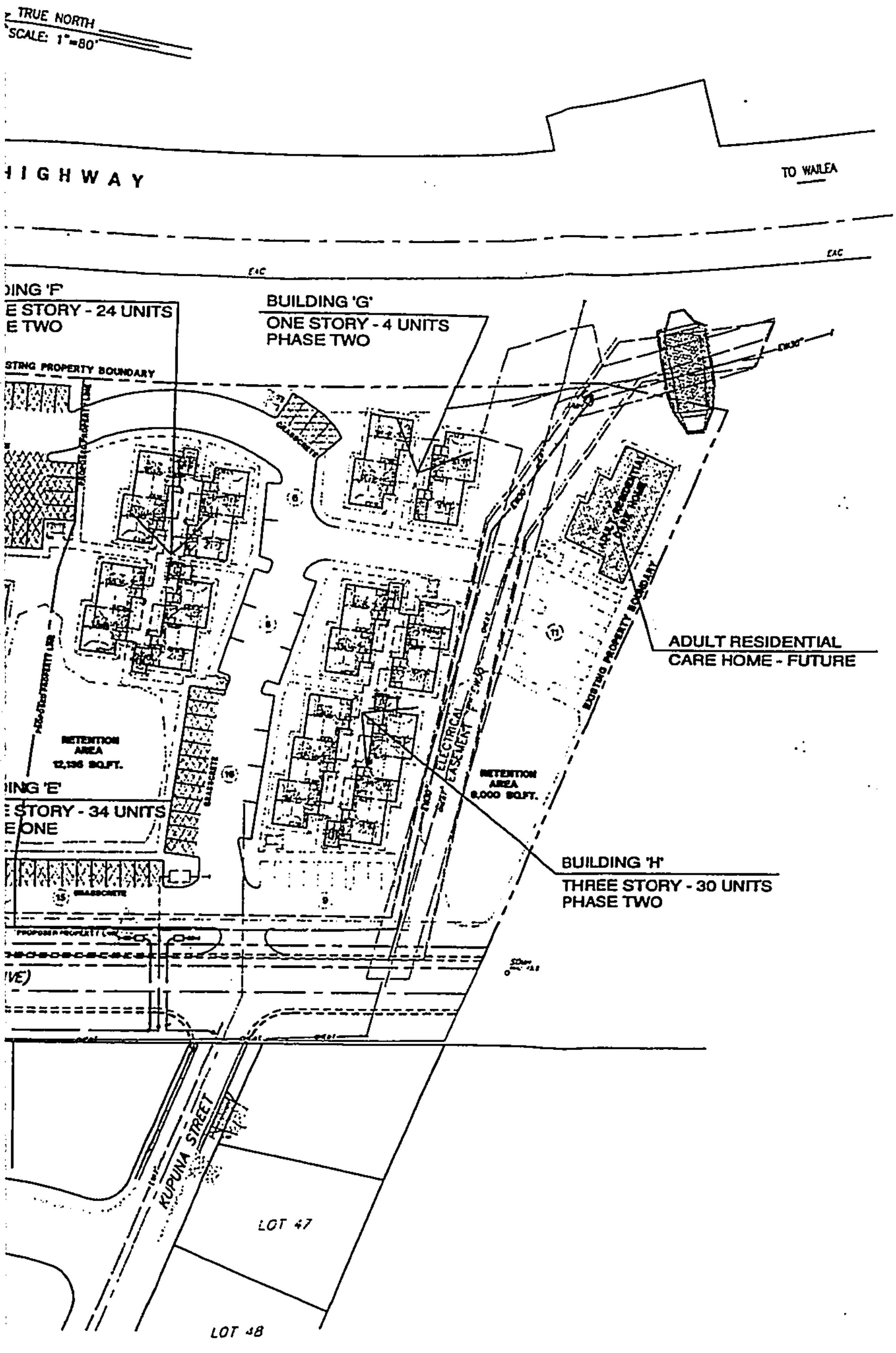


CONCEPTUAL MASTER PLAN

SUBJECT TO CHANGE

GENERAL PROJECT INFORMATION

OVERALL SITE AREA: 6.012 ACRES
TOTAL NUMBER OF UNITS SHOWN: 111 - ONE BEDROOM UNITS
1-THREE BEDROOM UNIT
SENIOR CENTER / COMMUNITY BUILDING 12,000 S.F.
ADULT DAY CARE CENTER
MAINTENANCE
ADULT RESIDENTIAL CARE HOME 2,426 S.F.



Hiyakumoto + Higuchi
ARCHITECTS - INC.

1860 Main Street
Wailuku, Maui, Hawaii 96793
Telephone (808) 242-9705

This work was prepared by me or under my supervision.

Date NOV. 17, 2003

Hans Riecke, FAIA

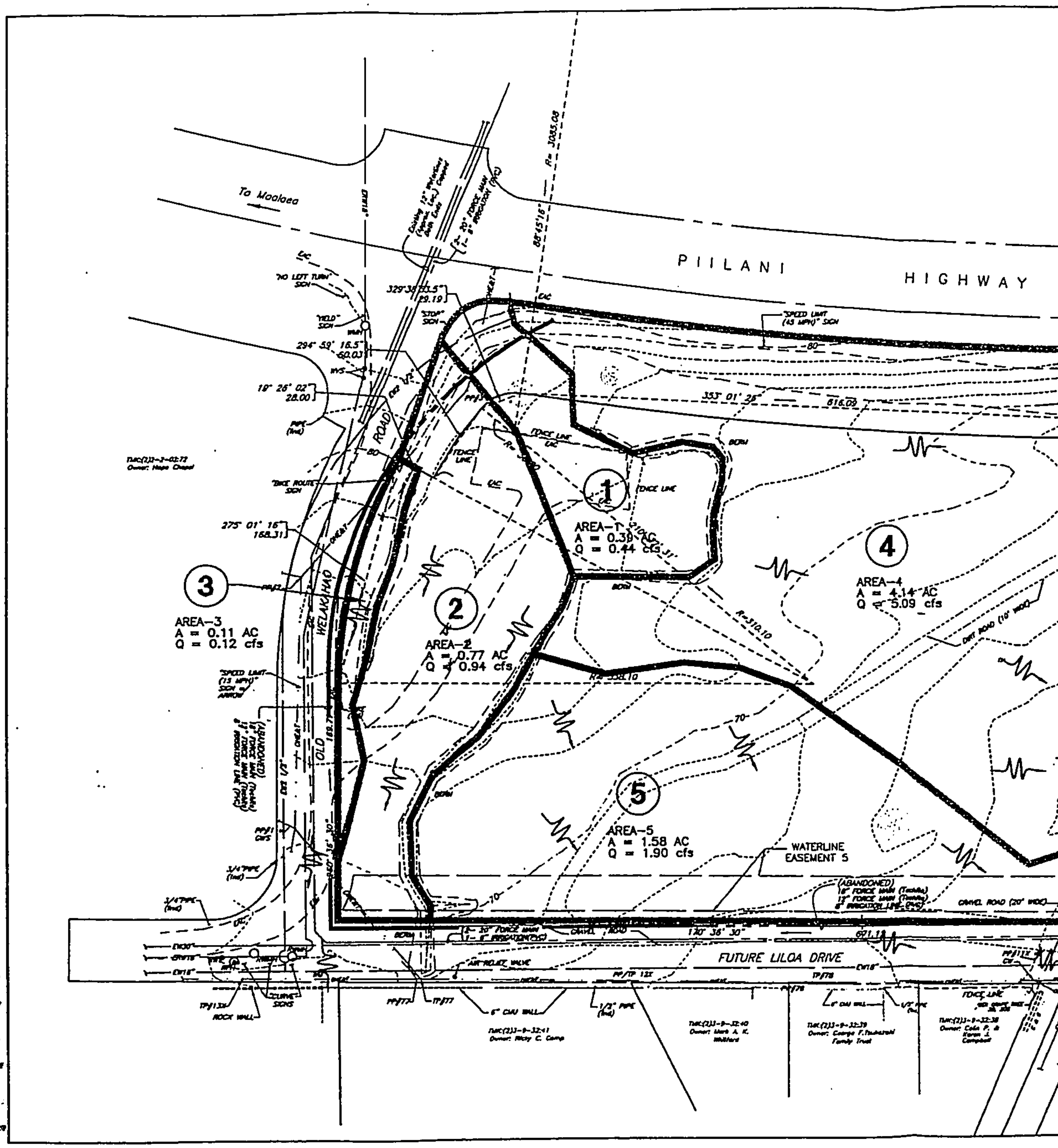
Revisions :

HALE MAHAOLU EHIKU
PARCEL 73 OF TAX MAP KEY: (2) 2-2-02
KIHEI, MAUI, HAWAII

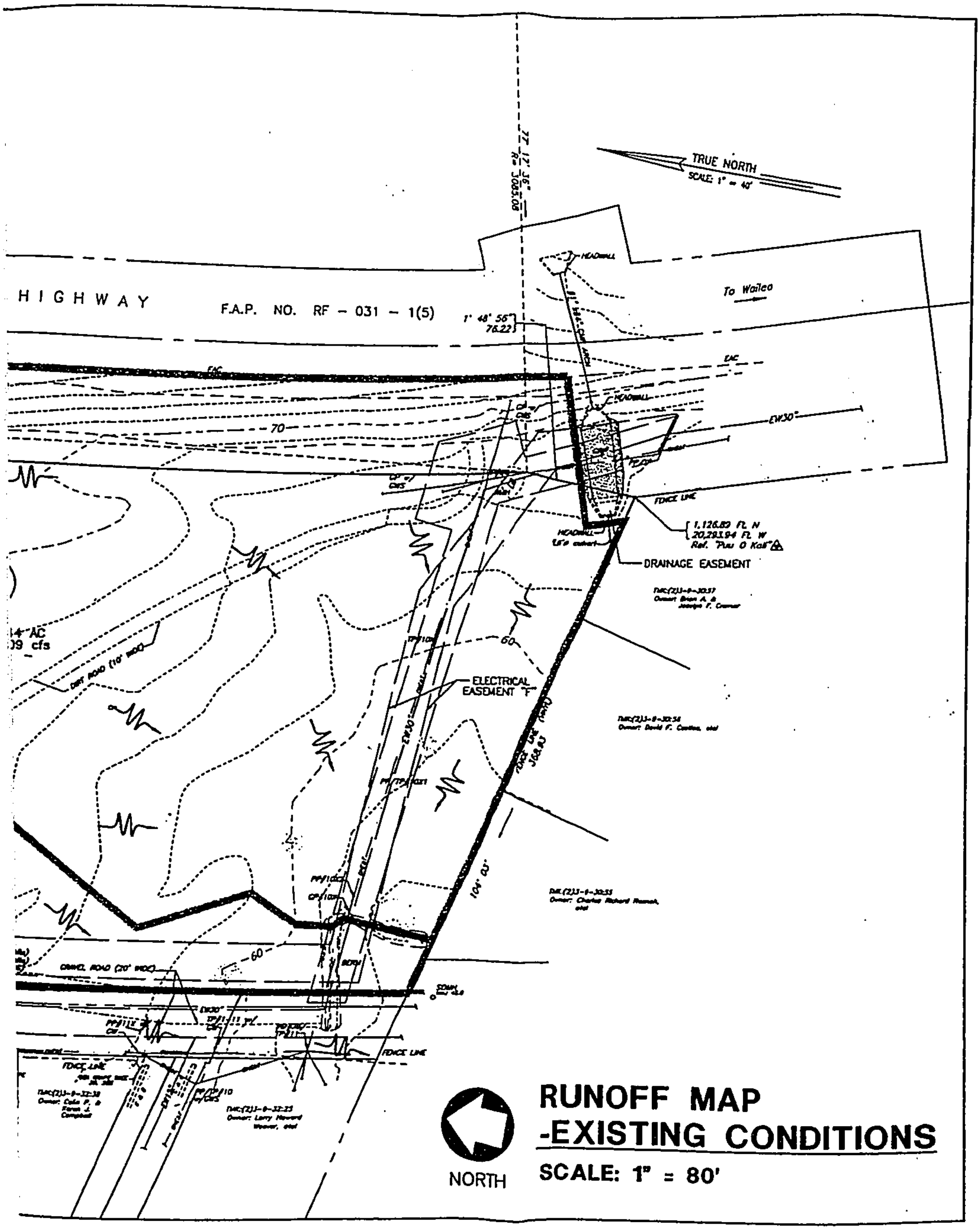
Sheet Title
CONCEPTUAL
SITE PLAN

Sheet Number

Sheet of



To Maalaea
PIILANI HIGHWAY
OLD WELAKAHAO ROAD
FUTURE LILOA DRIVE
"NO LEFT TURN" SIGN
"YIELD" SIGN
"STOP" SIGN
"BIKE ROUTE" SIGN
"SPEED LIMIT (45 MPH)" SIGN
329°38'33.5"
29.19
294° 59' 16.5"
60.03
19° 26' 02"
28.00
275° 01' 16"
168.31
353° 01' 35"
616.09
130° 36' 30"
R= 3035.08
88°45'16"
R=310.10
R= 338.10
FENCE LINE
BERM
1
AREA-1
A = 0.39 AC
Q = 0.44 cfs
2
AREA-2
A = 0.77 AC
Q = 0.94 cfs
3
AREA-3
A = 0.11 AC
Q = 0.12 cfs
4
AREA-4
A = 4.14 AC
Q = 5.09 cfs
5
AREA-5
A = 1.58 AC
Q = 1.90 cfs
WATERLINE EASEMENT 5
DIRT ROAD (10' WIDE)
GRAVEL ROAD (20' WIDE)
AIR RELIEF VALVE
ROCK WALL
"CURVE" SIGNS



RUNOFF MAP
-EXISTING CONDITIONS
SCALE: 1" = 80'

RUNOFF SUMMARY

PROJECT: HALE MAHAOLU EHIKU

Computed by: MI
Date: 1/8/04

Area No.	Area (Ac.)	Tm	Tc(min)	c	1-Hr. Rainfall	Intensity (in/hr)	Q (cfs)	Inlet	Remarks
EXISTING CONDITIONS									
1	0.39	10	12.5	0.27	2.0	4.18	0.44		Sheet Flows Offsite
2	0.77	10	18	.0.27	2.0	4.50	0.94		Sheet Flows Offsite
3	0.11	10	12.5	0.27	2.0	4.14	0.12		Sheet Flows Offsite
4	4.14	10	18.5	0.27	2.0	4.55	5.09		Sheet Flows Offsite
5	1.58	10	17	0.27	2.0	4.45	1.90		Sheet Flows Offsite
DEVELOPED CONDITIONS									
1	6.99	10	5	0.70	2.0	5.2	25.44		
1	6.99	50	5	0.70	2.25	5.8	28.40		

STORAGE CALCULATIONS

Flow Required To Be Stored:

Q_{50} =	28.40 cfs
Q into 24" Stubout =	(10.00) cfs
$Q_{STORAGE}$ =	18.40 cfs

Storage Required:

Vol required = ½ x $Q_{STORAGE}$ x 1 HR
= ½ x 18.40 x 1 HR
= 33,120 cf

Say Approximately 1 acre-feet

Appendix D

Traffic Impact Study

Julian Ng, Incorporated
Transportation Engineering Consultant

P. O. Box 816
Kaneohe, Hawaii 96744-0816

phone: (808) 236-4325
fax: (808) 235-8869
email: jngpe@lava.net

November 8, 2002

Ms. Robyne T. Nishida Nakao, Development Director
Hale Mahaolu
200 Hina Avenue
Kahului, Hawaii 96732-1821

Subject: Traffic Impact of Hale Mahaolu Ehiku project
Kihei, Maui, Hawaii

Dear Robyne:

The proposed project will have a minor impact to traffic conditions in Kihei. Traffic impact of the proposed project, which at full development will include 120 units for elderly housing and facilities for adult care and related programs, was determined by applying trip generation factors from a commonly used reference. Peak hour traffic volumes generated by the proposed project were compared with a suggested threshold for conducting traffic studies and with existing traffic in the area. Conditions at the intersection with the greatest impact were evaluated to illustrate potential impact. The conclusion of the analyses is that the project will have a very small impact to traffic.

Existing Conditions

The proposed project is located in Kihei, in south Maui. The project site is currently vacant and is situated south of Welakahao Road near Piilani Highway. Vehicular access will be from a portion of the Old Welakahao Road that will become part of the proposed "North-South Collector". The nearest existing intersection is at Old Welakahao Road and Welakahao Road.

In the Kihei area, traffic counts taken by the State Highways Division in April and May of 2001 are shown in Table 1. Peak traffic volumes were recorded between 6:45 AM and 9:00 AM and between 3:30 PM and 5:00 PM; the highest hourly volumes at each location are shown in the table.

Table 1- Recent Traffic Counts in the Kihei Area

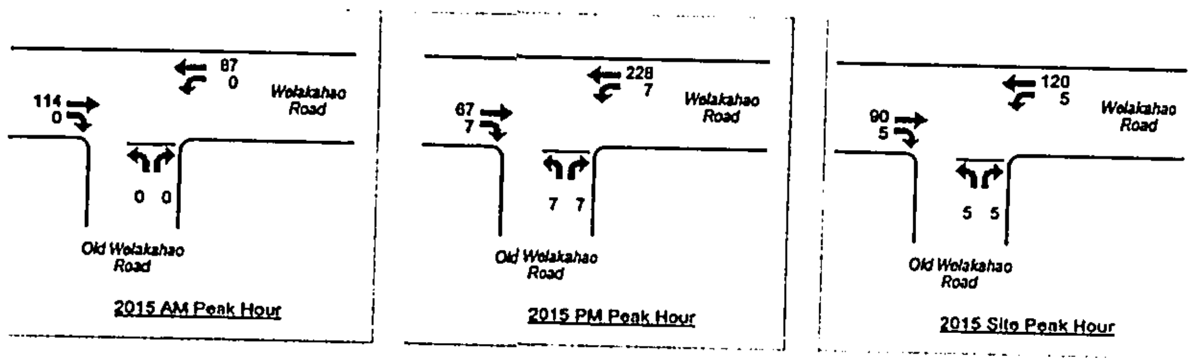
	South Kihei Road			Piilani Highway		
	southbound	northbound	Total	southbound	northbound	Total
South of Mokulele Highway						
24-hour weekday	8,777	8,097	16,874	16,319	15,118	31,437
AM Peak Hour	439	698	1,137	997	1,036	2,033
PM Peak Hour	801	610	1,411	1,271	1,142	2,413
North of Kilohana Drive						
24-hour weekday	5,614	5,663	11,277	9,674	9,920	19,594
AM Peak Hour	455	185	640	783	500	1,283
PM Peak Hour	396	522	918	709	956	1,665

Source: State of Hawaii Department of Transportation, Highways Division

Future Conditions

The Kihei Hope Chapel has proposed to develop a church and related facilities between the North-South Collector and Piilani Highway south of Welakahao Road. Full development of the Kihei Hope Chapel project is also projected for beyond ten years. The County of Maui has proposed to improve the North-South Collector, connecting it to the existing Liloa Drive to the north, with an expected timetable of less than five years for completion. The State Department of Transportation will be restriping Piilani Highway from the current two-lane configuration to four lanes; as part of this project, the existing intersection of the highway with Old Welakahao Road will be closed.

For the purpose of illustrating the potential impact of the proposed Hale Mahaolu Ehiku project on the local street system, traffic volumes for three typical hours were made for the existing intersection of Welakahao Road and Old Welakahao Road using assignments from the traffic study done for the Kihei Hope Chapel project with an annual growth rate of 3% for other traffic. Peak hour volumes are:



Project Effect on Traffic

The proposed project will be built in two phases. In the first phase, approximately 54 elderly units will be built, including a manager's unit, a recreation center/senior center, and an adult day care facility. The second phase would construct the remaining 66 units and an Adult Residential Care Home (ARCH). The second phase is projected for build-out in 10+ years.

Estimates of project traffic for full development were made using trip generation factors from the widely-used *Trip Generation, 6th Edition* report published by the Institute of Transportation Engineers, as shown in Table 2.

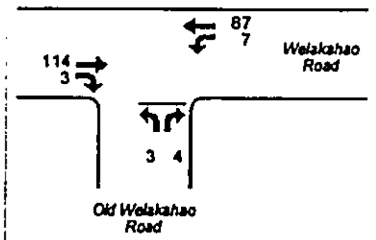
Table 2 - Site Traffic Generation at Full Development

	24-hour weekday		AM Peak Hour		PM Peak Hour	
	entering	exiting	entering	Exiting	entering	exiting
120 units, Elderly Housing	210	210	5	3	7	5
1 unit, Manager	10	10	0	1	1	0
128 participants, Congregate Care Facility	140	140	5	3	12	10
Site Total	360	360	10	7	20	15

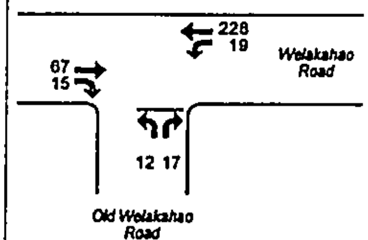
Project traffic will be 720 vehicle trips per day (total entering plus exiting). Using the traffic counts shown in Table 1 as an indicator to distribute the project traffic to the north and to the south, project traffic was found to be less than one percent of the existing traffic (88,000 vehicles per day) on South Kihei Road and Piilani Highway. Similarly, the project traffic during peak hours will be less than one percent of existing peak hour volumes.

The maximum impact of the proposed project would not occur during normal peak traffic hours. The maximum hourly traffic from the site is estimated to be 10% of the daily volume, or 36 vehicles in one direction, which is significantly less than the guideline 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) trips to or from the site during the adjacent roadways' peak hours or the development's peak hour." (from *Traffic Access and Impact Studies for Site Development, A Recommended Practice,* 1991).

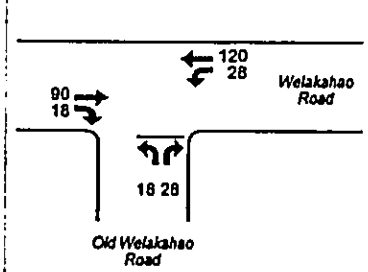
The project impact to traffic will be mitigated by the construction of the North-South Collector. If it were not constructed, the most significant impact would be at the existing intersection of Old Welakahao Road and Welakahao Road; traffic assignments for the peak hours are:



2015 AM Peak Hour



2015 PM Peak Hour



2015 Site Peak Hour

The intersection was evaluated as an unsignalized intersection using the procedure from the *Highway Capacity Manual 2000* to provide an illustration of the project impact to traffic. In this procedure, the main street volumes at the intersection are used to compute capacities for the side street movements that stop or yield before using the intersection (controlled movements). Delays to the controlled movements computed in the analysis provide a "Level of Service" for each controlled movement. The Levels of Service range from "A" representing minimal delay and very good conditions to "F" representing very long delays and congested conditions. Level of Service D (or better) is considered acceptable in urban situations. Table 3 compares the results of the analyses (without project shown normal, with project shown below in ***italicized boldface***).

Table 3 - Intersection Levels of Service

Without project *With Hale Mahaolu Ehiku*	AM Peak Hour		PM Peak Hour		Site Peak Hour	
	ADPV	LOS	ADPV	LOS	ADPV	LOS
Westbound left turns into Old Welakahao Road	7.5	A	7.4	A	7.4	A
	7.5	*A*	*7.4*	*A*	*7.5*	*A*
Shared lane (northbound) from Old Welakahao Road	9.3	A	9.7	A	9.4	A
	9.3	*A*	*9.8*	*A*	*9.7*	*A*

APDV = average delay per vehicle, seconds LOS = Level of Service

As shown in Table 3, the addition of project traffic will have a minimal effect on peak hour traffic conditions at the intersection of Old Welakahao Road and Welakahao Street. Similar impacts during non-peak hours are expected. Impacts at other locations will be less since traffic will be distributed on different roadways farther from the project site.

Conclusion

The proposed project would have a minor impact to traffic conditions along Welakahao Road and in Kihei. An evaluation of the potential increase in traffic caused by the project showed an impact that would be much less than the threshold suggested by the Institute of Transportation Engineers for conducting a site access or traffic impact study. Application of the unsignalized intersection analysis on the nearest intersection showed very little impact with the addition of project traffic to future baseline traffic volumes. The first phase of the project will have smaller impacts to traffic.

Should you have any questions, please contact me at phone (808) 236-4325.

Sincerely,

JULIAN NG, INCORPORATED

Julian Ng, P.E., P.T.O.E.
President

HALEMAHAOLU-E.DOC

Appendix D-1

Letter Update to Traffic Impact Study Dated September 7, 2004

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

September 7, 2004

Ms. Robyne T. Nishida Nakao, Development Director
Hale Mahaolu
200 Hina Avenue
Kahului, Hawaii 96732-1821

Subject: Traffic Impact of Hale Mahaolu Ehiku project - update
Kihei, Maui, Hawaii

Dear Robyne:

This letter updates the information presented previously in a letter dated November 8, 2002. Our earlier conclusion that the proposed project will have a minor impact to traffic conditions in Kihei has not changed. The traffic impact of the proposed project, which at full development was previously computed for 120 units for elderly housing and facilities for adult care and related programs, is slightly less now that the project has been changed to include only 112 units.

Peak hour traffic volumes generated by the proposed project were found to be less than the threshold suggested by the Institute of Transportation Engineers for conducting traffic studies. Project related traffic would be less than 1% of existing traffic volumes on the major roadways in the area. Conditions at a nearby intersection where the project would have its greatest impact were evaluated to illustrate the potential impact of the project, which was found to be minimal. The conclusion of the analyses is that the project will have a very small impact to traffic.

Existing Traffic Volume Data

The proposed project is located in Kihei, in south Maui. The project site is currently vacant and is situated south of Welakahao Road near Piilani Highway. Vehicular access will be from a portion of the Old Welakahao Road that will become part of the proposed "North-South Collector". The nearest existing intersection is at Old Welakahao Road and Welakahao Road.

Traffic counts taken by the State Highways Division in April and May of 2001 were shown previously and are repeated in the top of Table 1. In 2001, peak traffic volumes were recorded between 6:45 AM and 9:00 AM and between 3:30 PM and 5:00 PM. The lower part of the table shows the daily totals and peak hour volumes from counts taken in April and May of 2003; peak hourly volumes occurred between 6:45 AM and 9:00 AM and between 3:15 PM and 6:00 PM.

As shown in the table (next page), the counts generally show a slight increase in traffic volumes, as expected. The State Department of Transportation has completed the previously identified project to restripe Piilani Highway from two to four lanes, and construction of the nearby Kihei Hope Chapel project has begun. All other descriptions and conclusions that were made in our earlier analyses and reported in the November 8, 2002 letter are still valid.

Julian Ng, Incorporated

Ms. Robyne T. Nishida Nakao
September 7, 2004

Table 1- Traffic Counts in the Kihei Area

	South Kihei Road			Piilani Highway		
	southbound	northbound	Total	Southbound	northbound	Total
South of Mokulele Highway (April and May, 2001)						
24-hour weekday	8,777	8,097	16,874	16,319	15,118	31,437
AM Peak Hour	439	698	1,137	997	1,036	2,033
PM Peak Hour	801	610	1,411	1,271	1,142	2,413
North of Kilohana Drive (April and May, 2001)						
24-hour weekday	5,614	5,663	11,277	9,674	9,920	19,594
AM Peak Hour	455	185	640	783	500	1,283
PM Peak Hour	396	522	918	709	956	1,665
South of Mokulele Highway (April and May, 2003)						
24-hour weekday	8,936	8,564	17,500	14,062	14,384	28,446
AM Peak Hour	530	902	1,432	849	1,292	2,141
PM Peak Hour	821	635	1,456	1,101	1,058	2,159
North of Kilohana Drive (April and May, 2003)						
24-hour weekday	5,905	5,638	11,543	9,601	9,846	19,447
AM Peak Hour	403	251	654	672	518	1,190
PM Peak Hour	451	437	888	691	1,012	1,703

Source: State of Hawaii Department of Transportation, Highways Division

As indicated earlier, the analyses and conclusions from 2002 are still valid. Should you have any questions, please contact me at phone (808) 236-4325.

Sincerely,

JULIAN NG, INCORPORATED

Julian Ng, P.E., P.T.O.E.
President

HALEMAHAOLU-G.DOC