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COUNTY OF MAUI
DEPARTMENT OF FIRE AND PUBLIC SAFETY

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December 17, 2010

Office of the Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED HAIKU FIRE STATION AND RELATED IMPROVEMENTS, TMK (2)2-7-007:008 (POR.), MAUI, HAWAII

Dear Sir or Madame:

The County of Maui, Department of Fire and Public Safety, the Approving Agency for the Draft Environmental Assessment (EA) for the subject project, has reviewed the Draft EA and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for this project in the next available publication of the Office of Environmental Quality Control (OEQC) Environmental Notice.

We have enclosed a completed OEQC Publication form and Project Summary, a CD (PDF.file) and one (1) copy of the Draft EA. Additionally, the Draft EA has been transmitted to the Makawao Public Library by copy of this letter.

Should you have any questions, please feel free to contact our planning consultant, Mark Alexander Roy of Munekiyo & Hiraga, Inc. at (808) 244-2015.

Very truly yours,

FOR Jeffrey A. Murray
Fire Chief
Department of Fire and Public Safety

JM
Enclosures
cc: Wendy Taomoto, County of Maui, Department of Management
Mark Alexander Roy, Munekiyo & Hiraga, Inc.
Makawao Public Library (w/copy of Draft EA only)
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Draft Environmental Assessment

PROPOSED HAIKU FIRE STATION AND RELATED IMPROVEMENTS (TMK (2)2-7-007:008(por.))

Prepared for:

County of Maui,
Department of Fire and Public Safety

December 2010

MUNEKIYO & HIRAGA, INC.

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Executive Summary

Project Name:	Proposed Haiku Fire Station and Related Improvements
Type of Document:	Draft Environmental Assessment
Legal Authority:	Chapter 343, Hawaii Revised Statutes
Agency Determination:	Anticipated Finding of No Significant Impact (FONSI)
Applicable Environmental Assessment review "Trigger":	Use of County Funds, Use of State/County Lands and Amendment to County General Plan
Location:	Maui Island Haiku, Maui TMK No. (2)2-7-007:008 (por.)
Landowner:	County of Maui
Applicant:	County of Maui, Department of Fire and Public Safety
Approving Agency:	County of Maui, Department of Fire and Public Safety 200 Dairy Road Kahului, Hawaii 96732 Contact: Lee Mainaga, Fire Services Officer Phone: (808) 270-7561
Consultant:	Munekiyo & Hiraga, Inc. 305 High Street, Suite 104 Wailuku, Hawaii 96793 Contact: Mark Alexander Roy, AICP, Program Manager Phone: (808) 244-2015
Project Summary:	The County of Maui, Department of Fire and Public Safety (DF&PS) proposes the construction of a new 7,528 square foot fire station and related improvements on a 6.1-acre parcel of land located in the vicinity of the intersection of Hana Highway and East Kuiaha Road in Haiku, Maui. The proposed facility will incorporate state-of-the-art functional and technological elements to ensure that services delivered meet the life safety mandate of the DF&PS. The fire station will also be designed according to sustainable design principles and will undergo certification through the U.S.

Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) green building rating system. Implementation of this facility will enhance the County of Maui's ability to provide fire prevention suppression and protection services to residents and businesses throughout the Haiku area.

The project site is designated "Agricultural" by the State Land Use Commission, the Paia-Haiku Community Plan and Maui County Zoning. To enable project implementation, District Boundary Amendment, Community Plan Amendment and Change in Zoning applications will be initiated and processed by the County of Maui, Department of Planning for the 6.1-acre project site.

Inasmuch as the proposed project involves amendment to the Paia-Haiku Community Plan, use of County lands and funds and installation of driveway and utility improvements within State and County-owned roadways, an Environmental Assessment (EA) is being prepared pursuant to Chapter 343, Hawaii Revised Statutes (HRS). The DF&PS will serve as the approving agency for the EA.

I. PROJECT OVERVIEW

I. PROJECT OVERVIEW

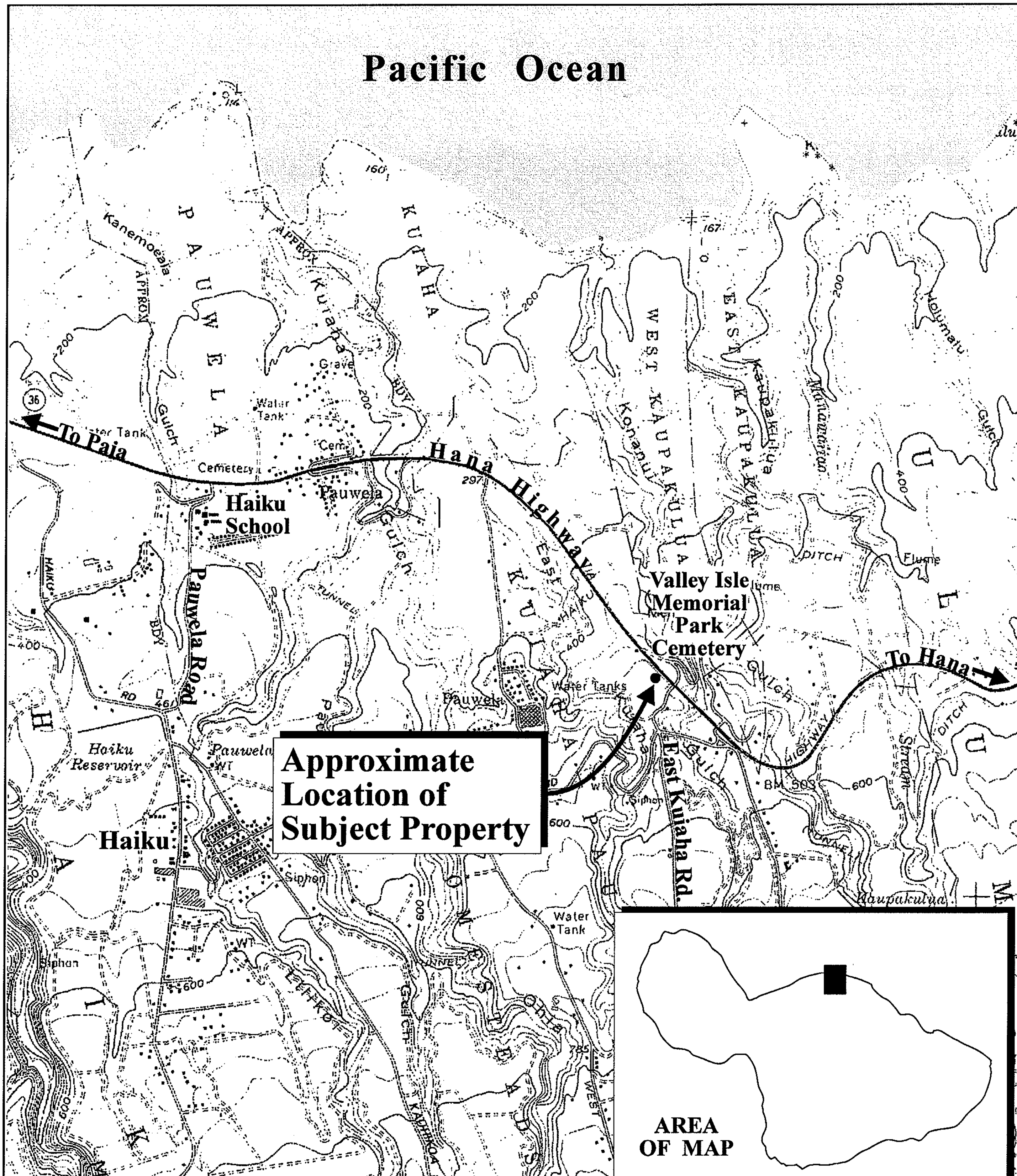
A. PROJECT LOCATION, EXISTING USE AND OWNERSHIP

The County of Maui, Department of Fire and Public Safety (DF&PS) is proposing to construct a new fire station and related improvements (hereafter referred to as the "subject project") on an approximately 6.1-acre portion of land (hereafter referred to as the "project site") at Tax Map Key (TMK) (2)2-7-007:008 (por.), Haiku, Maui , Hawaii. The subject property, Parcel 08 (approximately 27.9 acres in area), is owned by the County of Maui and is located at the intersection of East Kuiaha Road and Hana Highway. A subdivision application will be processed by the County of Maui to subdivide the 6.1-acre project site from the larger parcel. Access to the site is currently provided via an existing driveway from Hana Highway. See **Figure 1** and **Figure 2**. Implementation of this new fire station facility will enhance the County of Maui's ability to provide adequate fire services to both residential and commercial/industrial areas located throughout the growing Haiku community.

In addition, an approximately 4,200-foot waterline will be installed as part of the subject project connecting the fire station to an existing waterline at the West Kuiaha Road and Haiku Road intersection via the existing East Kuiaha Road and Dolder Drive/Haiku Road. Refer to **Figure 2**. This proposed waterline site will be referred to hereafter as the "waterline corridor". The term "project area" is used in this document to refer to both the project site and the waterline corridor.

B. PROPOSED ACTION

The 6.1-acre project site will be subdivided from the larger 27.9-acre subject property through a large-lot subdivision application process. The proposed fire station will be developed on the project site as a low-rise facility and will use plantation design themes similar to that of other commercial/industrial structures located throughout the Paia-Haiku region. See **Figure 3** and **Figure 4**. The plans for the project have been developed in accordance with the architectural and land use objectives set forth in both the Paia-Haiku Country Town Design Guidelines and the Paia-Haiku Community Plan. Preliminary Development Plans for the project are presented in **Appendix "A"**.



Source: U.S. Geological Survey, Haiku Quad Map

Figure 1

Proposed Haiku Fire Station and Related Improvements

Regional Location Map

0 1000 Feet
500 2000

Prepared for: County of Maui, Dept. of Fire and Public Safety

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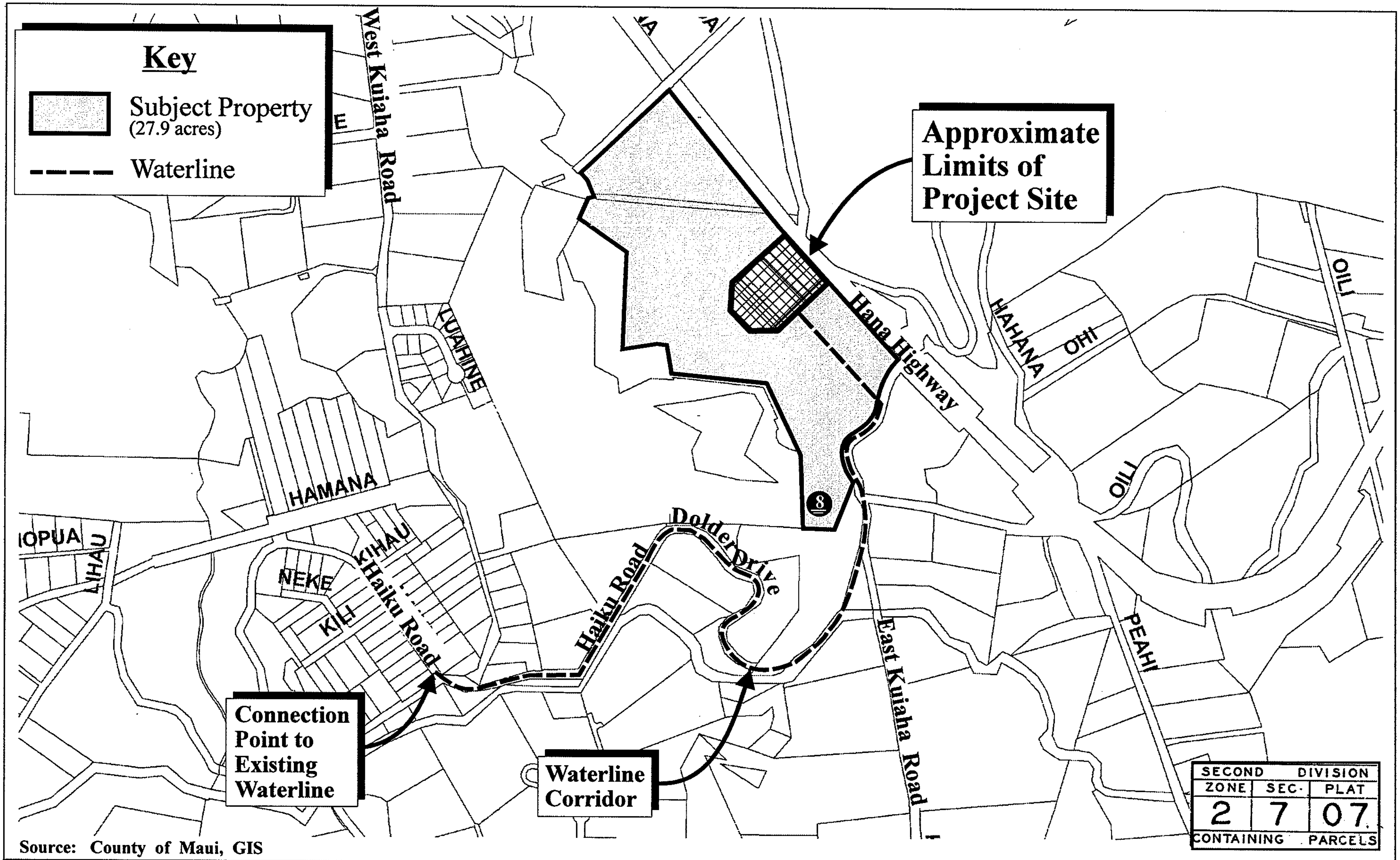
COM\DFire Haiku\regional



Source: County of Maui, GIS

Figure 2

Proposed Haiku Fire Station and Related Improvements

Property Location Map

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

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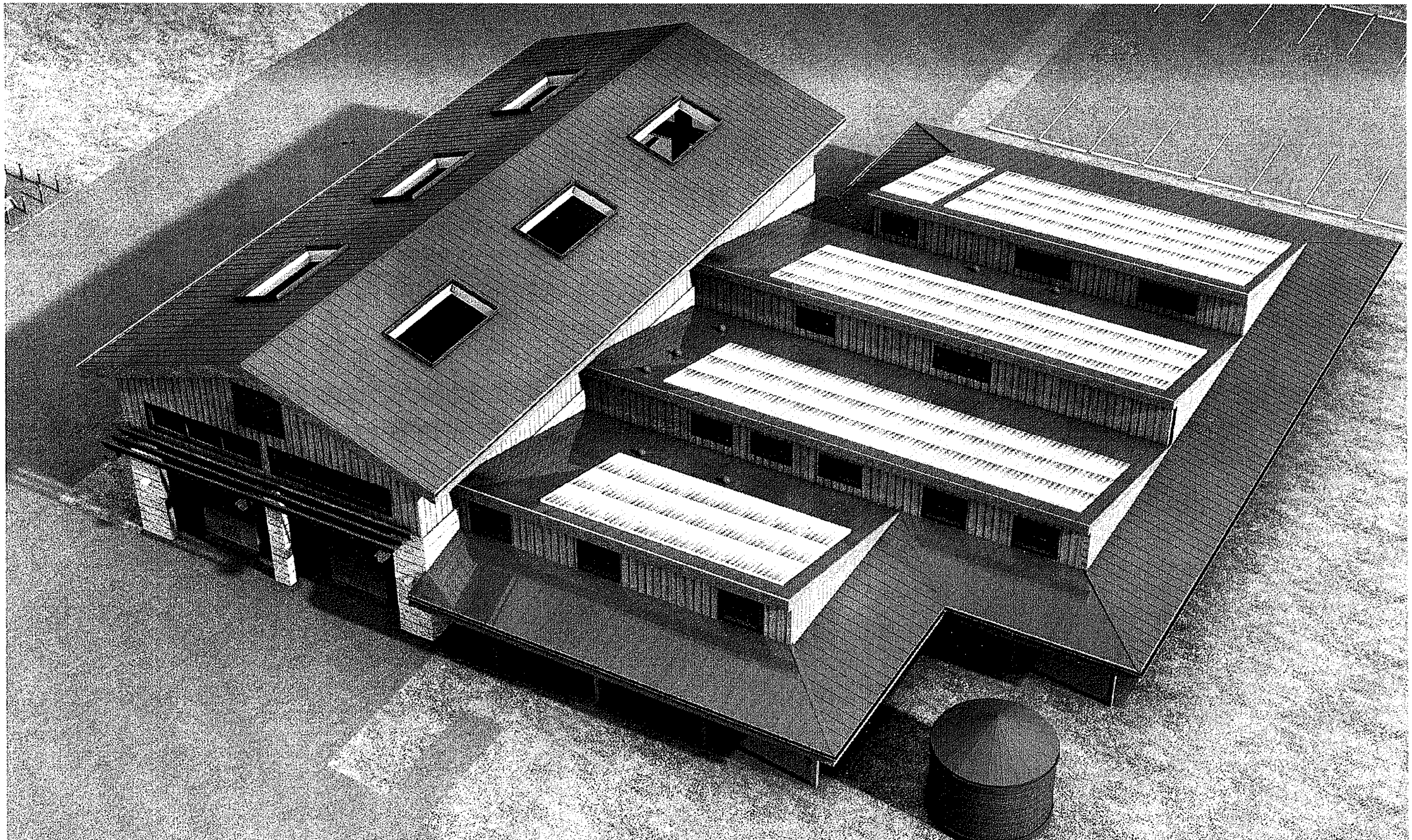
COM\DFire Haiku\proplocation



Source: Architects Hawaii Limited

Figure 3

Proposed Haiku Fire Station and Related Improvements

Architectural Rendering

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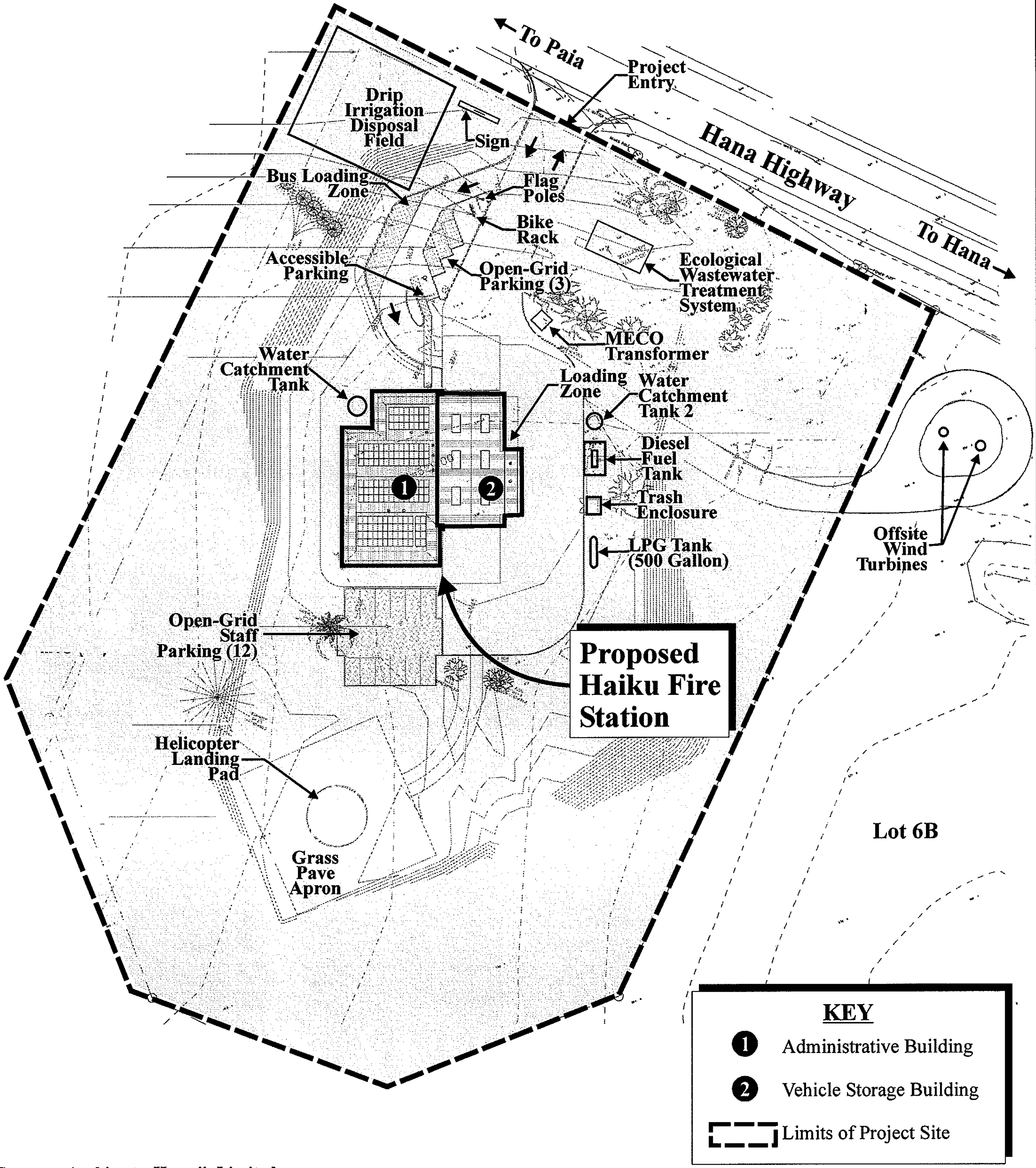
COM\DFire Haiku\rendering



Source: Architects Hawaii Limited

Figure 4 Proposed Haiku Fire Station and Related Improvements

Site Plan

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

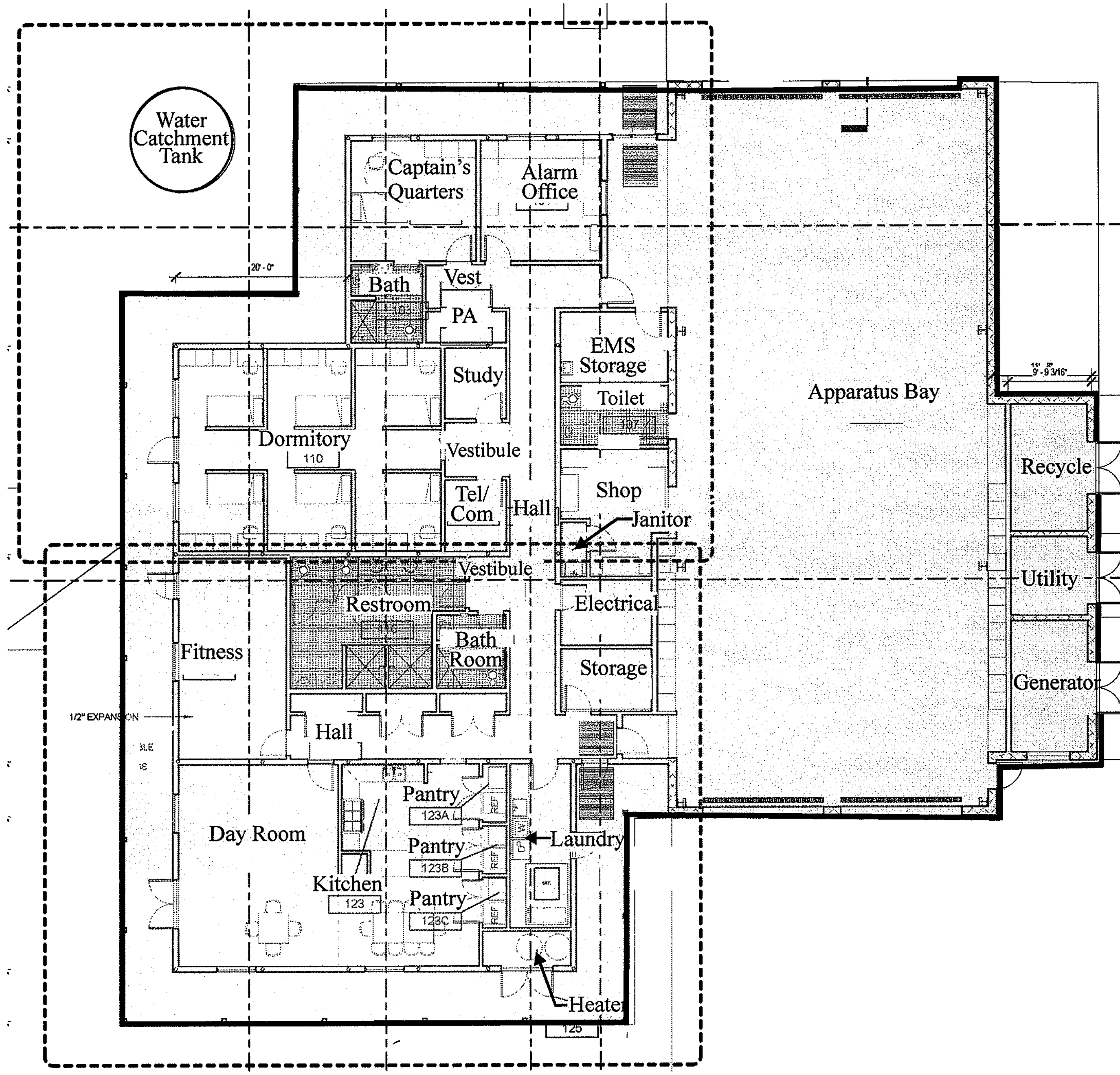
MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\siteplan

The fire station facility will consist of administrative, vehicle storage and utility buildings. Structures within the project site will not exceed 30 feet in height . The main single-story administrative building (approximately 7,528 square feet, including covered exterior walkways) will provide offices, dormitories, a work-out area, dining/kitchen facilities, and other support functions necessary for the estimated five (5) personnel that will be assigned to the station. See **Figure 5**, **Figure 6**, and **Figure 7**. Various other related improvements will be completed as part of project implementation, including demolition of several unused agricultural buildings over 50 years in age, site grading and grubbing, landscaping, installation of utilities, and construction of an access driveway off of Hana Highway and associated site-related roadway improvements. This shared driveway will provide access for both emergency and non-emergency vehicles utilizing the facilities at the site. A helipad will also be implemented as part of the project to facilitate civil defense, training, rescue and firefighting operations in Central Maui and the surrounding areas.

The proposed Haiku Fire Station will be designed according to sustainable design principles and will undergo certification through the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) green building rating system. The facility will feature a number of "green" design features, including energy efficient appliances, bio-swales, bio-filters, rain gardens, grass paving, water efficient irrigation systems, an ecological wastewater treatment system, and two (2) offsite vertical axis wind turbines. The ecological wastewater treatment system will treat wastewater from the proposed fire station to a R-3 standard and will consist of a primary settling tank (septic tank), a lined vegetated area for secondary treatment, a pump station and a subsurface drip irrigation disposal system. The ecological wastewater treatment system will allow reuse of the treated effluent for irrigation of landscaping within the property, thus reducing potable water consumption for the proposed project. The two (2) offsite wind turbines will be free-standing, less than 35 feet in height, and will generate electricity to offset the overall energy requirements of the proposed fire station. Refer to **Figure 4**.

As noted previously, a new offsite waterline will also be installed within the existing right-of-way of East Kuiaha Road and Dolder Drive/Haiku Road to address potable water service requirements for the new fire station facility. This waterline will connect the proposed fire station to two (2) existing County-owned waterlines located approximately 2,300 feet to the south of the project site near the intersection of West Kuiaha Road and Haiku Road. Refer to **Figure 2**. A copy of the engineering plans showing the configuration of the proposed new offsite waterline is presented in **Appendix "A"**.



Source: Architects Hawaii Limited

Figure 5 Proposed Haiku Fire Station and Related Improvements

Floor Plan

NOT TO SCALE

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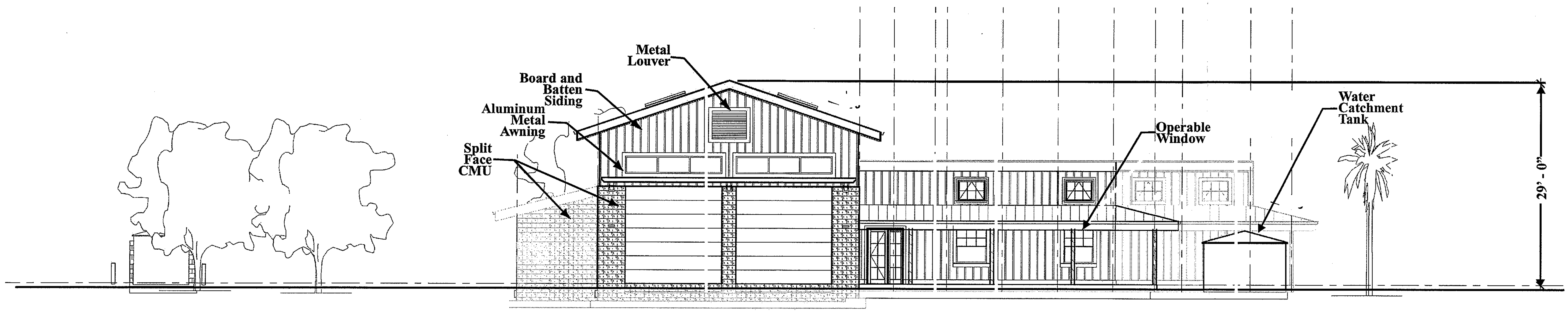
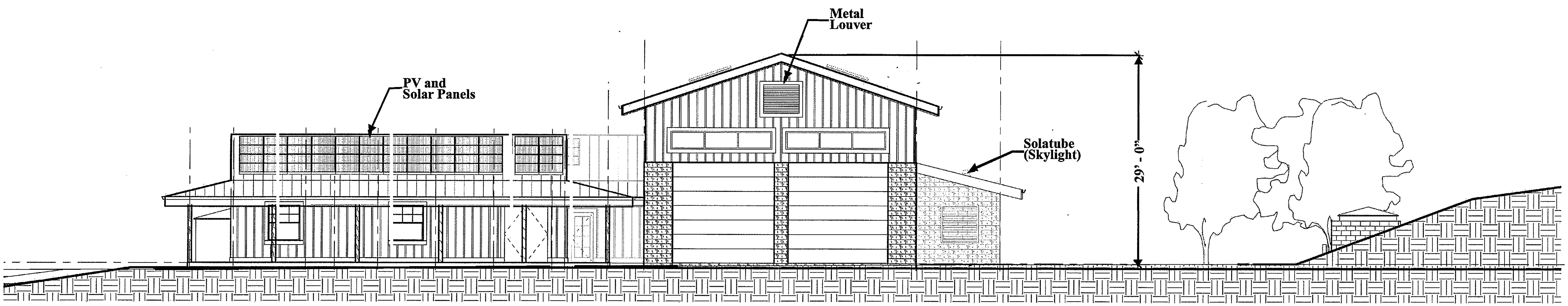
MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\floorplan



North Elevation
(Looking Mauka)



South Elevation
(Looking Makai)

Source: Architects Hawaii Limited

Figure 6

Proposed Haiku Fire Station and Related Improvements
North/South Elevations

NOT TO SCALE

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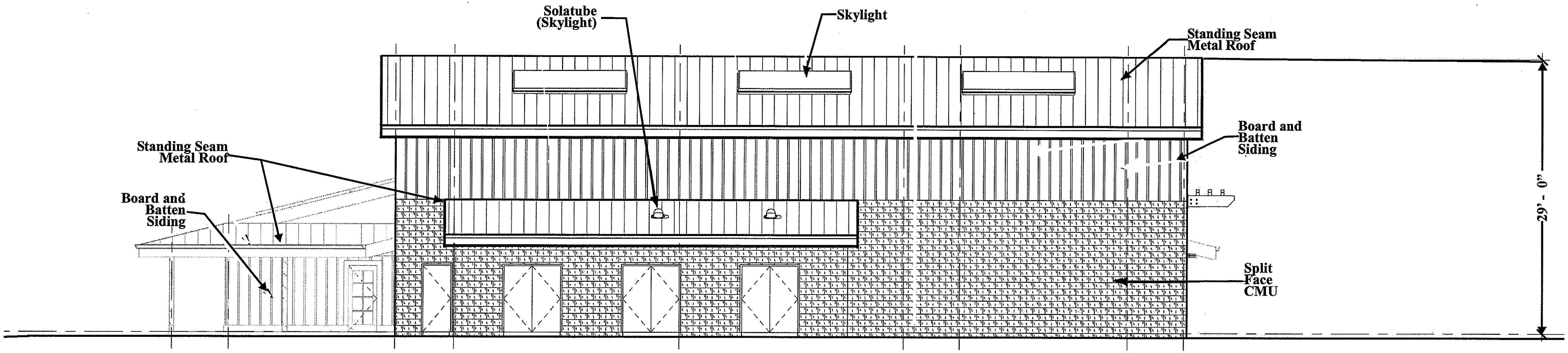
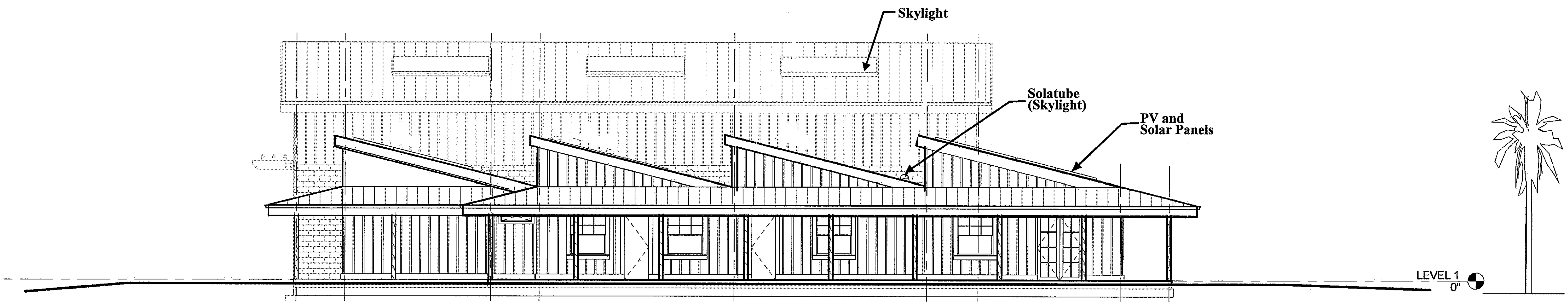
Prepared for: County of Maui, Dept. of Fire and Public Safety

COM\DFire Haiku\N-SElevations



East Elevation
(Looking Towards Paia)



West Elevation
(Looking Towards Hana)

Source: Architects Hawaii Limited

Figure 7

Proposed Haiku Fire Station and Related Improvements
East/West Elevations

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Dept. of Fire and Public Safety

COM\DFire Haiku\E-WElevations

At the location where Haiku Road crosses Kuiaha Gulch, the proposed waterline will be aboveground and supported on a beam parallel to the existing bridge structure. The existing bridge span is approximately 20-feet. The beam will not be connected to the existing bridge and will have foundation supports on both sides of the gulch. There will be no work either to the existing bridge or within the course of the gulch.

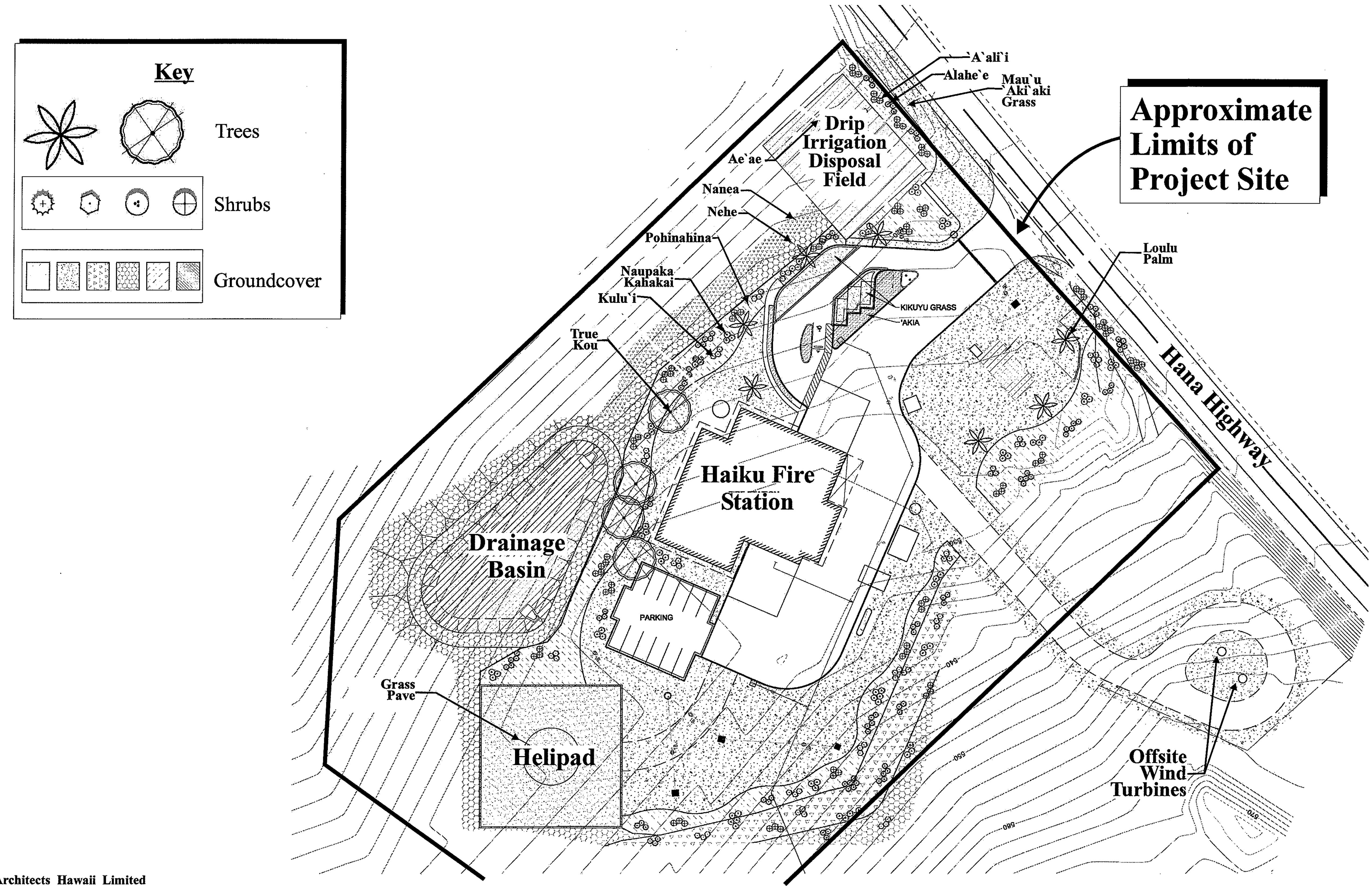
With regard to landscaping, the planting design for the project will help create a visual identity for the new fire station by accenting the structures with vertical planting and ground covers while also integrating site with the surrounding community. The following objectives have been used in developing a landscaping plan that is conducive to the sustainable design strategy for the project:

- Minimize landscape maintenance and irrigation requirements.
- Select native Hawaiian plant species that quickly acclimate and thrive within the Haiku micro-climate and promote irrigation efficiency.
- Integrate biologically sustainable features such as bio-swales, landscaped gardens and a rainwater catchment system to facilitate irrigation reuse objectives and to reduce and filter water run-off from the site.

The theme of the fire station will, therefore, reflect a natural yet functional, low maintenance landscape environment which will provide both visual relief and heat gain reduction for the buildings. See **Figure 8**. The preliminary landscaping plan for the project is presented in **Appendix "A"**. This plan provides detailed information on the species of palms, shrubs and groundcover that have been selected for use in the design of the new fire station.

C. PROJECT NEED

As noted previously, the proposed fire station is intended to improve fire protection services throughout the Haiku area by providing a facility in a rural area of Maui where there is currently none available. Presently, fire prevention, suppression and protection services for the Paia-Haiku Community Plan region are provided by the County's Paia and Makawao fire stations. The Paia fire station is located on Hana Highway in Paia town approximately six (6) miles to the west of the project site. The Makawao fire station is situated approximately eight (8) miles to the south of the project site on Makawao Avenue. Both the Paia and Makawao stations are undersized to meet the increasing fire protection service needs of the outlying rural communities, including Haiku, Pauwela and Peahi.



Source: Architects Hawaii Limited

Figure 8 Proposed Haiku Fire Station and Related Improvements

Preliminary Landscaping Plan

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MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\landscape

The Paia-Haiku Community Plan region has experienced a substantial increase in population in recent years. The population increased from 7,788 persons in 1990 to 11,866 persons in 2000, an increase of approximately 52 percent (County of Maui, 2006). The population is projected by the County of Maui's 2006 Land Use Forecast to further increase to 13,863 persons by 2030.

The proposed new fire station is, therefore, being implemented by the County of Maui to meet the long-term fire protection service needs of the growing rural community in the Haiku area. The development of the fire station at the location proposed will allow for the more efficient deployment of emergency vehicles and shortened response times, both of which are deemed critical given access limitations and the prevalence of wooden structures throughout the Haiku area.

D. REGULATORY REQUIREMENTS

The subject property (27.9 acres) is designated "Agricultural" by the State Land Use Commission, the Paia-Haiku Community Plan and Maui County Zoning. The 6.1-acre project site is, however, reflected as a Rural Growth Area (RGB) in the draft Maui Island Plan that is under review by the County of Maui as part of the 2030 General Plan Update process. To enable project implementation, District Boundary Amendment (DBA), Community Plan Amendment (CPA) and Change in Zoning (CIZ) applications will be initiated and processed by the Department of Planning for the 6.1-acre project site. The requested amendments to the land use entitlements are summarized in **Table 1** below:

Table 1. Summary of Requested Land Use Amendments For Haiku Fire Station Project

Land Use Designation	Existing	Requested Amendment
State Land Use Commission	Agricultural	Rural
Paia-Haiku Community Plan	Agricultural	Public/Quasi-Public
Maui County Zoning	Agricultural	Public/Quasi-Public

The project site is located outside of the County of Maui's Special Management Area (SMA). As such, a SMA Use Permit will not be required for the project.

The proposed project involves a number of items which trigger the need to comply with the requirements of Hawaii Revised Statutes (HRS), Chapter 343, including an amendment to the Paia-Haiku Community Plan, use of County lands and funds, and the installation of driveway and utility improvements within both the State-owned Hana Highway and the County-owned East Kuiaha Road and Haiku Road. An Environmental Assessment (EA) is, therefore, being prepared to evaluate the technical characteristics, environmental impacts and alternatives, as well as advance findings relative to the significance of the project and its related onsite/offsite improvements. The EA will act as the primary supporting technical document for the County's consolidated DBA/CPA/CIZ applications. The Approving Agency for the EA will be the DF&PS.

E. PROJECT FUNDING AND SCHEDULING

The estimated construction cost of the proposed project is $11.2 million. Assuming all necessary approvals and entitlements are obtained, construction is expected to begin in first quarter 2012, with completion estimated in the fourth quarter of 2012.

II. DESCRIPTION OF THE EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

II. DESCRIPTION OF THE EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

A. PHYSICAL SETTING

1. Surrounding Land Uses

a. Existing Conditions

The subject property is situated in Haiku, Maui, an agricultural and rural residential area located to the east of Pauwela, and to the west of Hana Town. The project site itself is 1.5 miles east of the Haiku Elementary School via Hana Highway. It lies approximately 1 mile inland (south) of the Pacific Ocean shoreline. The project site abuts the mauka side of Hana Highway to the north and East Kuiaha Road to the east. Across Hana Highway to the north is the Valley Isle Memorial Park Cemetery. The project site property is currently accessed from Hana Highway. Refer to **Figure 1**.

The proposed waterline corridor extends east from the project site and joins with East Kuiaha Road. From there, it follows East Kuiaha Road through Dolder Drive and Haiku Road, eventually joining an existing waterline in the vicinity of the intersection of Haiku Road and West Kuiaha Road. Refer to **Figure 2**.

Lands in the immediate vicinity of the project area are characterized by rural and agricultural uses. The subject property was used for pineapple farming in the early 1900's and then cleared to make way for a nursery operation which ended about 10 years ago. At present the land is vacant and underutilized.

b. Potential Impacts and Mitigation Measures

The subject project is not anticipated to adversely impact surrounding land uses in the vicinity of the project area. The new fire station will occupy former agricultural lands which have been unused for some time. The facility will be located in an area of Haiku along Hana Highway near the intersection with East Kuiaha Road and will facilitate ready access to surrounding service areas. As further discussed in Section D.4 of this chapter, onsite drainage mitigation measures will be implemented to address the increase in storm water runoff associated with the development of the fire station. These improvements, coupled with the proposed grading plan will ensure that downstream or adjacent properties are not affected by the project.

The proposed waterline corridor is also not anticipated to adversely impact surrounding land uses in the vicinity of the project site. The proposed waterline will be installed within the right-of-way of the existing County-owned East Kuiaha Road, Dolder Drive and Haiku Road roadway corridors.

2. Climate, Topography and Soils

a. Existing Conditions

Hawaii's tropical location results in uniform weather conditions throughout the year. Climatic conditions on Maui are characterized by mild and consistent year round temperatures, moderate humidity and steady northeasterly tradewinds. Variations in Maui's weather are attributable to regional topographic and climatic conditions.

Haiku is situated on the north coast of the island, near sea level. Average annual rainfall for the area is approximately 67.14 inches per year. The months of October through March are typically the wetter periods of the year, with April through September being typically the drier months. Mean temperatures range from 60.5 degrees Fahrenheit in February to 79 degrees Fahrenheit in September (Maui County Databook, 2007).

Topography in the region ranges from a rocky coastline, to the moderately steep slopes, and gulches of Haleakala. The subject property, which is characterized by slopes of approximately 7 to 15 percent slope, sits between 500 and 590 feet above mean sea level (amsl) (AECOM Pacific, Inc., 2010). The ground cover across the site is characterized by a variety of grasses and aggressive weeds associated with the property's former use as a nursery.

Underlying the project area are soils belonging to the Pauwela-Haiku Association. See **Figure 9**. The Pauwela-Haiku Association is characterized by well drained, fine textured soils commonly found on low uplands . These soils are gently sloping to moderately steep. The Pauwela-Haiku Association makes up about 3 percent of the island (U. S. Soil Conservation Service, 1972).

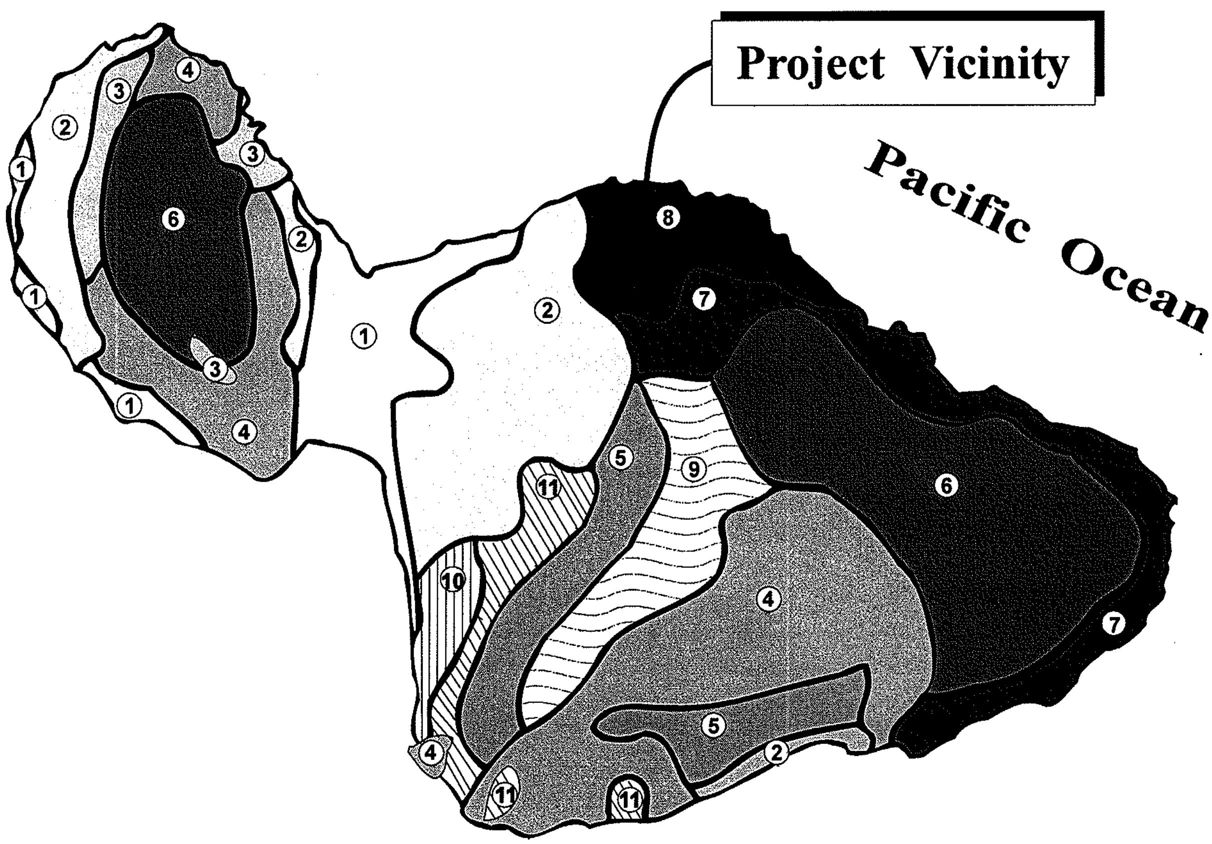
The project area contains underlying soils from the Haiku Clay soil (HbB and HbC) as well as the Rough Broken Land (rRR) classifications. See **Figure 10**. In a representative profile, the surface layer of Haiku Clay soil (HbB and HbC) is dark brown clay about 14 inches thick. The subsoil is yellowish-red, dark reddish-brown, and dark-red clay or silty clay about 31 inches thick. The substratum is soft, weathered, basic igneous rock. The soil is very strongly acidic in the surface layer and extremely acidic and very strongly acidic in the subsoil and substratum. Permeability is moderately rapid. Runoff is slow to medium, and the erosion hazard is slight to moderate. In general, the soil is less than 30 inches deep to the bedrock, and slopes are generally 7 to 15 percent (U. S. Soil Conservation Service, 1972).

Rough broken land (rRR) consists of very steep, land broken by numerous intermittent drainage channels. It occurs in gulches and on mountainsides. The slope is 40 to 70 percent, runoff is rapid and geologic erosion is active. These soils are variable and in most places some weathered rock fragments are mixed with the soil material. Small areas of rock outcrop, stones and soil slips are common. This land type is used primarily for watershed and wildlife habitat. In places it is also used for pasture and woodland (U. S. Soil Conservation Service, 1972).

The State Department of Agriculture has established three (3) categories of Agricultural Lands of Importance to the State of Hawaii (ALISH). The ALISH system classifies lands into "Prime", "Unique", and "Other Important Agricultural Land". The remaining lands are "Unclassified". Utilizing modern farming methods, "Prime" agricultural lands have the soil quality, growing season, and moisture supply needed to produce sustained crop yields economically, while "Unique" agricultural lands possess a combination of soil quality, location, growing season, and moisture supply currently used to produce sustained high yields of a specific crop. "Other Important

KEY

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 9

Proposed Haiku Fire Station and Related Improvements

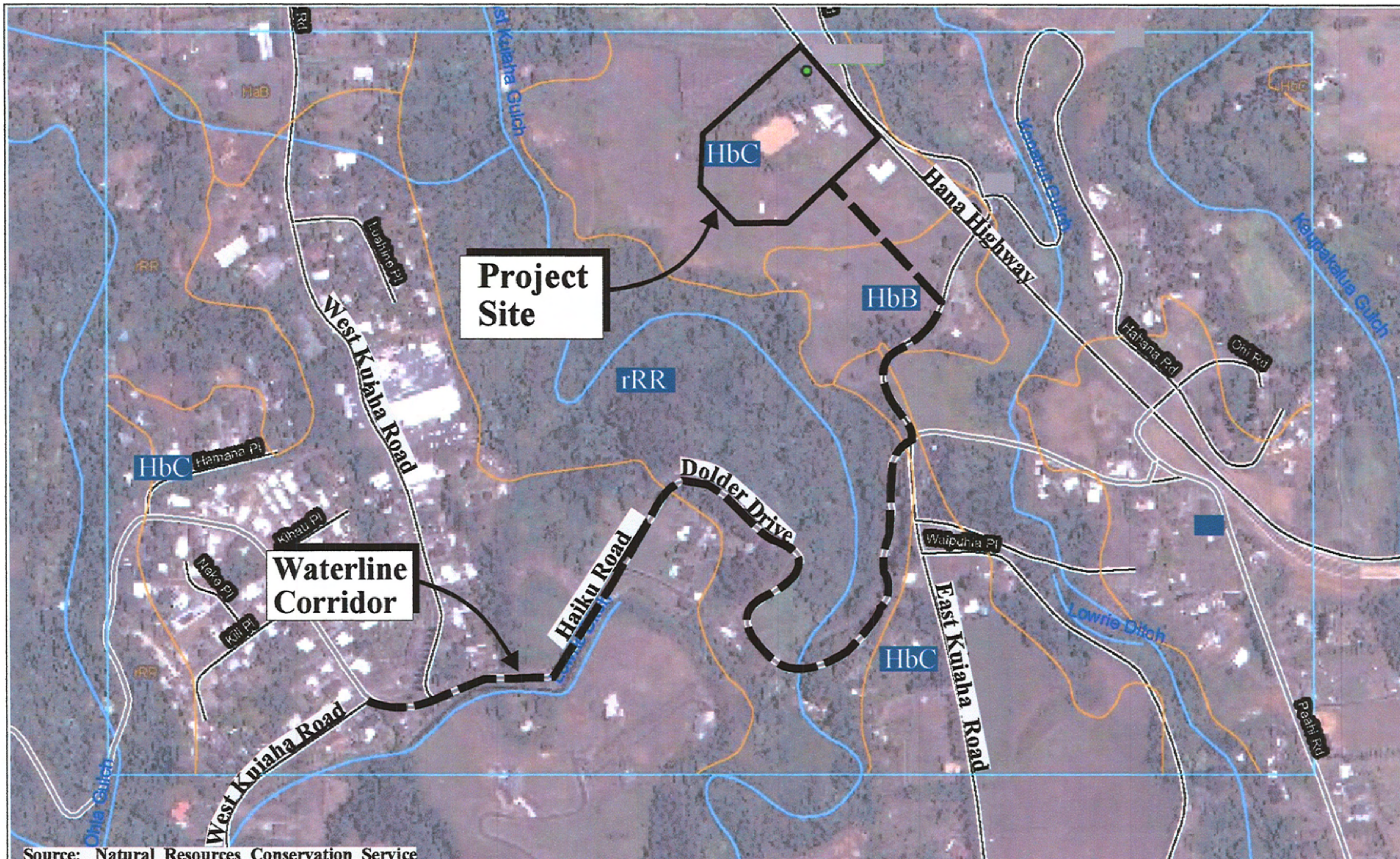
Soil Associations Map

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\Soil Association Map



Source: Natural Resources Conservation Service

Figure 10

Proposed Haiku Fire Station and Related Improvements

Soils Classification Map

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\soilsclass.rev

Agricultural Land" includes those which have not been rated as "Prime" or "Unique". The project site is located on lands that have been defined as "Prime Agricultural Lands" by the ALISH rating system. See **Figure 11**.

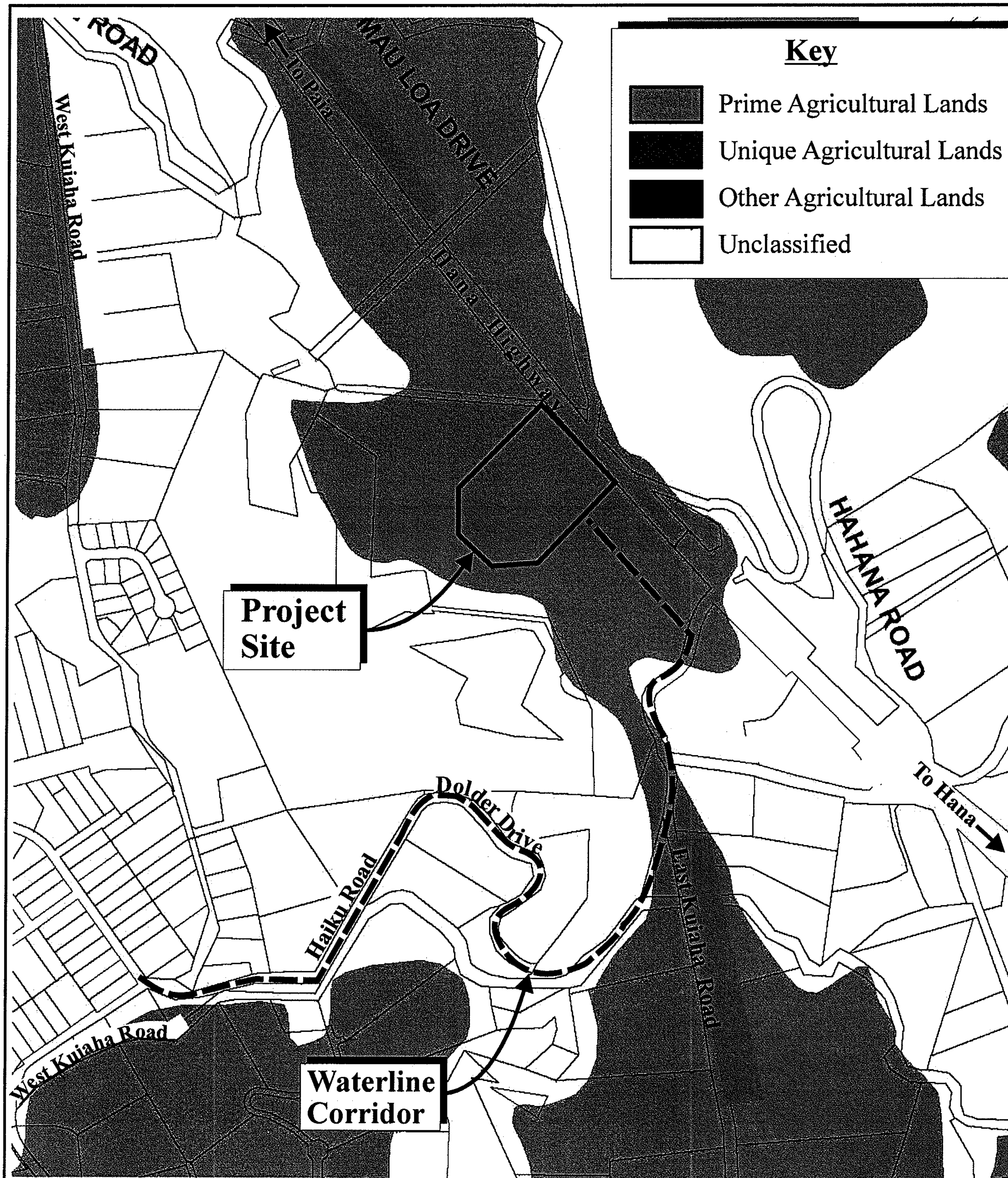
In addition, the University of Hawaii, Land Study Bureau (LSB) classifies productivity characteristics on a scale of "A' through "E", with lands designated as "A" reflecting the highest productivity and "E" representing lands with the lowest productivity. These letters are followed by numbers which further classify the soil types and convey information such as texture, drainage, and stoniness (Land Study Bureau, 1967).

Lands underlying the project area have been classified by the LSB as "C9", "E96", as well as land not classified by LSB. See **Figure 12**. The fire station site is "C" land, while the waterline is located on "C", "E", and "Unclassified" lands. Lands designated "C" lands are well-suited for agriculture, primarily pineapple and grazing. Lands designated "E" lands are not suited for agriculture and are primarily used for grazing and forest.

b. <u>Potential Impacts and Mitigation Measures</u>

Construction of the new fire station will require grading and grubbing of the project site. Given the variation in site topographic conditions, cut-and-fill quantities vary. The proposed grading plan will require an estimated excavation of approximately 9,810 cubic yards and fill of approximately 8,120 cubic yards. The area of the property that will be affected by grading operations is approximately 3.6 acres.

The installation of the new waterline will also require grading and grubbing of the waterline corridor. Given the variation in site topographic conditions, cut-and-fill quantities will vary but are expected to be minimal given that the waterline will be constructed on lands falling within the right-of-way of existing County-owned roadways.



Source: State of Hawaii, Department of Agriculture

Figure 11 Proposed Haiku Fire Station and Related Improvements

Agricultural Lands of Importance to the State of Hawaii

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\ALISH

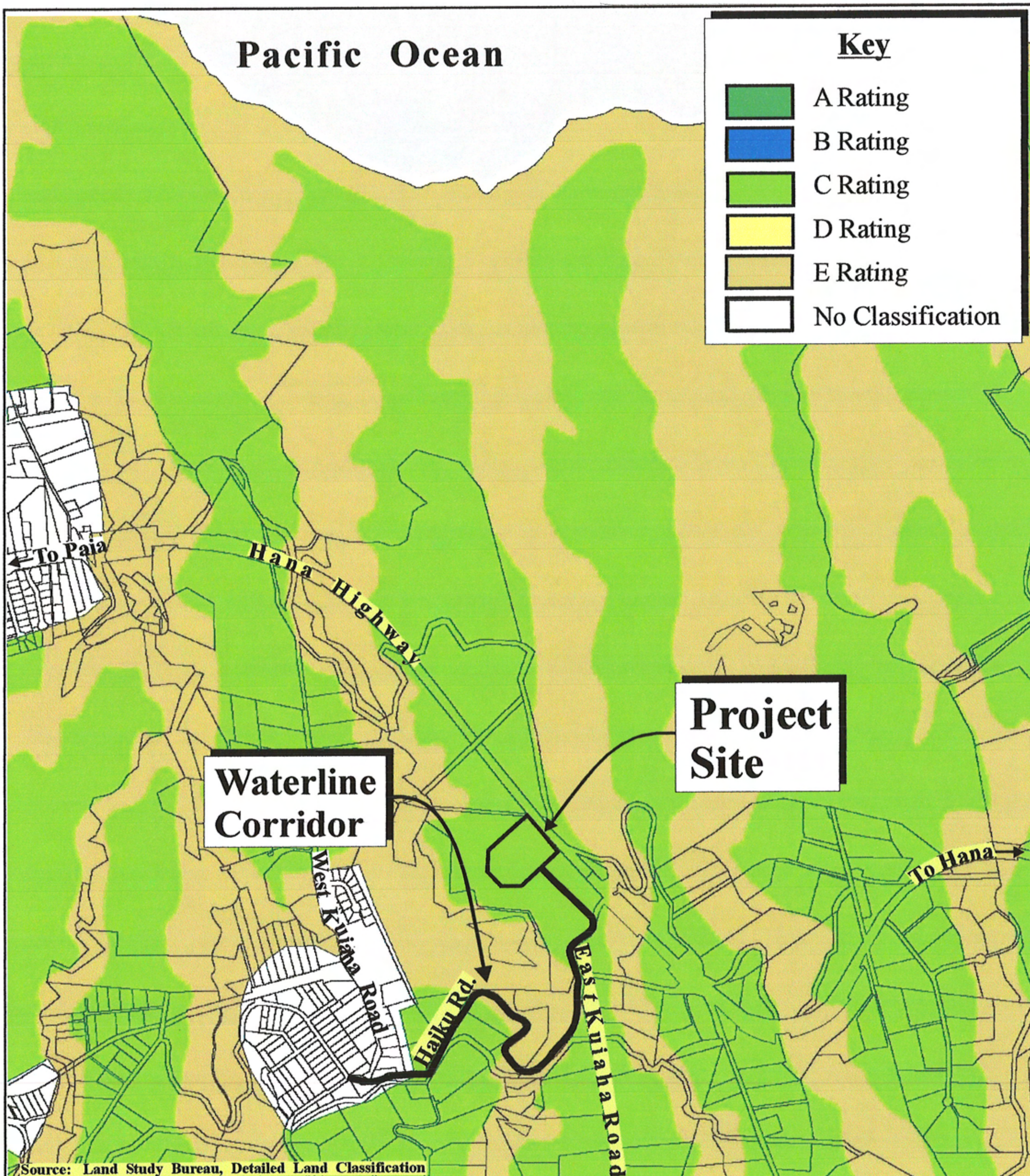


Figure 12 Proposed Haiku Fire Station and Related Improvements
Land Study Bureau Map

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\LandStudy

3. Flood and Tsunami Conditions

a. Existing Conditions

The project area is located in Flood Zone X, an area of minimal flooding. The project area is not located within a tsunami evacuation zone.

b. Potential Impacts and Mitigation Measures

As further discussed in Section D.4 of this chapter, onsite drainage mitigation measures will be implemented to address the increase in storm water runoff associated with the development of the proposed new fire station. These improvements, coupled with the proposed grading plan, will ensure that downstream or adjacent properties are not impacted by project implementation.

4. Flora and Fauna

a. Existing Conditions

A Biological Resources Survey of the project site was completed by Robert Hobdy in September 2009. See **Appendix "B"**.

Vegetation identified within the vacant lands of the project site is characterized by a host of introduced and native species of grasses and herbaceous weeds associated with the former use of the property as a nursery. There are also a few large trees that have grown on the site, including the African tulip tree *(Spathodea campanulata)*, common ironwood *(Casuarina equisetifolia)*, albizia *(Falcataria moluccana)* and Java plum *(Syzgsium cumini)*. Of the 104 plant species identified on the site, five (5) were native Hawaiian species and two (2) were Polynesian introductions – all of which are extremely widespread and common species indigenous in Hawaii and many other Pacific islands. No rare, threatened, or endangered plant species or habitats were identified within the project site.

Avifauna and mammals common to the project site and surrounding areas include introduced birds and feral animals (mongoose, domestic dog, rats, mice and cats). Only two (2) mammal species were observed during the survey; the Mongoose *(Herpestes auropunctatus)* and the domestic dog *(Canis familiaris)*. It is noted that a special effort was made during the survey to look for the Hawaiian hoary bat *(Lasturus cinereus semotus)*. Despite visibility being excellent during the evening survey, no evidence of the Hawaiian hoary bat was observed. A bat detection device was also used during the survey. No bats were detected using this device. Refer to **Appendix "B"**.

The federally protected seabirds, Hawaiian petrel and Newell's shearwater, were not detected on the property nor would these species be expected to utilize it for breeding or resting. These birds, however, would be expected to fly over the area between March and November to reach their burrows high in the mountains. Young bird fledging would also likely take their first tentative flights to the ocean over the Haiku area during November and December. These young birds are especially vulnerable and are often attracted to bright lights during their late evening and early dawn flights and become easily disoriented and crash or killed by vehicles or predators.

The proposed waterline corridor is confined to the existing right-of-way of existing County-owned roadways (East Kuiaha Road, Dolder Drive and Haiku Road). Flora, fauna, or avifauna located within the proposed waterline corridor would be expected to exhibit similar characteristics to that found within the project site.

b. Potential Impacts and Mitigation Measures

There are no known or identified habitats of rare, threatened, or endangered species of flora, fauna or avifauna located within the project site. Proposed landscaping will reflect the character of the area and will include the use of native species. A copy of the Preliminary Landscaping Plan for the project is presented in **Appendix "A"**. Further, outdoor lighting will be shielded so that direct light is not visible from above to reduce any threat to seabirds. The proposed fire station is not anticipated to have an adverse impact upon flora and fauna resources in the area.

As discussed in Chapter I, two (2) offsite wind turbines will be installed within the subject property to the east of the 6.1-acre project site. The site selected for placement of these turbines provides an optimal location for energy performance from captured wind. Refer to **Figure 4**. The incorporation of these turbines represents a key sustainable design component of the project as they will provide green, locally generated power to supplement the electrical requirements of the proposed new fire station. The turbines are not anticipated to present significant adverse impacts on birds traversing the area. A vertical axis design will be used for the turbines, which allows utilization of an aluminum helical blade scoop for power generation purposes. The helical blade scoop design is considerably safer for avifauna than the traditional propeller (windmill) design of conventional wind generation turbines.

Similarly, the proposed construction of a subsurface waterline along the waterline corridor is not anticipated to have an adverse impact upon flora and fauna resources in the area. Once the utility work is completed, the affected areas of the right-of-way are expected to return to pre-existing natural conditions.

5. Historical and Archaeological Resources

a. Existing Conditions

An Archaeological Inventory Survey of the project area was conducted by Scientific Consultant Services, Inc. (SCS) on February 2010. See **Appendix "C"**. The project site assessment included historic background research, a pedestrian survey, and a subsurface investigation of eleven (11) backhoe trenches. The waterline corridor assessment included historic background research and a pedestrian survey.

Historically, the project site was used for large scale pineapple cultivation and pasture, and later as a house site and most recently for a nursery operation. These heavy land alterations were likely to have destroyed any traditional Hawaiian sites or features that were present in the area at that time. Any remaining sites encountered would, therefore, likely be of a historic nature related to modern agriculture, animal husbandry, or recent habitation within the project area.

The waterline corridor follows previously disturbed existing County-owned roadways. The roadway along the waterline corridor has been cut up to 15 feet into the slope effectively eliminating any possibility of encountering sub-surface deposits. It is anticipated that any sites present along the corridor will be related to agriculture, animal husbandry or recent habitation within the area.

b. **Potential Impacts and Mitigation Measures**

The Archaeological Inventory Survey of the project site revealed no intact subsurface cultural layers or historic materials. This is likely due to historic land use patterns, such as pineapple cultivation, and subsequent grading by the landowners. Only one (1) historic era site (SHIP No. 50-50-06-6678) was recorded during the pedestrian survey of the project site, and was attributed to the former occupants of the existing vacant house found on the property.

Site 6678 consists of two (2) features and is situated in the northwest portion of the project area adjacent to a vacant cottage and asphalt driveway. The site is in fair to good condition and functions as a retaining wall and garden terrace constructed of dry-stacked basalt. The age of the site is estimated to be 50 to 60 years old and associated with the previous residential use on the property.

Using the Rules Governing Procedures for Historic Preservation Review, the following significance criteria are used for evaluation of archaeological sites:

> ***Criterion A**: Site is associated with events that have made a significant contribution to the broad patterns of our history;*
>
> ***Criterion B**: Site is associated with the lives of persons significant to our past;*
>
> ***Criterion C**: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual*

construction;

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

***Criterion E**: Site has cultural significance; probable religious structures or burials (State of Hawaii criteria only)*

The project site meets Criterion D, as it houses a site that has yielded or has the potential to yield information important in prehistory or history (attributed to the former occupants of the vacant house). This site has been thoroughly documented and it has been concluded that further research would not contribute to the interpretation of the area, region, or Hawaiian prehistory and/or history. Thus, no further archaeological work or archaeological monitoring is anticipated to be necessary within the project site.

With regard to the waterline corridor, archaeological monitoring is recommended along portions of Haiku Road that is not within the cut slope, including an approximately 500 foot (150 meter) stretch crossing Kuiaha Gulch and a western portion of the corridor that extends approximately 1,300 feet (400 meter), towards the gulch from the intersection of Haiku Road and West Kuiaha Road.

The Archaeological Inventory Survey report and its recommendations was approved by SHPD on November 12, 2010. See **Appendix "C-1"**.

In the event that a discovery of significant cultural materials and/or burials is made during construction activities for the project, all work in the immediate area of the find will cease and the State Historic Preservation Division (SHPD) will be notified to discuss mitigation measures, in accordance with Chapter 6E, Hawaii Revised Statutes.

6. <u>Cultural Assessment</u>

a. <u>Existing Conditions</u>

A Cultural Impact Assessment was completed for the proposed project in May 2009 by Scientific Consultant Services, Inc. See **Appendix "D"**.

(i) **Geopolitical Organization**

Prior to Western contact in Hawaii, land was divided into *moku*, or districts. Each of these was further subdivided into units called *ahupua'a.* Ideally, each *ahupua'a* was self-sufficient, running from *mauka*, the mountain, to *makai*, the ocean (MacKenzie). These divisions served as both cultural and settlement systems as traditional Hawaiian life was tied intimately to the land. Hunting, gathering, cultivation, and habitation took place within three (3) zones which characterized the *ahupua'a*: the *Mauka* Zone, the Agricultural Zone, and the Coastal Zone. The *Mauka* Zone provided access to a variety of trees, plants, and herbs for various needs, customs and practices. Planting of yams, sweet potato, sugar cane, taro, and other foods took place in the Agricultural Zone, where gradual slopes of land allowed terraces to be constructed for more efficient irrigation. The Coastal Zone and low-lying areas was where most of the *kauhale*, group of houses, were found, as well as temples, fishing shrines, and fishponds (Minerbi, 1993).

Western contact brought changes to the Hawaiian land system with the introduction of private ownership of land, a concept foreign to the Native Hawaiians. A Board of Land Commissioners was established in 1845 to uphold or reject all private land claims of both foreigners and Hawaiians. The Commission adopted rules pertaining to the proof of claims, right of tenants, and commutation to the government in attempts to achieve the goal of totally partitioning undivided lands. All lands not claimed by February 1848 were to be forfeited to the government (MacKenzie, 1991).

Following the enactment of these rules, the *Mahele* division of 1848 divided all lands of Hawaii between the king and chiefs. Two (2) years later the *Kuleana* act completed the *Mahele* process by authorizing the Land Commission to award fee simple titles to native tenants for their land. These *kuleana* parcels, also known as Land Commission Awards (LCA), were generally among the richest and most fertile in the islands and came from the king, government, or chief's land. All claims and awards were numbered and recorded in the *Mahele* Book (MacKenzie, 1991). In addition, government lands were sold as "Royal Patent Grants" or "Grants" in order to meet the increasing costs of government. These grants differed from LCAs, as it was not necessary for the recipients to obtain an award for their land from the Land Commission (Chinen, 1958).

(ii) Historical Overview

The subject project is located in the ahupuaa of Pauwela, which translates to "hot soot". Traditionally, Pauwela was considered a part of the Hamakua Loa District.

The Hamakua Loa region was traditionally associated with the gods Kanaloa and Kane, and contained many small gulches, springs, and streams. The gulches in this region helped to support the loi, or taro patches, that ascended with the stream bed. The location of many ahupuaa along this coast suggests that this area held a considerable Hawaiian population. The soil in this region was excellent for yielding sweet potato, yams, bananas, and other crops, while the nearby bays were excellent for fishing.

Prior to the arrival of Capt. Cook on the islands, there was fierce competition between the chiefs of Hawaii island and the alii nui of Maui. In the late 1700's, Kalaniopuu, an alii of Hawaii island, invaded the Hamakua Loa region. He was defeated there by Kahekili, an alii of Maui, but ventured back to the area several more times. As a result, the Hamakua Loa region became the site of many battles.

With the onset of Western contact, the Pauwela Ahupuaa came under government ownership and was later sold as a government grant. As sugar became a major industry for the islands in the 1800's, Pauwela was utilized for its excellent land cultivation. As the plantations and industry operations grew in scale, the need for water became significant and several ditches were constructed through the Pauwela area. In the 1930's the land was used as cattle pasture and in the 1940's (during WWII) the land was used as the site of a military training camp. Later, the land was used for sugar cane and pineapple farming.

(iii) Traditional and Customary Rights

The traditional and customary rights of Native Hawaiians can be broken down into access rights, gathering rights, burial rights, and religious rights.

Access

Native Hawaiians generally share the same access rights as the general public. However, they have the unique access rights to *kuleana* parcels and between *ahupuaa*. Access to *kuleana* parcels may involve access via ancient trails or expanded access not limited to any route. Additionally, the *Kuleana* Act granted unobstructed access within the *ahupuaa* to obtain items necessary to make the *kuleana* parcel productive. Access rights between *ahupuaa* involve access a ancient or well established trails (MacKenzie, 1991).

Gathering

In terms of gathering rights, the Hawaii Supreme Court has upheld gathering rights within an *ahupuaa* for firewood, house-timber, *aho* cord, thatch, and *ki*-leaf under three (3) conditions. The tenant must physically reside within the *ahupuaa*, the right to gather can only be exercised upon undeveloped lands within the *ahupuaa,* and the right must be exercised only for the purpose of practicing Native Hawaiian customs and traditions (MacKenzie, 1991).

Burial

According to traditional Hawaiian burial beliefs, following death, the *uhane,* or spirit, must remain near na iwi, or bones. Burial sites are chosen by Hawaiians for symbolic purposes in places for safekeeping. Often, bones were hidden in caves, cliffs, sand dunes, or deposited in the ocean. Today, federal and state laws protect both unmarked and marked burial sites. Island Burial Councils assist the State Historic Preservation Division with inventory and identification of unmarked Hawaiian burial sites and determine the preservation or relocation of native Hawaiian burial sites (MacKenzie, 1991).

Religious

Hawaiian religion and beliefs were intimately tied to the land. While some practices and traditions were lost over the years, basic Hawaiian religious concepts remain. The terms *"aloha aina,"* love the land and *"malama aina,"* care for and protect the land, convey the unity of humans, nature, and the gods in Hawaiian philosophy (Minerbi, 1993). Furthermore, Hawaiians honored and worshiped *aumakua,* deities, and *akua*, gods. There were numerous *akua* of farming, fishing, tapa making, dancing, sports, and any other activity of Hawaiian life. The concept of *mana* or sacred attachment to places, people, or things also remains as a significant aspect of Hawaiian religion (MacKenzie, 1991).

b. Potential Impacts and Mitigation Measures

From a recent historical perspective, land underlying the proposed project site was primarily maintained for agricultural cultivation activities. More recently, the site has been underutilized and is vacant. With regards to the waterline corridor, it follows existing County-owned roadways. No indications of cultural practices, such as gathering, access, or religious traditions, are known to be associated with the project site and waterline corridor.

With regard to the subject project, no adverse impact to cultural resources, practices, and traditions is anticipated. Refer to **Appendix "D"**.

7. Air and Noise Quality

a. Existing Conditions

Due to the low level of residential and commercial development in the Haiku area, the lack of major point sources of air pollution, and the prevailing tradewind conditions, the Haiku region has good air quality. The primary source of emissions may be attributed to motor vehicles traversing Hana Highway and local roadways in the area. However, these mobile sources have no adverse influence on regional air quality.

There are no significant noise generators in the vicinity of the project site. Noise generated in this locale may be attributed to traffic in the Haiku area.

b. Potential Impacts and Mitigation Measures

Airborne particulates, including dust, may be generated during site preparation and construction activities. However, dust control measures, such as regular watering and sprinkling, will be implemented as needed to minimize wind-blown emissions.

In the long term, vehicle-generated emissions related to the project will not adversely impact local and regional ambient air quality conditions. The new fire station will be a relatively small facility and is expected to accommodate six (6) full-time employees at any one time.

As with air quality, ambient noise conditions will be temporarily impacted by construction activities. Heavy construction equipment, such as bulldozers, front end loaders, and dump trucks and trailers will be the dominant source of noise during site construction. Construction generated noise will be mitigated through Best Management Practices (BMPs), and construction activities will be limited to daylight work hours only. The contractor will coordinate with the State Department of Health to ensure that noise permits are obtained, as appropriate.

Noise will be generated by emergency vehicles and sirens and helicopter operations, however, such impact will be intermittent in frequency. Use of the sirens and air horns by emergency vehicles will be limited to roadway clearing activity as stipulated by law. On average, sirens or air horns are utilized for roadway clearing approximately 30 seconds to one (1) minute, two (2) times per day. The use of sirens and air horns will be limited to those instances where maintenance of public safety is essential. The helipad will be utilized during civil defense emergency operations, fire training, rescue and firefighting operations and will be located on the south side of the fire station complex, away from residential areas. A helicopter will not be stored onsite. The helipad will be used only during emergencies.

The project also proposes the installation and use of two (2) vertical axis wind turbines within the subject property to the east of the 6.1-acre project site. Refer to **Figure 4**. These turbines will produce less noise than conventional horizontal axis blade types as they do not slice into the wind using propellers. The assembly (including the helical blade scoop) is almost silent, at less than five (5) decibels above ambient background noise. The installation and use of these wind turbines is not anticipated to present significant noise impacts on adjacent land uses to the fire station site, which are predominantly agricultural in character.

8. Scenic and Open Space Resources

a. Existing Conditions

The project site is located in the Haiku area, abutting the mauka side of the Hana Highway to the north and East Kuiaha Street to the east. Located to the north of the project site is the Valley Isle Memorial Park Cemetery. The immediate vicinity of the project site is composed mainly of vacant, rural, and agricultural lands. The coastal shoreline lies about 1 mile away to the north and the Haleakala Crater lies about 35 miles to the south.

The waterline corridor extends east from the project site and joins with East Kuiaha Road. From there it follows East Kuiaha Road through Dolder Drive and Haiku Road, eventually joining an existing waterline at the far south intersection of Haiku Road and West Kuiaha Road.

The subject property does not lie within a designated scenic view corridor.

b. Potential Impacts and Mitigation Measures

The proposed fire station and waterline are not anticipated to have substantial, adverse impacts on existing view corridors. Most of the project site is overgrown and views of the site from adjacent areas are limited. Because of this, the property is not considered part of a scenic view corridor to the shoreline. Also, the proposed waterline will be installed entirely underground (except for the proposed crossing at Kuiaha Gulch) and will not be visible from the surface. All structures installed in connection with the proposed action (including the offsite wind turbines) will respect height standards set forth by existing and proposed zoning designations. There are no anticipated adverse impacts to the visual resources of the surrounding environment as a result of the proposed project.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population and Economy

a. Existing Conditions

The population of the County of Maui has exhibited relatively strong growth over the past decade with the 1995 resident population of 117,895 persons increasing to 138,774 persons in 2005 (Maui County Data Book, 2009).

As of 2010, the population of Maui Island was estimated at 151,300 persons, with approximately 12,525 persons residing in the Paia-Haiku region. Forecasts for 2015 and 2020 reflect an island-wide population of 162,600 persons and 174,450 persons, respectively, and a population for the Paia-Haiku region of 12,837 persons and 13,168 persons, respectively (County of Maui, Department of Planning 2006).

The unemployment rate (not seasonally adjusted) for Maui County was 8.5 percent in June 2010, with Maui Island's rate at 8.4 percent. These numbers represent respective decreases of 0.9 percent and 0.7 percent from June 2009 (Department of Labor and Industrial Relations, 2010). The State's unemployment rate for June 2010 was 6.3 percent, down by 0.7 percent from the same time in 2009.

b. Potential Impacts and Mitigation Measures

Short-term economic benefits associated with construction expenditures for the new fire station is anticipated. The proposed project is not a population generator. Thus, there are no anticipated long-term impacts on population parameters. The proposed fire station will fulfill the Haiku community's need for fire protection and public safety and will also result in lower insurance premiums for surrounding residents.

C. PUBLIC SERVICES

1. Police and Fire Protection

a. Existing Conditions

The County of Maui's Police Department headquarters are located in Wailuku. There are three (3) patrol divisions on the island of Maui. These are the Wailuku, Lahaina, and Hana divisions. The Wailuku division covers Central Maui, Paia-Haiku, Kihei-Makena, and Upcountry Maui. Currently, the Wailuku division utilizes 146 patrol officers and 11 motorized beats.

Fire prevention, suppression, and protection services for the project area are provided by the County Department of Fire and Public Safety's Paia Fire Station, located six (6) miles from the project site, along Hana Highway in Paia Town. The commercial and residential areas of Paia have adequate fire protection, however, large areas beyond Haiku do not.

b. Potential Impacts and Mitigation Measures

The new fire station is anticipated to substantially improve fire protection services in Haiku and the surrounding rural areas. The new station will allow for more efficient deployment of emergency vehicles. Implementation of the project is not anticipated to adversely impact existing police services in the region.

2. Medical Facilities

a. Existing Conditions

Maui Memorial Medical Center is currently the only major medical facility on the island. Acute, general, and emergency care services are provided by the 201-bed facility. In addition, Paia has medical and dental clinics to service local community residents. Haiku also has a medical office and a pharmacy.

b. **<u>Potential Impacts and Mitigation Measures</u>**

The proposed project is not anticipated to have adverse impacts on existing medical facilities or services on Maui.

3. <u>Solid Waste</u>

a. **<u>Existing Conditions</u>**

Except for remote areas, single family solid waste collection service is provided by the County of Maui on a weekly basis.

Solid waste is collected by County refuse collection crews and disposed at the Central Maui Landfill. Commercial waste from private collection companies is also disposed of at the landfill.

b. **<u>Potential Impacts and Mitigation Measures</u>**

The proposed fire station will be undergoing certification through the Leadership in Environmental and Energy Design (LEED) green building rating system and will include various initiatives intended to minimize the solid waste impact of the proposed project. A preliminary construction waste management plan will be prepared prior to construction. For the majority of demolition waste, such as concrete slabs, walkways, and driveways, it is anticipated that these items will be crushed and reused on-site for fill and/or base course. For other materials, such as wood, roofing, windows, and doors, it is anticipated that these materials will be diverted away from the landfill or recycled. LEED guidelines on the proposed fire station suggest a possible maximum diversion of 50 percent of demolition and construction waste away from the Central Maui Landfill.

In sum, the proposed fire station aims to facilitate the recycling and reuse of construction materials and also to divert construction waste away from disposal at the Central Maui Landfill. Recycling receptacles will also be utilized within the proposed fire station building to promote responsible waste management practices during the operational phase of the project. With implementation of the foregoing initiatives, the proposed fire station is not anticipated to adversely impact existing solid waste services on Maui.

4. Recreational Resources

a. Existing Conditions

The main facilities catering to the recreational needs of the Pauwela area are the Haiku Community Center and park, located one (1) mile from the project site. Another major recreational resource of the Pauwela Haiku area is Hookipa Beach Park, an internationally recognized park known for its excellent surf and windsurfing.

b. Potential Impacts and Mitigation Measures

The proposed project is not anticipated to adversely impact the existing recreational facilities located in and around the Haiku area.

5. Educational Facilities

a. Existing Conditions

The State of Hawaii, Department of Education operates seven (7) public schools in Upcountry Maui. They are Makawao Elementary School, Kalama Intermediate School, Pukalani Elementary School, Kula Elementary School, Haiku Elementary School, Paia Elementary School, and King Kekaulike High School.

The region is also served by the privately operated Montessori Preschool, Doris Todd, Haleakala Waldorf School, Seabury Hall, and the Maui Campus of Kamehameha Schools.

b. Potential Impacts and Mitigation Measures

The proposed project is not anticipated to adversely impact existing education facilities or services on Maui.

D. INFRASTRUCTURE

1. Roadways

a. Existing Conditions

The project site is located adjacent to Hana Highway, a State of Hawaii roadway that serves as the main access road along the northern coast of Maui. It is a predominantly two-lane, two-way roadway generally oriented in the east-west direction. Southeast of the project site, Hana Highway intersects with East Kuiaha Road at an unsignaled intersection. East Kuiaha Road is a two-lane, two-way County-owned roadway generally oriented in the north-south direction. At the intersection with Hana Highway, the East Kuiaha Road approach has one stop-controlled northbound lane that serves all traffic movements. The southbound approach of the intersection is comprised of a driveway serving an adjacent parcel.

The proposed waterline corridor extends east of the project site and follows East Kuiaha Road through Dolder Drive and Haiku Road, eventually ending at a connection to an existing waterline, at the southern intersection of Haiku Road and West Kuiaha Road. Refer to **Figure 2**.

Much of Haiku is composed of rural residential and agricultural areas. Due to the rural nature of the area, traffic is generally light and with minimal traffic congestion.

b. Potential Impacts and Mitigation Measures

A preliminary Traffic Impact Analysis Report was completed by Wilson Okamoto Corporation for the proposed project. See **Appendix "E"**.

The fire station will be staffed by approximately five (5) people, during each 24-hour shift. The shift changes occur daily between 7:00 a.m. and 7:30 a.m. Given the low number of vehicle trips to and from the station and the capacity of Hana Highway, the proposed project is not anticipated to result in any substantive, adverse impacts to traffic.

At the intersection of East Kuiaha Road at Hana Highway, the level of service for the project is expected to continue to operate at acceptable levels of service. Also, at the approaches of the fire station driveway with Hana Highway the LOS is expected to operate at LOC "C" or better during the AM peak period, as shown in the following **Table 3**:

Table 2. Summary of Level of Service Analysis

Intersection	Approach	AM			PM		
		Existing Conditions	Year 2012 Without Project	Year 2012 With Project	Existing Conditions	Year 2012 Without Project	Year 2012 With Project
Hana Highway/ East Kuiaha Road	Eastbound	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A
	Northbound	C	C	C	B	B	B
Hana Highway/ Fire Station Driveway	Westbound	--	--	A	--	--	--
	Northbound	--	--	C	--	--	--

Source: Wilson Okamoto Corporation, 2010.

The TIAR recommends the following mitigation measures for incorporation in the design for the proposed project:

1. Maintain sufficient sight distance for motorists to safely enter and exit all project driveways/roadways.

2. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.

3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.

4. Provide sufficient turning radii at all project driveways/roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

The Haiku Fire Station is not expected to have a significant impact on the traffic operations in the project vicinity.

2. Water System

a. Existing Conditions

Domestic water for the Haiku region is provided by the Department of Water Supply's (DWS) Upcountry System. Water for the Upcountry system is provided by the Kamaole Weir Water Treatment Facility (WTF) which draws water primarily from Wailoa Ditch. The Kamaole Weir WTF is approximately 1,120 feet above sea level and lies approximately 2 miles away from the project site. Kamaole Weir's average daily production is approximately 3.6 million gallons per day. There is an existing 5/8-inch water meter located towards East Kuiaha Road on the southeastern side of the subject property. The Department of Water Supply, by letter dated December 4, 2009, has confirmed that the property possesses a reservation for three (3) additional water meters.

b. Potential Impacts and Mitigation Measures

A Preliminary Engineering Report (PER) was prepared for the project in November 2010. See **Appendix "F "**.

The proposed fire station will connect (via a 6-inch waterline) to a new 12-inch offsite waterline that will be installed as part of the project. Refer to **Figure 2**. The new 4,200 linear feet waterline will provide potable water source to the project through the source available at the Kaupakalua storage tank, which is located approximately 5,000 feet to the south of the project site. Average water demand from the new fire station is estimated at 1,186 gallons per day (gpd). Total fire flow for the project is estimated at 1,500 gallons per minute (gpm) for a two (2) hour duration. Upon subdivision of the 6.1-acre project site from the larger property, the existing 5/8-inch water meter will be replaced with a larger one-inch meter. The one-inch meter will service the domestic water requirements of the proposed fire station. Two (2) rain catchment tanks will also be installed on the project site to meet the non-potable water requirements of the proposed fire station. Refer to **Figure 4**. Water conservation measures to be incorporated into the proposed project site include the use of low flow plumbing fixtures and use of landscape planting material which minimizes irrigation water consumption.

Appropriate Best Management Practices (BMPs) will be employed during construction in order to protect the integrity of groundwater and surface water resources in the vicinity of the project site.

Water requirements will be coordinated with the DWS to ensure that adequate supply is available at the time of development. In addition, calculations for domestic, irrigation and fire protection use will be submitted to the DWS during building permit processing for the project.

3. Wastewater System

a. Existing Conditions

There are no County wastewater treatment facilities servicing the Haiku area. Wastewater disposal in the region is accommodated via cesspools or individual wastewater treatment systems, such as septic tanks and leach fields.

b. Potential Impacts and Mitigation Measures

The proposed project will generate approximately 700 gallons of wastewater per day. A private, ecological wastewater treatment system has been designed for the proposed fire station by Roth Ecological Design International, LLC and will be utilized to treat all wastewater generated onsite. See **Appendix "G"**.

The ecological wastewater treatment system will be located within the 6.1-acre project site (refer to **Figure 4**) and will consist of several stages of treatment. The first stage will involve the collection of wastewater into a 1,500 gallon septic tank. The septic tank will filter out solids from the effluent stream and will retain them until their organic matter has broken down significantly. The wastewater will then continue to a natural filtration basin. The natural filtration basin is composed of various media. The bottom layer will be comprised of porous material (typically gravel), with water maintained beneath its surface, at a constant depth of 18 to 40 inches. A thin layer of mulch/compost will be placed directly on top of the porous material layer. Wastewater will enter, flow laterally across the basin through the porous material, and will collect at the opposite end. A system of distribution pipes and chambers will ensure an equalized flow of wastewater across the basin. Plants will be planted within the mulch/compost layer and their roots will dip into the porous material. As wastewater flows through the basin, the plants' roots will act as natural filters, further breaking down organic contaminants present in the wastewater. A graphic illustration of the ecological wastewater treatment system is provided in Design Drawing Sheet EC-101 of **Appendix "G"**. Upon completion of this ecological wastewater treatment process, reclaimed water will be redirected for reuse within the property, in accordance with the State of Hawaii Department of Health R-3 reuse regulations. The plants used for the treatment system will also function as attractive, visual relief for the project site and will be visible from Hana Highway, complimenting the project landscape. Reclaimed water from the ecological wastewater treatment system will be dispersed within an adjacent drip irrigation disposal field. Refer to **Figure 4** and **Appendix "G"**.

4. Drainage

a. Existing Conditions

A Preliminary Drainage Report (PDR) was prepared for the project by AECOM Pacific, Inc. in November, 2010. The objective of the PDR is to analyze, evaluate and mitigate the drainage impacts of the proposed Haiku Fire Station project in accordance with the County of Maui's Rules for the Design of Storm Drainage Facilities in the County of Maui (November 1995). Refer to **Appendix "H"**.

There are four (4) drainage areas within the 27.9-acre subject property (Parcel 08) affecting the 6.1-acre project site, two (2) of which are located onsite (i.e., within the project site) and two (2) offsite (i.e., outside of project site but within the 27.9-acre subject property). The onsite drainage areas are referenced (in Figure 3 of the PDR) as drainage areas XDA-1 and XDA-2, whereas the offsite drainage areas are referenced as drainage areas XDA-3 and XDA-4. Total run-off from the project site under existing conditions (for the 50-year, 1-hour storm) is 22.76 cubic feet per second (cfs). A summary of the existing drainage conditions is presented below in **Table 3**:

Table 3. Summary of Existing Drainage Conditions Affecting Project Site for the 50-Year, 1-Hour Storm

Drainage Area	Size (acres)	Direction of Flow	Drainage Flow (cfs)
XDA-1 (onsite)	4.49	Sheet Flow Towards Northwest Property Line	10.04
XDA-2 (onsite)	1.61	Sheet Flow Towards Hana Highway	3.60
XDA-3 (offsite)	0.92	Sheet Flow Towards Hana Highway through XDA-2	2.53
XDA-4 (offsite)	2.84	Sheet Flow Towards Northwest Property Line through XDA-1	6.59
		TOTAL	22.76 cfs
Source: AECOM Pacific, Inc., 2010.			

There are currently no drainage system improvements located within the limits of the project site due to undeveloped conditions present within the subject property.

b. <u>Potential Impacts and Mitigation Measures</u>

Under developed conditions, there will be a total of eight (8) drainage areas affecting the 6.1-acre project site, five (5) of which will be located onsite (i.e., within project site) and three (3) offsite (i.e., outside of project site but within 27.9-acre subject property). The post-development onsite drainage areas are referenced (in Figure 4 of the PDR) as drainage areas NDA-1 through NDA-5, whereas, the post-development offsite drainage areas are referenced as drainage areas NDA-6 through NDA-8. A summary of the modified drainage conditions within the project site is presented below in **Table 4**:

Table 4. Summary of Post-Development Drainage Conditions Affecting Project Site for the 50-Year, 1-Hour Storm

Drainage Area	Size (acres)	Direction of Flow	Drainage Flow (cfs)
NDA-1 (onsite)	2.54	Sheet Flow Towards Northwest Property Line	8.38
NDA-2 (onsite)	1.15	Piped into Detention Basin	3.17
NDA-3 (onsite)	1.27	Piped into Detention Basin	3.62
NDA-4 (onsite)	0.88	Sheet Flow into Detention Basin	2.08
NDA-5 (onsite)	0.26	Fire Station Roof Into Rainwater Catchment System	1.44
NDA-6 (offsite)	0.78	Sheet Flow Towards NDA-2	2.22
NDA-7 (offsite)	0.91	Sheet Flow Towards NDA-3	2.60
NDA-8 (offsite)	2.06	Sheet Flow Towards NDA-1	5.50
		TOTAL	**29.01 cfs**
Source: AECOM Pacific, Inc., 2010.			

The development of the project site will result in the introduction of impervious areas within the property and an associated increase in storm water runoff through the project site, from 22.76 cfs to 29.01 cfs, an increase of 6.25 cfs (based on the 50-year, 1-hour storm). To accommodate the increase in drainage runoff resulting from project implementation, an onsite drainage system will be constructed consisting of drainage structures, drainlines, and a detention basin. The detention basin will be located on the northwest side of the new fire station building as reflected on the site plan (Sheet C-5), and, grading and drainage plan (Sheet C-7) of the PDR (refer to **Appendix "H"**). The detention basin will have a capacity of 23,047 cfs and will retain 100 percent (6.25 cfs) of the increase in stormwater runoff associated with the project. With the proposed drainage improvements, there are no adverse impacts to downstream properties anticipated from construction of the proposed Haiku Fire Station project. Refer to **Appendix "H"**.

5. Electrical, Telephone and Cable Services

a. Existing Conditions

Electrical service to the area in the vicinity of the project site, is provided by Maui Electric Company (MECO). There is a primary overhead system, located along Hana Highway, fronting the project site.

Telephone and cable service is provided to the area via the existing overhead distribution system along Hana Highway by Hawaiian Telcom and Oceanic Time Warner Cable, respectively.

b. Potential Impacts and Mitigation Measures

Coordination is being undertaken with the respective utility companies to connect electrical, telephone and cable TV services from the existing overhead distribution system along Hana Highway to the project site. Underground ductline systems will be installed for extension of services up to the proposed fire station building. This work will include installation of a new MECO pad-mounted transformer within the project site. Refer to **Figure 4**.

Two (2) offsite wind turbines will be installed within the subject property to the east of the 6.1-acre project site. The site selected for placement of these turbines provides an optimal location for energy performance from captured wind. Refer to **Figure 4**. The two (2) proposed turbines will utilize a vertical axis design instead of the conventional horizontal axis (windmill/propeller) design. The overall height of the vertical axis wind turbine will be 35 feet, with more than 15 feet clear between the existing grade and the bottom of the turbine assembly. This configuration considers safety by locating all moving parts more than 15 feet above grade using a monopole design, and places the turbine where the wind is best captured. The proposed wind turbines will have the capability to efficiently utilize wind from any direction at speeds as low as eight (8) miles per hour.

Photovoltaic and solar hot water heating systems will also be installed on the roof of the new fire station.

The incorporation of these systems represent key sustainable design components of the project as they will provide green, locally generated power to supplement the electrical requirements of the proposed new fire station.

Energy conservation design measures will also be incorporated as part of the sustainable design program for the project. Examples of such measures being considered for implementation include the following:

1. Installation of roof insulation and skylights;

2. Tinted windows to shade and cool the building;

3. Installation of trees around the building for shade and cooling of the building;

4. Installation of a heat recovery hot water system that will utilize waste heat from air conditioning condensing units;

5. Use of variable frequency drive to minimize energy usage by fan motors for air conditioning system;

6. Use of low flow plumbing fixtures;

7. Installation of high pressure sodium (HPS) luminaires around entrances/exit;

8. Installation of HPS pole mounted lights at all driveways and vehicle parking areas;

9. Installation of lights to the exterior of the site and building that will be automatically triggered by time switch controls and limited to night time use only;

10. Installation of energy efficient fluorescent lighting to the building interior;

11. Installation of multi-level and/or zoned switching of interior lighting in large rooms; and

12. Installation of wall mounted occupancy sensor light switches within private offices.

The proposed project is not anticipated to adversely affect electrical, telephone or cable systems.

E. CUMULATIVE AND SECONDARY IMPACTS

Cumulative impacts are defined as the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

The proposed project is not part of a larger action, nor would it occur within the context of such actions. There are no direct community growth impacts resulting from or occurring with the subject project. There are no other public works projects anticipated within the project context.

Secondary impacts are those which have the potential to occur later in time or are farther in distance, but are still reasonably foreseeable. They can be viewed as actions of others that are taken because of the presence of the subject project.

Secondary impacts from highway projects can occur, for example, because they can induce development by removing one of the impediments to growth-transportation access.

There are no foreseeable secondary impacts associated with the proposed subject project. The new fire station will provide much needed fire coverage for the Haiku area and is not a generating component for population. Nor will it place additional burden upon infrastructure or the environment.

III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

III. RELATIONSHIP TO GOVERNMENTAL 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 lands in the State are placed. These districts are "Urban", "Rural", "Agricultural", and "Conservation".

The 6.1-acre project site is located within the State "Agricultural" district. See **Figure 13**. The proposed action involves a County-initiated District Boundary Amendment (DBA) to the "Rural" District to permit the proposed action. Due to the size of the 6.1-acre project site (i.e., less than 15 acres), the DBA will be processed by the County of Maui and acted upon by the Maui County Council.

The proposed offsite waterline will follow an existing County-owned roadway right-of-way that affects both "Agricultural" and "Urban" land use districts.

B. LAND USE COMMISSION RULES, CHAPTER 15-15, HAWAII ADMINISTRATIVE RULES

The proposed reclassification of the project site is in conformance with the following standards of the Rural District set forth in Chapter 15-15-21, Hawaii Administrative Rules:

Chapter 15-15-21 Standards for determining "R" rural district boundaries. *Except as otherwise provided in this chapter, in determining the boundaries for the "R" rural district, the following standards shall apply:*

1. *Areas consisting of small farms, provided that the areas need not be included in this district if their inclusion will alter the general characteristics of the areas.*

   Comment: The proposed fire station will be located in Haiku, a low density area that is comprised mostly of farms and agricultural lands.

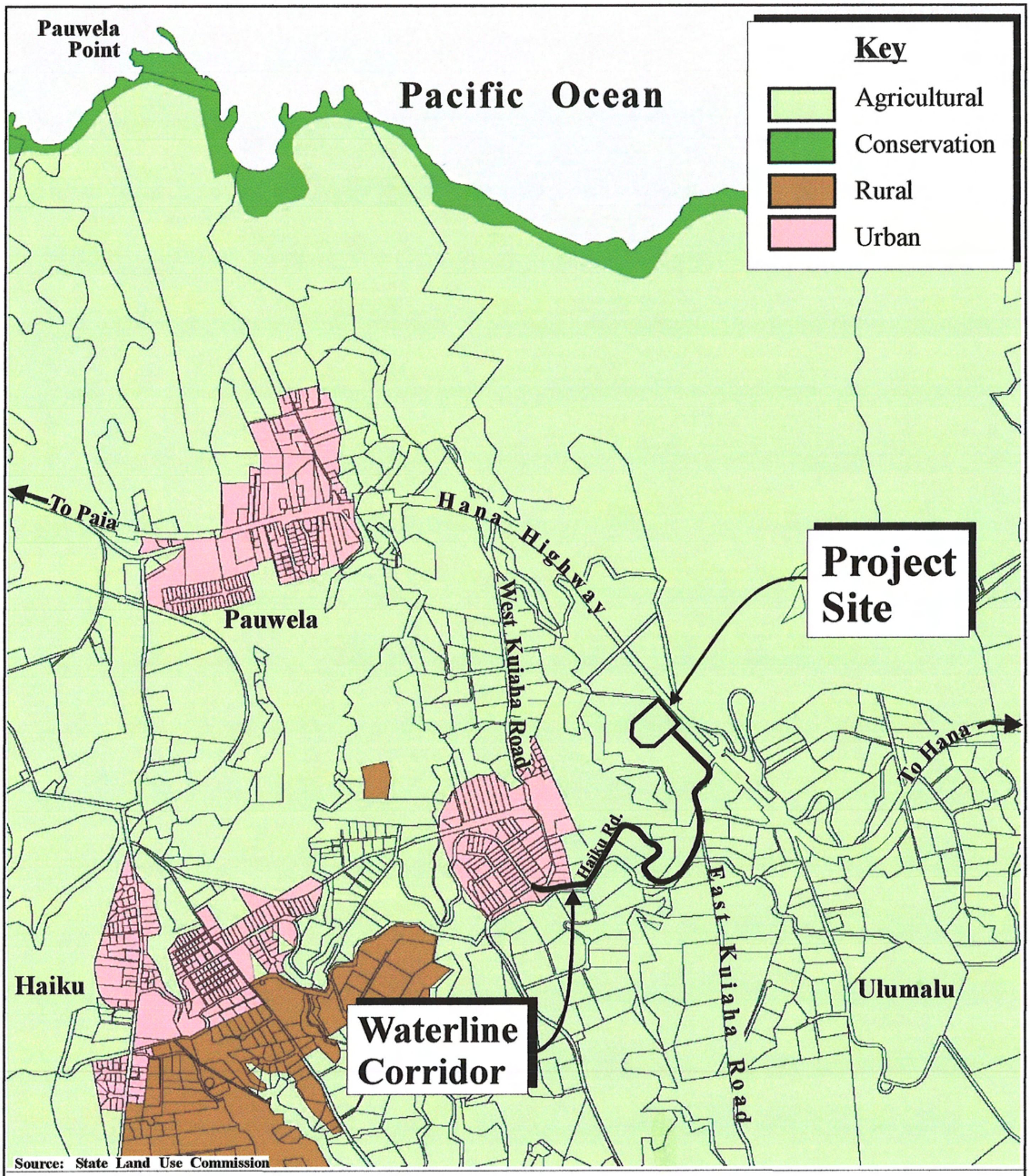


Figure 13 Proposed Haiku Fire Station and Related Improvements
State Land Use Designations Map

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Prepared for: County of Maui, Dept. of Fire and Public Safety

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COM\DFire Haiku\SLUD

2. *Activities or uses as characterized by low-density residential lots of not less than one-half acre and a density of not more than one single-family dwelling per one-half acre in areas where "city-like" concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with the low-density residential lots; and*

   Comment: As mentioned previously, the proposed project site lies in a low density area that is comprised mostly of farms and agricultural lands and lacks "city-like" concentrations of people, structures, streets, and services.

3. *It may also include parcels of land which are surrounded by, or contiguous to this district, and are not suited to low-density residential uses for small farm or agricultural uses.*

   Comment: The lands contiguous to the proposed rural district are comprised of low density areas of former and existing agricultural uses.

C. CHAPTER 226, HRS, HAWAII STATE PLAN

Chapter 226, HRS, also known as the Hawaii State Plan, is a long-range comprehensive plan which serves as a guide for the future long-range development of the State by identifying goals, objectives, policies, and priorities, as well as implementation mechanisms. The proposed action is consistent with the following goals of the Hawaii State Plan:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.
- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
- Physical, social, and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring, and of participation in community life.

1. Objectives and Policies of the Hawaii State Plan

The proposed reclassification is consistent with the following objectives and policies of the Hawaii State Plan:

Chapter 226-6, HRS, Objectives and Policies for the Economy—in General

226-6 (b)(6), HRS: Strive to achieve a level of construction activity responsive to, and consistent with, State growth objectives.

226-6 (b)(8), HRS: Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.

Chapter 226-11, HRS, Objectives and Policies for the Physical Environment – Land Based, Shoreline, and Marine Resources.

226-11(b)(3), HRS: Take into account the physical attributes of areas when planning and designing activities and facilities.

226-11(b)(8), HRS: Pursue compatible relationships among activities, facilities and natural resources.

Chapter 226-12, HRS, Objective and policies for the physical environment--scenic, natural beauty, and historic resources.

226-12 (b)(5), HRS: Encourage the design of developments and activities that complement the natural beauty of the islands.

Chapter 226-13, HRS, Objectives and policies for the physical environment--land, air, and water quality.

226-13 (b)(6), HRS: Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.

Chapter 226-14, HRS, Objective and policies for facility systems--in general.

226-14 (b)(2), HRS: Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

Chapter 226-15, HRS, Objectives and policies for facility systems--solid and liquid wastes.

226-15 (b)(2), HRS: Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.

226-15 (b)(3), HRS: Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.

Chapter 226-18, HRS, Objectives and policies for facility systems--energy.

226-18 (b)(4), HRS: Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.

226-18 (c)(1), HRS: Support research and development as well as promote the use of renewable energy sources.

Chapter 226-26, HRS, Objectives and policies for socio-cultural advancement--public safety.

226-26 (a)(1), HRS: Assurance of public safety and adequate protection of life and property for all people.

226-26 (a)(2), HRS: Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic wellbeing of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.

226-26 (b)(1), HRS: Ensure that public safety programs are effective and responsive to community needs.

226-26 (d)(1), HRS: Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.

2. **Priority Guidelines of the Hawaii State Plan**

The proposed action coincides with the following priority guidelines of the Hawaii State Plan.

Chapter 226-104, HRS, Population Growth and Land Resources Priority Guidelines.

226-104(a)(1), HRS: Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawaii's people.

D. GENERAL PLAN OF THE COUNTY OF MAUI

As indicated by the Maui County Charter, the purpose of the general plan shall be to:

> *... indicate desired population and physical development patterns for each island and region within the county; shall address the unique problems and needs of each island and region; shall explain 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, water and sewage systems, visitor destinations, urban design, and other matters related to development.*

As reflected in the Draft Maui Island Plan, Chapter 2.80B of the Maui County Code, relating to the General Plan and Community Plans, implements the foregoing Charter provision through enabling legislation which calls for a Countywide Policy Plan and a Maui Island Plan. The Countywide Policy Plan was adopted as Ordinance No. 3732 on March 24, 2010. The draft Maui Island Plan, which delineates areas for future urban and rural growth as part of a Directed Growth Strategy, is currently in the process of review and formulation by the Maui County Council. The project site is located within a Rural Growth Boundary that has been recommended for the Haiku area in the Draft Maui Island Plan.

With regard to the Countywide Policy Plan, Section 2.80B.030 of the Maui County Code states the following.

> *The countywide policy plan shall provide broad policies and objectives which portray the desired direction of the County's future. The countywide policy plan shall include:*
>
> 1. *A vision for the County;*
> 2. *A statement of core themes or principles for the County; and*
> 3. *A list of countywide objectives and policies for population, land use, the environment, the economy, and housing.*

Core principles set forth in the Countywide Policy Plan are listed as follows:

1. Excellence in the stewardship of the natural environment and cultural resources;
2. Compassion for and understanding of others;
3. Respect for diversity;
4. Engagement and empowerment of Maui County residents;
5. Honor for all cultural traditions and histories;
6. Consideration of the contributions of past generations as well as the needs of future generations;
7. Commitment to self-sufficiency;
8. Wisdom and balance in decision making;
9. Thoughtful, island appropriate innovation; and
10. Nurturance of the health and well-being of our families and our communities.

Congruent with these core principles, the Countywide Policy Plan identifies goals objectives, policies and implementing actions for pertinent functional planning categories, which are identified as follows:

1. Natural environment
2. Local cultures and traditions
3. Education
4. Social and healthcare services
5. Housing opportunities for residents
6. Local economy
7. Parks and public facilities
8. Transportation options
9. Physical infrastructure
10. Sustainable land use and growth management

11. Good governance

With respect to the proposed Haiku Fire Station and Related Improvements, the following goals, objectives, policies and implementing actions are illustrative of the project's compliance with the Countywide Policy Plan.

PROTECT THE NATURAL ENVIRONMENT

Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.

Objective:

- Improve the stewardship of the natural environment.

  Policies:

  - Evaluate development to assess potential short-term and long-term impacts on land, air, aquatic, and marine environments.
  - Reduce air, noise, light, land, and water pollution, and reduce Maui County's contribution to global climate change.
  - Educate the construction and landscape industries and property owners about the use of best management practices to prevent erosion and nonpoint source pollution.

IMPROVE PHYSICAL INFRASTRUCTURES

Goal: Maui County's physical infrastructure will be maintained in optimum condition and will provide for and effectively serve the needs of the County through clean and sustainable technologies.

Objective:

- Improve water systems to assure access to sustainable, clean, reliable, and affordable sources of water.

  Policies:

  - Ensure that adequate supplies of water are available prior to approval of subdivision or construction documents.
  - Promote the reclamation of gray water, and enable the use of

- reclaimed, gray, and brackish water for activities that do not require potable water.

- Improve the management of water systems so that surface-water and groundwater resources are not degraded by overuse or pollution.

Objective:

- Improve waste-disposal practices and systems to be efficient, safe, and as environmentally sound as possible.

  Policies:

  - Provide sustainable waste-disposal systems and comprehensive, convenient recycling programs to reduce the flow of waste into landfills.

  - Support innovative and alternative practices in recycling solid waste and wastewater and disposing of hazardous waste.

Objective:

- Significantly increase the use of renewable and green technologies to promote energy efficiency and energy self-sufficiency.

  Policies:

  - Promote the use of locally renewable energy sources, and reward energy efficiency.

  - Encourage small-scale energy generation that utilizes wind, sun, water, biowaste, and other renewable sources of energy.

  - Expand renewable-energy production.

  - Develop public-private partnerships to ensure the use of renewable energy and increase energy efficiency.

  - Require the incorporation of locally appropriate energy-saving and green building design concepts in all new developments by providing energy efficient urban design guidelines and amendments to the Building Code.

  - Promote the retrofitting of existing buildings and new development to incorporate energy-saving design concepts and devices.

- Encourage green footprint practices.

- Support green building practices such as the construction of buildings that aim to minimize carbon dioxide production, produce renewable energy, and recycle water.

- Promote and support environmentally friendly practices in all energy sectors.

Objective:

- Direct growth in a way that makes efficient use of existing infrastructure and to areas where there is available infrastructure capacity.

  Policy:

  - Support catchment systems and on-site wastewater treatment in rural areas and aggregated water and wastewater systems in urban areas if they are appropriately located.

Objective:

- Improve the planning and management of infrastructure systems.

  Policies:

  - Ensure that infrastructure is built concurrent with or prior to development.

  - Locate public facilities and emergency services in appropriate locations that support the health, safety, and welfare of each community and that minimize delivery inefficiencies.

  - Promote the undergrounding of utility and other distribution lines for health. safety, and aesthetic reasons.

PROMOTE SUSTAINABLE LAND USE AND GROWTH MANAGEMENT

Goal: Community character, lifestyles, economies, and natural assets will be preserved by managing growth and using land in a sustainable manner.

Objective:

- Design all developments to be in harmony with the environment and to protect each community's sense of place.

Policies:

- Support and provide incentives for green building practices.

- Encourage the incorporation of green building practices and technologies into all government facilities to the extent practicable.

- Protect rural communities and traditional small towns by regulating the footprint, locations, site planning, and design of structures.

STRIVE FOR GOOD GOVERNANCE

Goal: Government services will be transparent, effective, efficient, and responsive to the needs of residents.

Objective:

- Strive for County government to be a role model for implementing cultural and environmental policies and practices.

Policy:

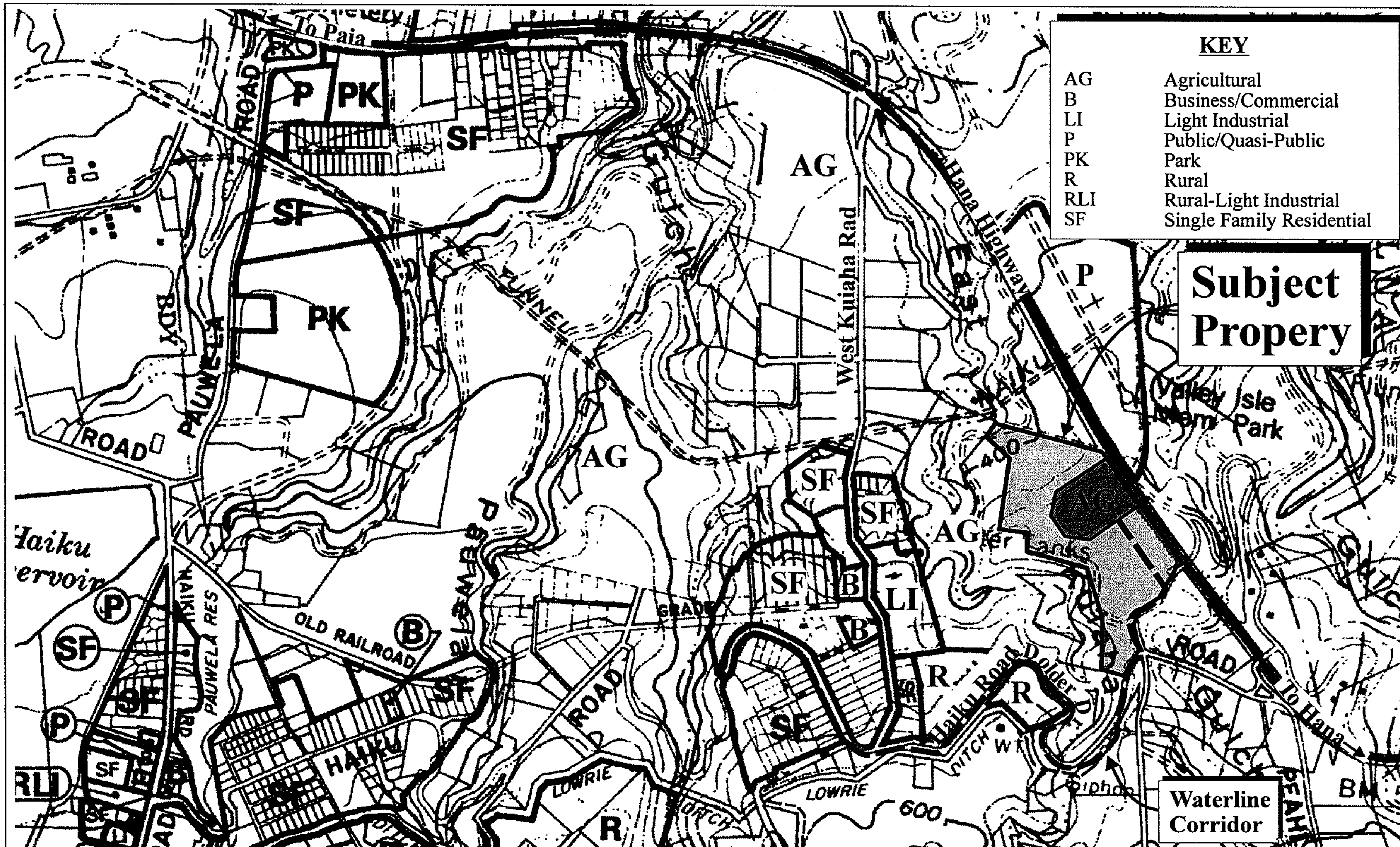
- Incorporate environmentally sound and culturally appropriate practices in government operations and services.

In summary, the proposed project is consistent with the themes and principles of the Countywide Policy Plan.

E. PAIA-HAIKU COMMUNITY PLAN

Within Maui County, there are nine (9) community plan regions. From a General Plan implementation standpoint, each region is governed by a Community Plan implementation standpoint, each region is governed by a Community Plan which sets forth desired land use patterns, as well as goals, objectives, policies, and implementing actions for a number of functional areas, including infrastructure-related parameters.

The subject property is located within the Paia-Haiku region and occupies lands designated as AG, Agricultural in the Community Plan. See **Figure 14**. The proposed action involves processing of a County-initiated Community Plan Amendment (CPA) application to redesignate the 6.1-acre project site as "Public/Quasi Public" so that the proposed action is a compatible use.



Source: Paia-Haiku Community Plan

Figure 14

Proposed Haiku Fire Station and Related Improvements

Community Plan Land Use Designations

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COM\DFire Haiku\CPLUD

The proposed project is consistent with the following goals, policies, and objectives of the Community Plan:

LAND USE

Goal

A well-planned community that preserves the region's small town ambiance and rural character, coastal scenic vistas, and extensive agricultural land use, and accommodates the future needs of residents at a sustainable rate of growth and in harmony with the region's natural environment, marine resources, and traditional uses of the shoreline and mauka lands.

Objectives and Policies

- Define urban and rural growth limits and densities for the region by determining the needed space to accommodate projected growth, designating the required land using the land use map, and supporting needed development in these areas.

- For the outlying areas such as Ha`iku with existing Urban or Rural Land Use classifications, consideration for expansion of the State Land Use District Boundary should be made on a case by case basis for limited residential development in accordance with the following criteria:

    a. That the proposed change is contiguous with the Urban or Rural District and compatible with the existing character of the surrounding area;

    b. That adequate public services and facilities are available or can be provided at reasonable cost to the petitioner; and

    c. That the proposed land use amendment shall have no significant adverse effects upon agricultural, natural, environmental, recreational, scenic, historic, or other resources of the area.

ENVIRONMENT

Goal

The preservation and protection of the natural environment, marine resources and scenic vistas to maintain the rural and natural ambiance and character of the region.

Objectives and Policies

- Promote greater awareness and opportunities for recycling and sound conservation practices.

CULTURAL RESOURCES

Goal

Identification, protection, preservation, enhancement and appropriate use of cultural resources, cultural practices and historic sites that provide a sense of history and define a sense of place for the Paia-Haiku region.

Objectives and Policies

- Prevent the desecration of ancient and historic burial sites.

- Identify, protect, preserve, and, where appropriate, restore significant archaeological and cultural sites and resources unique to the State of Hawaii and Island of Maui.

TOWN DESIGN

Goal

Attractive rural town development in keeping with the existing scale, form and character of settlement areas in the region.

Objectives and Policies

- Incorporate design standards, including, but not limited to, lighting, building and roadway design, appropriate for rural communities. In Agricultural and Rural Districts, excessive roadway standards and street lighting requirements should be discouraged.

- Limit building heights to two (2) stories or thirty (30) feet above grade throughout the region, with any exceptions being subject to design review by the County.

- Follow the established design standards for the commercial use areas of Pa`ia Town and Ha`iku based on the following guidelines:

  a. Visually maintain and enhance the low-density town character.

  b. Require that future development be compatible with the desired scale and rural character.

c. Maintain the ambiance of Pa`ia and Ha`iku Towns.

Design improvements should be undertaken in a coordinated and ongoing fashion so as to ensure compatibility of future development projects with the desired character. Road improvements for drainage, lighting, and safety should be coordinated with the maintenance of the existing rural, informal streetscape which exemplifies the character of Pa`ia and Ha`iku Towns. For example, urban roadway standards which require excessive street widths detract from a rural character and should be discouraged.

- Use "native plants" for landscape planting in all public projects to the extent practicable.

- Ensure that all future subdivisions, construction projects, and developments comply with the Maui County Planting Plan.

PHYSICAL INFRASTRUCTURE

Liquid and Solid Waste

Goal Efficient, safe and environmentally sound systems for the disposal, recycling and reuse of liquid and solid wastes.

Energy

Goal Greater self-sufficiency in the need for non-renewable energy and more efficiency in use of energy resources.

Objectives and Policies

- Promote energy efficiency as the energy resource of first choice and increase the energy efficiency in all sectors of the community.

- Promote environmentally and culturally sensitive use of renewable resources such as biomass, solar, wind, and hydroelectric energy in all sectors of the community.

- Support energy-efficient building design and site development practices.

- Promote energy conservation and awareness programs.

Health and Public Safety

Goal A sense of security for all residents and visitors, and aid in the protection of life and property.

Objectives and Policies

- Improve fire protection capabilities in the Ha`iku area and ensure adequate water pressure for fire protection, particularly in urban and rural areas.

GOVERNMENT

Goal Government that demonstrates the highest standards of fairness and is responsive to the needs of the community, fiscally responsible and prudent, effective in planning and implementing programs to accommodate anticipated growth, fair and equitable in taxation, strict in the implementation of the Community Plan, and managed efficiently to provide coordinated and timely responses and the delivery of necessary services and programs to the public.

Objectives and Policies

- Coordinate, direct and manage future development, and provide for necessary public services and infrastructure in a more effective and timely fashion.

- Require that actions taken by public officials, boards or commissions of the County of Maui be in compliance with the goals, objectives and policies of the Community Plan.

F. ZONING

Enactment of Chapter 19.30A Agricultural Districts, Maui County Code (MCC) on December 31, 1998 also zoned lands designated as "Agriculture" by the Maui County General Plan and community plans. The Paia-Haiku Community Plan adopted on May 17, 1995 designated the subject property as "Agricultural". As such, the subject property is zoned "Agricultural". A County-initiated Change in Zoning (CIZ) application will be processed for the proposed project to redesignate the 6.1-acre project site as "Public/Quasi-Public".

Pursuant to Section 19.30A.020 District criteria, agricultural lands that meet two (2) of three (3) criteria should be given the highest priority for retention in the Agricultural district. The subject property meets the following two (2) criteria for retention:

1. Agricultural Lands of Importance to the State of Hawaii (ALISH) designates the property as "Prime" agricultural lands; and

2. Lands which have seventy-five (75) percent or more of their boundaries contiguous to lands within the Agricultural district.

Although the subject property meets the highest priority for retention in the Agricultural district, it is important to note that based on a site selection study conducted by the Department of Fire and Public Safety in 2007, the subject property was selected as the best site for a new fire station to serve Haiku and the surrounding areas. The construction of a new fire station on the subject property will provide a greater public benefit to the community than retention of vacant agricultural land. As noted above, the County of Maui, Department of Planning will initiate a CIZ application to redesignate the 6.1-acre project site as "P-1, Public/Quasi-Public" so that the proposed action is a compatible use.

It is noted that the proposed Haiku Fire Station has been designed to be architecturally compatible with the Paia-Haiku Country Town Design Guidelines. Some examples of key design considerations from the Paia-Haiku County Town Design Guidelines are provided below:

Architectural Compatibility and Regional Sensitivity:

- The building design will be fit into the context of the surrounding environment while drawing inspiration from the architecture in the Paia-Haiku region.

Building Scale:

- The new fire station facility will be human scaled to fit into the rural setting of Haiku.

Roofs:

- A white metal standing seam roof with slopes of 3/12 will be incorporated to facilitate sustainable building strategies. Two (2) major roof forms make up the entire facility. The first is a large front gable roof over the apparatus bay. The second is a series of saw tooth roofs over the living quarters.

Facades:

- The new facility will utilize a false front (facade) at the living quarters area of the fire station.

Exterior Wall Finishes and Fenestrations:

- The new fire station will incorporate vertical siding consistent with other structures throughout the Paia-Haiku region. The building color will be green, with multi-paned double hung and casement windows.

It is further noted that the two (2) offsite wind turbines will be located on a portion of the subject property that will not be redesignated for "Public/Quasi-Public" use. Refer to **Figure 4**. These lands will remain in the "Agricultural" district. The offsite wind turbines have been determined by the Planning Department to be minor utility facilities (as defined by Section 19.040.040, Maui County Code (MCC)) and are a permitted use (according to Section 19.30A.050, MCC) within the "Agricultural" district. See **Appendix "I"**.

G. COASTAL ZONE MANAGEMENT OBJECTIVES AND POLICIES

The Hawaii Coastal Zone Management Program (HCZMP), as formalized in Chapter 205A, HRS, establishes objectives and policies for the preservation, protection, and restoration of natural resources of Hawaii's coastal zone. The project site lies outside of the County of Maui's Special Management Area (SMA), the boundary of which follows the makai-side of the right-of-way line of Hana Highway. See **Figure 15**.

Although a SMA Use permit is not required for the project, this section addresses the project's relationship to applicable coastal zone management considerations, set forth in Chapter 205A, Hawaii Revised Statutes.

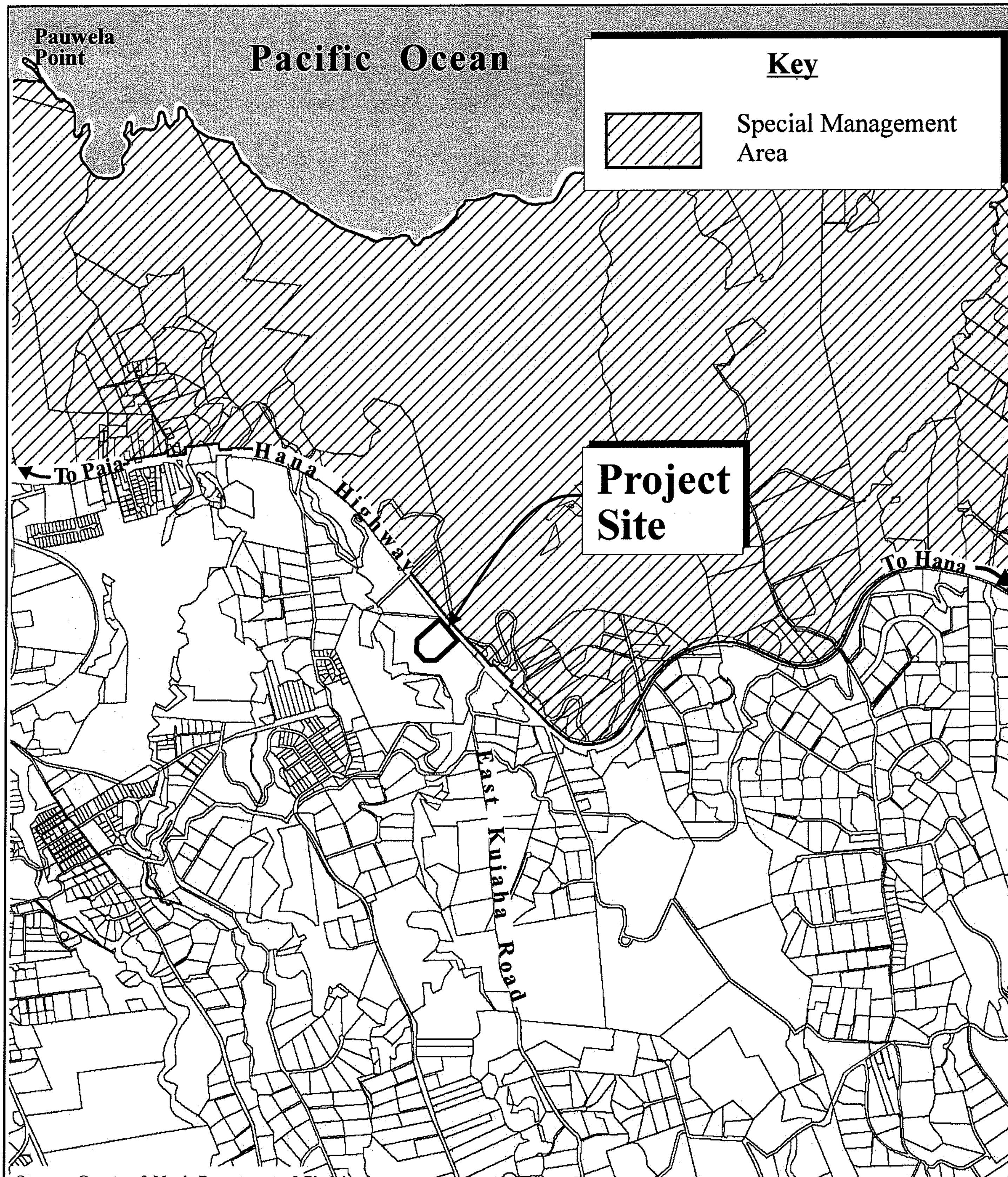
1. Recreational Resources

Objective:

Provide coastal recreational opportunities accessible to the public.

Policies:

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



Source: County of Maui, Department of Planning

Figure 15 Proposed Haiku Fire Station and Related Improvements
Special Management Area Map

NOT TO SCALE

Prepared for: County of Maui, Dept. of Fire and Public Safety

MUNEKIYO & HIRAGA, INC.

COM\DFire Haiku\SMA

(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 a 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.

Response: The proposed project is not anticipated to result in adverse impacts to existing coastal or inland recreational resources. The project is not anticipated to limit or compromise any existing shoreline recreational activity.

2. **Historic 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: The proposed project is not anticipated to have an adverse effect on historic or cultural resources. This finding is based upon the conclusions of the Archaeological Inventory Survey that was completed for the proposed project. Refer to **Appendix "C"**. The Archaeological Inventory Survey was accepted by the State Historic Preservation Division (SHPD) on November 12, 2010. Refer to **Appendix "C-1"**.

Should any cultural or historical materials be uncovered during construction-related activities, work shall be halted in the area of the find and SHPD shall be notified for determination of appropriate mitigation 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 project site is currently being utilized as vacant land and is not deemed a scenic resource. The site is also located away from the shoreline and is not part of a scenic view corridor to the shoreline. No substantive adverse impacts to scenic or open space resources are anticipated to result from implementation of the proposed action.

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: The proposed project is not anticipated to result in substantive, adverse impacts to coastal ecosystems. Best Management Practices (BMPs) and appropriate drainage design will mitigate potential impacts to the coastal environment.

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 industry 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 is not a coastal dependent development. The project will provide short-term economic benefits during the construction-phase, as well as fire protection benefits to area residents during the operational phase.

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 subject property is not located in a tsunami zone. It is located in Flood Zone X, an area of minimal flooding action and without developmental restrictions. No significant adverse impacts resulting from storm water drainage are anticipated to adjoining or downstream properties.

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 -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: Opportunities for public involvement will be provided as part of the Environmental Assessment process and County-initiated land use entitlement change (DBA/CPA/CIZ) processes.

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: Public awareness and participation are being facilitated through the Chapter 343, HRS process, as well as the County's land use entitlement review process as discussed previously.

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: The proposed project is located well beyond the vicinity of the shoreline area and will not impact natural 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: The project is not located in the vicinity of the shoreline. The use of appropriate BMPs and the proposed drainage system will mitigate any potential impacts to marine resources.

In addition to the foregoing objectives and policies, Hawaii Revised Statutes (HRS) Section 205A-30.5 Prohibitions, provides specifications for the limitation of lighting in coastal shoreline areas in relation to the granting of SMA permits:

> No special management area use permit or special management area minor permit shall be granted for structures that allow artificial light from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:
>
> (1) Directly illuminates the shoreline and ocean waters; or
>
> (2) Is directed to travel across property boundaries toward the shoreline and ocean waters.

(b) Subsection (a) shall not apply to special management area use permits for structures with:

(2) Artificial lighting provided by a government agency or its authorized users for government operations, security, public safety, or navigational needs; provided that a government agency or its authorized users shall make reasonable efforts to properly position or shield lights to minimize adverse impacts.

Response: The proposed project is located in the Haiku-Pauwela area, a significant distance from the shoreline. No impacts on the shoreline or ocean waters will occur with implementation of the project and its related improvements. The project will comply with applicable requirements of the County's Outdoor Lighting Ordinance.

IV. SUMMARY OF UNAVOIDABLE IMPACT ON THE ENVIRONMENT AND RESOURCES

IV. SUMMARY OF UNAVOIDABLE IMPACT ON THE ENVIRONMENT AND RESOURCES

Project construction will result in a certain amount of unavoidable construction-related impacts. These impacts include noise-generated impacts and air quality impacts associated with the operation of construction equipment. Air quality will also be temporarily impacted by dust generated from site work. The construction-related impacts will be temporary and mitigated through implementation of appropriate BMPs.

The development of the proposed project will involve the commitment of vacant and undeveloped lands. In addition, the proposed action would involve a commitment of fuel, labor, funding, and material resources. However, the commitment of resources necessary to implement the proposed project will be justified, given the eventual emergency response benefits to be realized through the completion of the new fire station.

In the long term, the construction of the new fire station is not anticipated to create any significant, long-term adverse environmental effects.

V. ALTERNATIVES TO THE PROPOSED ACTION

V. ALTERNATIVES TO THE PROPOSED ACTION

A. PREFERRED ALTERNATIVE

The proposed project involves the development of a fire station in the Haiku area. Currently, residents living in the area are not assured adequate fire protection, as the nearest fire station, located in Paia, is located about six (6) miles away. The new facility would provide much needed fire coverage for the Haiku area and its residents. In addition, the proposed station will conform to Leadership in Energy and Environmental Design (LEED) standards. As such, the facility aims to be functionally efficient, energy efficient, sustainable, and contextually appropriate for its location. The station's current proposed location (in the lower elevations of the property) also conforms to the preferences of the Haiku residents expressed during the site selection process for the project. Finally, population studies done on the Paia-Haiku area estimate that the resident population will increase over the next decade. As the population in this region grows, fire protection in turn will need to expand. Establishing necessary infrastructure in the region now will ensure that future fire protection needs are provided for as population in the region grows over time. For these reasons, the proposed project has been selected as the preferred alternative, as it meets both the current and future needs of the Haiku region and its residents.

B. NO ACTION ALTERNATIVE

The "no action" alternative would see the Haiku area continue to remain without adequate fire coverage and would also see the existing site location remain as vacant land. The "no action" alternative would not meet the present and future needs of Haiku residents in providing adequate fire coverage for the area. The existing facilities of the Paia Fire Station are located too far away to swiftly respond to emergency calls in much of the Haiku area. The "no action" alternative would, therefore, not meet the objective of providing residents of the Haiku area with enhanced fire protection services.

C. DEFERRED ACTION ALTERNATIVE

A "deferred action" alternative would have similar consequences to the "no action" alternative in terms of leaving the residents of the Haiku area without adequate fire protection. This alternative could also result in higher development costs due to increases in labor and material costs.

VI. SIGNIFICANCE CRITERIA ASSESSMENT

VI. SIGNIFICANCE CRITERIA ASSESSMENT

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 proposed project will have a significant adverse impact to the environment. The following analysis is provided:

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

   The project site is currently vacant, while the new waterline will utilize existing County rights-of-way. Furthermore, there are no known rare, threatened or endangered species of flora, fauna, avifauna or important habitats located within the project site. Refer to **Appendix "B"**. No significant natural or cultural resources have been identified on the subject property. Refer to **Appendix "C"** and **Appendix "C-1"**. Should there be unanticipated finds of culturally significant material during project construction, the State Historic Preservation Division (SHPD) will be notified and appropriate mitigative measures implemented in accordance with SHPD program requirements.

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

   The project site is not anticipated to result in adverse environmental impacts. There will be no consequent curtailment of uses of the environment resulting from the proposed action.

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 (HRS). The proposed action is in consonance with the policies and guidelines of Chapter 344, HRS. The loss of approximately 6.1 acres of agricultural lands is not deemed significant when compared to the public safety needs addressed by the new fire station.

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

The proposed action would provide a direct, short-term economic benefit to the community during the construction phase and enhanced fire protection services to area residents during the operational phase. Implementation of the project will result in lower insurance premiums for surrounding landowners served by the new fire station. There are no adverse long-term economic or social welfare impacts associated with the proposed action.

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

The new fire station would have a direct, positive impact to public health, as the DF&PS will be able to fulfill its goals more capably both in emergency protection and educational outreach. No adverse impacts to public health are anticipated to result from the proposed action.

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

The proposed action is not deemed a population generator. There are also no anticipated adverse effects upon public services, such as police, medical, educational, or waste collection services. Beneficial impacts to fire protection services are anticipated to result from the new fire station.

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

During project implementation, appropriate measures such as Best Management Practices (BMPs), will be utilized to mitigate potential adverse environmental impacts. The proposed action will have no substantial impact to environmental quality.

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 is not part of or linked to any larger action. The proposed project is not anticipated to create any considerable effect upon the environment.

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

There are no identified rare, endangered, or threatened species or habitats within the project vicinity. Thus, there should be no impact from the proposed action.

10. **<u>Air Quality, Water Quality or Ambient Noise Levels Would Not Be Detrimentally Affected by the Proposed Project</u>**

During the construction of the new fire station and new waterline, there may be short-term impacts to air and noise quality. Appropriate BMP's will be implemented to minimize these short-term impacts, which will not extend into the long term. No impacts to water quality are anticipated.

11. **<u>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</u>**

The project site is not located within and would not affect environmentally sensitive areas. The Flood Insurance Rate Map (FIRM) for this region indicates that the project is located in Zone X, areas of minimal flooding. In addition, the project site is located beyond the reaches of the tsunami inundation zones. The project is not a shoreline property, nor is it situated near streams, wetland areas or other areas which may pose flooding concerns. 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.

The project site and waterline corridor are not located in or adjacent to any environmentally sensitive areas. Potential impacts to downstream properties will be mitigated through appropriate BMPs during construction-related activities, as well as drainage improvements.

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

The subject property is currently being utilized as vacant land and is not deemed a scenic resource. The project site is not part of a scenic corridor, either inland or shoreline related. Therefore, the proposed action is not anticipated to result in substantive, adverse impacts to identified scenic vistas or viewplanes. There are no residences or public view areas in the immediate area that would have viewplanes impacted by the proposed structures.

13. The Proposed Action Would Not Require Substantial Energy Consumption

The proposed action will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this is not anticipated to result in any substantial consumption of energy. In addition, the proposed fire station project will obtain certification through the Leadership in Energy and Environmental Design (LEED) Green Building Rating System. To achieve LEED certification, the following sustainable design objectives will be considered for implementation:

- Sensitive and appropriate site development
- Innovative wastewater treatment strategies
- Storm water treatment strategies
- Rainwater harvesting
- Water reuse
- Water efficient domestic use and landscaping
- High levels of energy efficiency
- Enhanced commissioning
- On site renewable energy using Photovoltaics/wind turbines
- Green Power
- Construction waste diversion away from landfills
- Construction Indoor Air Quality Management
- Low, or no Volitile Organic Compound (VOC) materials
- Daylighting and views
- Controllability of systems
- Recycled, regional, and rapidly renewable materials

- Sustainable maintenance and grounds keeping practices.

For these reasons, the new fire station is not anticipated to require substantial energy consumption in the long term.

In conclusion, based on the foregoing findings, the proposed action is anticipated to result in a Finding of No Significant Impact (FONSI).

VII. LIST OF PERMITS AND APPROVALS

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

Federal

1. Section 404 Department of Army Permit, as applicable (waterline gulch crossing only).

State of Hawaii

1. State Land Use Commission District Boundary Amendment (DBA) for 6.1-acre project site
2. Construction Permits (Work to Perform Within State Highway)
3. National Pollutant Discharge Elimination System (NPDES) Permit, as applicable
4. Community Noise Permit, if applicable
5. Section 401 Water Quality Certification, as applicable (waterline gulch crossing only).
6. Coastal Zone Management Consistency Determination, as applicable (waterline gulch crossing only)
7. Stream Channel Alteration Permit, as applicable (waterline gulch crossing)

County of Maui

1. Community Plan Amendment (CPA) for 6.1-acre project site
2. County Change in Zoning (CIZ) for 6.1-acre project site
3. Construction Permits (Grubbing, Grading and Work to Perform on County Highway)

VIII. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

VIII. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during the preparation of the Draft Environmental Assessment. Comment letters received, as well as responses to substantive comments, are contained in this chapter.

1. Larry Yamamoto, State Conservationist
U.S. Department of Agriculture
Natural Resources Conservation Service
P.O. Box 50004
Honolulu, Hawaii 96850-0001

2. Ranae Ganske-Cerizo, Soil Conservationist
Natural Resources Conservation Service
U.S. Department of Agriculture
77 Hookele Street, Suite 202
Kahului, Hawaii 96732

3. George Young
Chief, Regulatory Branch
U.S. Department of the Army
U.S. Army Engineer District, Honolulu
Regulatory Branch
Building 230
Fort Shafter, Hawaii 96858-5440

4. Dave Wesley, Deputy Regional Director
U. S. Fish and Wildlife Service
Pacific Region
911 NE 11th Avenue
Portland, Oregon 97232

5. Patrick Leonard
Field Supervisor
U. S. Fish and Wildlife Service
300 Ala Moana Blvd., Rm. 3-122
Box 50088
Honolulu, Hawaii 96813

6. Russ K. Saito, State Comptroller
Department of Accounting and General Services
1151 Punchbowl Street, #426
Honolulu, Hawaii 96813

7. Sandra Lee Kunimoto, Chair
Department of Agriculture
1428 South King Street
Honolulu, Hawaii 96814-2512

8. Theodore E. Liu, Director
State of Hawaii
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

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

10. Heidi Meeker
Planning Division
Office of Business Services
Department of Education
c/o Kalani High School
4680 Kalanianaole Highway, #T-B1A
Honolulu, Hawaii 96821

cc: Bruce Anderson, Complex Area Superintendent (Central/ Upcountry Maui)

11. Kaulana Park, Chairman
Department of Hawaiian Home Lands
P. O. Box 1879
Honolulu, Hawaii 96805

12. Chiyome Fukino, M.D., Director
State of Hawaii
Department of Health
919 Ala Moana Blvd., Room 300
Honolulu, Hawaii 96814

13. Alec Wong, P.E., Chief
Clean Water Branch
State of Hawaii
Department of Health
919 Ala Moana Blvd., Room 300
Honolulu, Hawaii 96814

14. Patti Kitkowski
Acting District Environmental Health Program Chief
State of Hawaii
Department of Health
54 High Street
Wailuku, Hawaii 96793

15. Laura Thielen, Chairperson
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

16. Dr. Puaalaokalani Aiu, Administrator
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawaii 96707

17. Brennon Morioka, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

cc: Fred Cajigal

18. Major General Robert G.S. Lee, Director
Hawaii State Civil Defense
3949 Diamond Head Road
Honolulu, Hawaii 96816-4495

19. Katherine Kealoha, Director
Office Of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawaii 96813

20. Clyde Nāmu`o, Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

21. Abbey Seth Mayer, Director
State of Hawaii
Office of Planning
P.O. Box 2359
Honolulu, Hawaii 96804

22. Dan Davidson, Executive Officer
State of Hawaii
State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804

23. Charmaine Tavares, Mayor
County of Maui
200 South High Street
Wailuku, Hawaii 96793

24. Deidre Tegarden, Director
County of Maui
Office of Economic Development
2200 Main Street, Suite 305
Wailuku, Hawaii 96793

25. Gen Iinuma, Administrator
Maui Civil Defense Agency
200 South High Street
Wailuku, Hawaii 96793

26. Jeffrey A. Murray, Fire Chief
County of Maui
Department of Fire and Public Safety
200 Dairy Road
Kahului, Hawaii 96732

27. Lori Tsuhako, Director
County of Maui
Department of Housing and Human Concerns
One Main Plaza
2200 Main Street, Suite 546
Wailuku, Hawaii 96793

28. Tamara Horcajo, Director
County of Maui
Department of Parks and Recreation
700 Halia Nakoa Street, Unit 2
Wailuku, Hawaii 96793

29. Jeffrey Hunt, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

30. Gary Yabuta, Chief
County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

31. Milton Arakawa, Director
County of Maui
Department of Public Works
200 South High Street
Wailuku, Hawaii 96793

32. Cheryl Okuma, Director
County of Maui
Department of Environmental Management
One Main Plaza
2200 Main Street, Suite 100
Wailuku, Hawaii 96793

33. Donald Medeiros, Director
County of Maui
Department of Transportation
200 South High Street
Wailuku, Hawaii 96793

34. Jeffrey Eng, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

35. Danny Mateo, Council Chair
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

36. Michael J. Molina, Council Vice Chair
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

37. Councilmember Gladys Baisa
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

38. Councilmember Jo Anne Johnson
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

39. Councilmember Sol Kahoohalahala
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

40. Councilmember Bill Medeiros
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

41. Councilmember Wayne Nishiki
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

42. Councilmember Joseph Pontanilla
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

43. Councilmember Mike Victorino
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

44. **Hawaiian Telcom**
60 South Church Street
Wailuku, Hawaii 96793

45. Greg Kauhi, Manager, Customer Operations
Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Hawaii 96733

46. **Haiku Community Association**
P. O. Box 1036
Haiku, Hawaii 96708

47. Paia Main Street Association
c/o Jocelyn Perreira, Executive Director
Wailuku Main Street Association
1942 Main Street, Unit 101
Wailuku, Hawaii 96793

DEC 0 9 2009

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
P.O. Box 50004 Rm. 4-118
Honolulu, HI 96850
808-541-2600

December 7, 2009

Munekiyo & Hiraga, Inc.
Mark Alexander Roy, AICP, Project manager
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy,

Thank you for providing the NRCS the opportunity to review the Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at Haiku, Maui. Please find enclosed the NRCS Soil Survey Map, soil reports, and a map indicating areas of Important Farmlands. The Important Farmlands map has been enclosed for your aid in determining if an AD-1006 form, Farmland Impact Conversion Rating Form is needed for this project. Typically, this form is required on projects that convert farmlands into non-farmland uses, and have federal dollars attached to the project. See the website link below for more information on the Farmland Protection Policy Act, and a copy of the AD-1006 form, with instructions. The soil mapping does not identify any hydric soils in this project area. Hydric soils identify potential areas of wetlands. If wetlands do exist, any proposed impacts to these wetlands would need to demonstrate compliance with the "Clean Water Act", and may need an Army Corp of Engineers 404 permit.

The enclosed Soil Survey Map identifies all soil map units in the project area. The soil reports provide selected soil properties and interpretations, i.e. Small Commercial Buildings, soil layers with USDA textures, and engineering classifications. The limitation ratings for the selected uses, i.e. Small Commercial Buildings and Local Roads and Streets are Severe and Very Limited respectively. These ratings do not preclude the intended land use, however they do identify potential limitations for the use, which may require corrective measures, increase costs, and/or require continued maintenance.

The NRCS Soil Survey is a general planning tool and does not eliminate the need for an onsite investigation. If you have any questions concerning the soils or interpretations for this project please call, Tony Rolfes, Assistant State Soil Scientist, (808) 541-2600 x129, or email, Tony.Rolfes@hi.usda.gov.

NRCS - Farmland Protection Policy Act Website: http://www.nrcs.usda.gov/programs/fppa/

Sincerely,

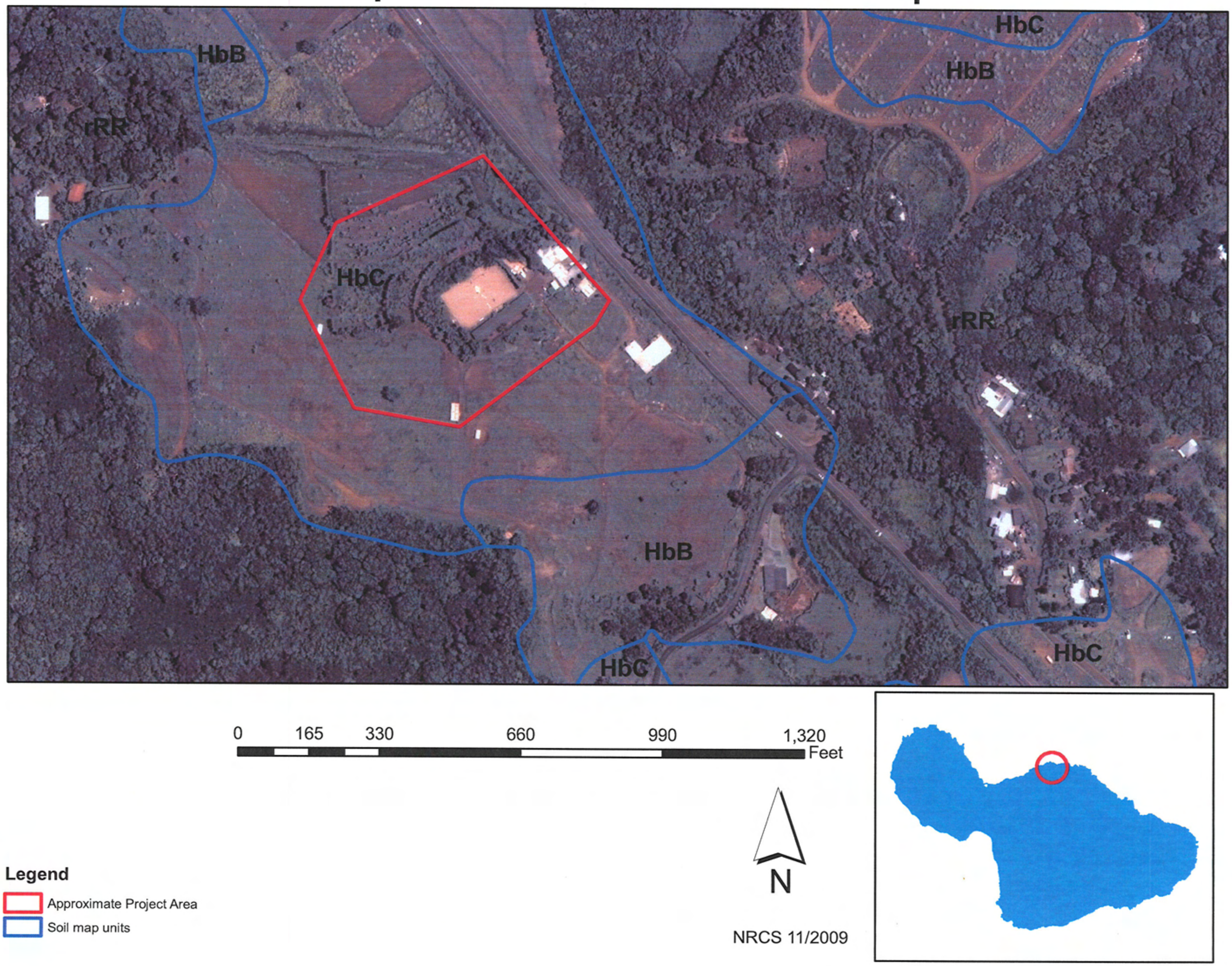
LAWRENCE T. YAMAMOTO
Director, Pacific Islands Area

Cc Michael Robotham, Asst. Director for Soil Science and Natural Resource Assessments

Enclosures: 5 pages

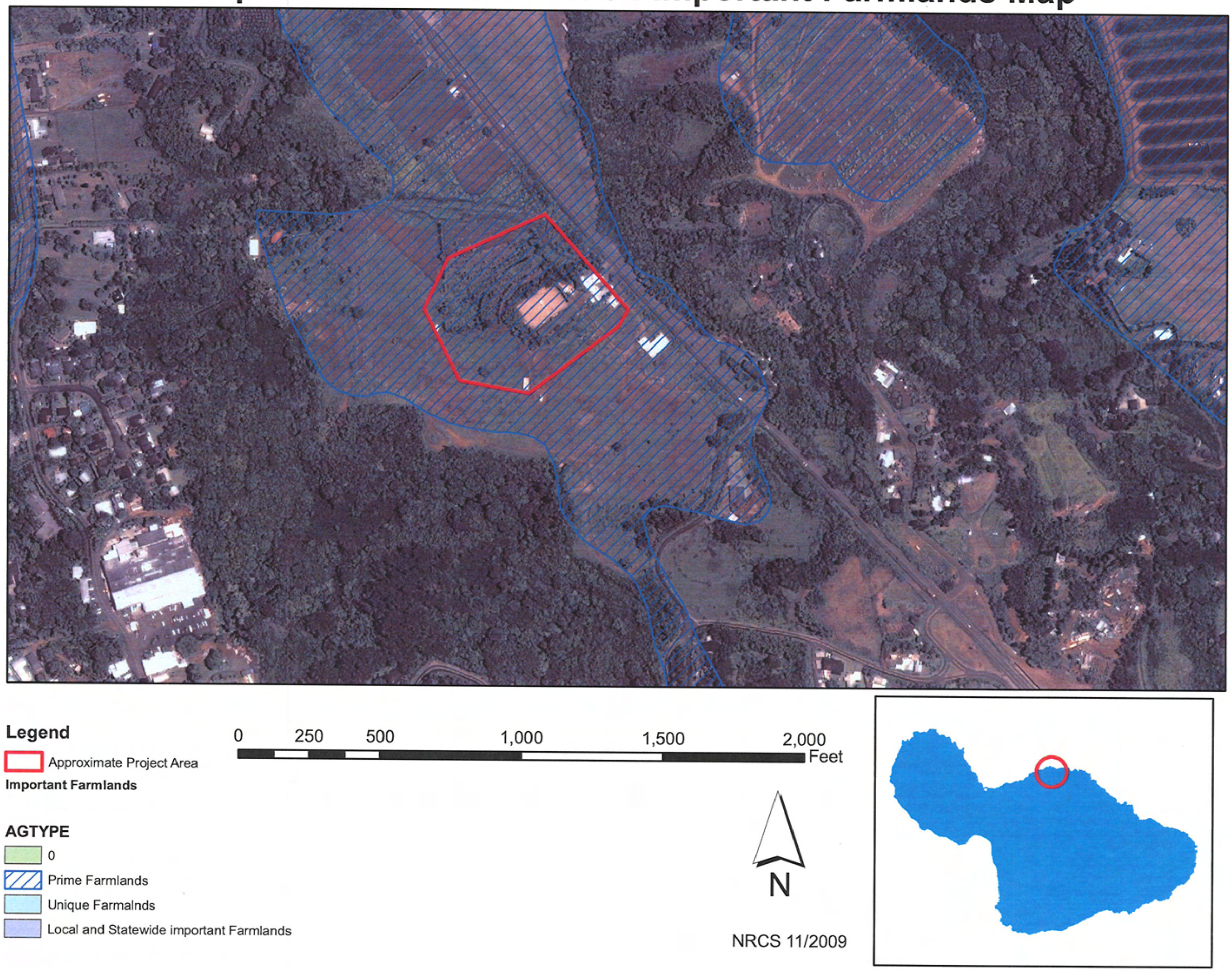
Helping People Help the Land

Proposed Haiku Fire Station Soil Map



2

Proposed Haiku Fire Station Important Farmlands Map



Map Unit Legend

Island of Maui, Hawaii

Map symbol	Map unit name
HbC	Haiku clay, 7 to 15 percent slopes

Engineering Properties

Island of Maui, Hawaii

[Absence of an entry indicates that the data were not estimated. This report shows only the major soils in each map unit]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percent passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 Inches	3-10 Inches	4	10	40	200		
	In				Pct	Pct					Pct	
HbC:												
Haiku	0-14	Clay	MH-O (proposed)	A-7	0	0	100	95-100	95-100	95-100	55-75	15-30
	14-66	Clay, silty clay	MH-O (proposed)	A-7	0	0	100	95-100	95-100	95-100	55-75	15-30

5

Selected Soil Interpretations

Island of Maui, Hawaii

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The table shows only the top five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

*This soil interpretation was designed as a "limitation" as opposed to a "potential" or "suitability". The numbers in the value column range from 0.01 to 1.00. The larger the value, the greater the potential limitation.

Map symbol and soil name	Pct. of map unit	ENG - Small Commercial Buildings (HI)*		ENG - Local Roads and Streets*		URB/REC - Lawn, Landscape, Golf Fairway (HI)*	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
HbC:							
Haiku	100	Severe		Very limited		Moderate	
		Slopes > 8%	1.00	Low strength	1.00	Clay in surface >= 40%	0.50
				Slope	0.37	Slopes 8 to 15%	0.37
						Surface pH from 3.5 to 5	0.04

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Lawrence Yamamoto, Director, Pacific Islands Area
Natural Resources Conservation Service
P. O. Box 50004, Room 4-118
Honolulu, Hawaii 96850

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Mr. Yamamoto:

Thank you for your letter dated December 7, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

Please find enclosed the NRCS Soil Survey Map, soil reports, and a map indicating areas of Important Farmlands.

Response: Thank you for your helpful assistance in providing us with a National Resources Conservation Service (NRCS), Soil Survey Map, soil reports, and a map indicating areas of Important Farmlands. We look forward to your continued support in completion of this project.

Comment No. 2:

The Important Farmlands map has been enclosed for your aid in determining if an AD-1006 form, Farmland Impact Conversion Rating Form is needed for this project. Typically, this form is required on projects that convert farmlands into non-farmland uses, and have federal dollars attached to the project. See the website link below for more information on the Farmland Protection Policy Act, and a copy of the AD-1006 form, with instructions. NRCS - Farmland Protection Policy Act Website: http://www.nrcs.usda.gov/programs/fppa/

Response: We acknowledge your recommendation to utilize the Important Farmlands map to determine if an AD-1006 form, Farmland Impact Conversion Rating Form is needed for this project. The applicant notes that should federal funds be used for the project, the necessary form will be submitted to your office.

Comment No. 3:

The soil mapping does not identify any hydric soils in this project area. Hydric soils identify potential areas of wetlands. If wetlands do exist, any proposed impacts to these wetlands would need to demonstrate compliance with the "Clean Water Act", and may need an Army Corp of Engineers 404 permit.

Response: We note your comments regarding potential Section 404, Clean Water Act requirements for the project. The applicant notes that there are no wetlands or potential areas of wetlands within, or adjacent to the project site. Therefore, impacts to wetlands or potential areas of wetlands are not anticipated from the project.

Comment No. 4:

The enclosed Soil Survey Map identifies all soil map units in the project area. The soil reports provide selected soil properties and interpretations, i.e. Small Commercial Buildings, soil layers with USDA textures, and engineering classifications. The limitation ratings for the selected uses, i.e. Small Commercial Buildings and Local Roads and Streets are Severe and Very Limited respectively. These ratings do not preclude the intended land use, however they do identify potential limitations for the use, which may require corrective measures, increase costs, and/or require continued maintenance.

The NRCS Soil Survey is a general planning tool and does not eliminate the need for an onsite investigation.

Response: Thank you for providing us with a Soil Survey Map. A map and a description of the soils conditions relating to the project site will be included in the Draft Environmental Assessment (EA).

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.
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DEC 09 2009

United States Department of Agriculture

NRCS

Natural Resources Conservation Service
77 Ho'okele Street, Suite 202
Kahului, HI 96732
Phone 808-871-5500
Fax 808-873-6184

December 7, 2009

Mr. Mark Alexander Roy
AICP, Project Manager
Munekiyo & Hiraga, Inc.
305 High St., Suite 104
Wailuku, HI 96793

Subject: Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at TMK (2) 2-7-007: 008 (por.), Haiku, Maui, Hawaii

Dear Mr. Roy:

We have no comments at this time.

Sincerely,

Ranae Ganske-Cerizo
District Conservationist

DEC 1 1 2009

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

December 9, 2009

Regulatory Branch

Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr Roy:

This responds to your request for written comments for a draft Environmental Assessment (dEA) which will address activities and impacts of the proposed Haiku Fire Station and Related Improvements located on portions of a 6.1-acre parcel identified as TMK: 227007008, Haiku, Maui.

The dEA should indicate whether waters of the United States, as typically represented by perennial or intermittent streams and wetlands, are in, or adjacent to, or absent from, the proposed project area. The dEA should state in appropriate sections whether there is the potential for waters of the U.S. to be impacted by construction of project structures and associated ground disturbing activities. Upon our receipt of the dEA, we will provide a determination whether a Department of Army (DA) permit for Section 404 activities of the Clean Water Act may, or may not be, required for the proposed Haiku Fire Station and Related Improvements project.

Section 404 requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344). For regulatory purposes, the U.S. Army Corps of Engineers (Corps) defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The area of Corps jurisdiction under Section 404 extends to the Ordinary High Water Mark (OHWM) for navigable waters other than the Pacific Ocean, and to the upland boundary of any adjacent wetlands.

Thank you for your consideration of potential impacts to the aquatic environment of the Haiku watershed. Please contact Mr. Farley Watanabe of my staff at 438-7701, facsimile 438-4060, or by email at Farley.K.Watanabe@usace.army.mil if you have any questions or need additional information. Please refer to File Number **POH-2009-00341** in any future correspondence with us.

Sincerely,

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

11

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

George P. Young, P.E., Chief
Regulatory Branch
U. S. Army Corps of Engineers
Honolulu District,
Department of Army
Building 230
Fort Shafter, Hawaii 96858-5440

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui (POH-2009-00341)

Dear Mr. Young:

Thank you for your letter dated December 9, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

The DEA should indicate whether waters of the United States, as typically represented by perennial or intermittent streams and wetlands, are in, or adjacent to, or absent from, the proposed project area. The DEA should state in appropriate sections whether there is the potential for waters of the U.S. to be impacted by construction of project structures and associated ground disturbing activities. Upon our receipt of the DEA, we will provide a determination whether a Department of Army DEA permit for Section 404 activities of the Clean Water Act may, or may not be, required for the proposed Haiku Fire Station and Related Improvements project.

Response: The Draft Environmental Assessment (EA) will include information on existing site conditions and potential impacts to waters of the United States from the proposed project.

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

Comment No. 2:

Section 404 requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C.1344). For regulatory purposes, the U.S. Army Corps of Engineers (Corps) defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The area of Corps jurisdiction under Section 404 extends to the Ordinary High Water Mark (OHWM) for navigable waters other than the Pacific Ocean, and to the upland boundary of any adjacent wetlands.

Response: We note your comment regarding the need to obtain a Department of the Army (DA) permit for any discharge of dredged and/or fill material into waters of the U.S. The applicant looks forward to receiving the Section 404 determination from your office following review of the Draft EA and will comply with any DA permit requirements for the project, as applicable.

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.

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LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

SANDRA L. YAHIRO
DEPUTY COMPTROLLER

(P)1337.9

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

DEC 2 8 2009

Mr. Mark Alexander Roy, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

Subject: Early Consultation Request
Proposed Haiku Fire Station and Related Improvements
Haiku, Island of Maui, Hawaii
TMK: (2) 2-7-007:008

Thank you for the opportunity to provide comments for the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, please call me at 586-0400 or have your staff call Mr. David DePonte of the Public Works Division at 586-0492.

Sincerely,

Russ K Saito
RUSS K. SAITO
State Comptroller

c: Ms. Katherine Kealoha, DOH OEQC
Mr. David Victor, DAGS - Maui

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

November 30, 2009

Mr. Mark Alexander Roy, Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Roy:

Subject: Early Consultation for the Proposed Haiku Fire Station
Haiku, Maui TMK: 2-27-007: por 008

The Department of Education has no comment or concern.

Thank you for the opportunity to comment. If you have any questions, please call Heidi Meeker of the Facilities Development Branch at (808) 377-8301.

Very truly yours,

Patricia Hamamoto

Patricia Hamamoto
Superintendent

PH:jmb

c: Randolph Moore, Assistant Superintendent, OSFSS
Lindsay Ball, CAS, Hana/Lahainaluna/Lanai/Molokai Complex Areas

DEC 15 2009

LINDA LINGLE
GOVERNOR
STATE OF HAWAI'I

KAULANA H. R. PARK
CHAIRMAN
HAWAIIAN HOMES COMMISSION

ANITA S. WONG
DEPUTY TO THE CHAIRMAN

ROBERT J. HALL
EXECUTIVE ASSISTANT

STATE OF HAWAI'I

DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879
HONOLULU, HAWAI'I 96805

December 8, 2009

Mr. Mark Alexander Roy,
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

Subject: Comments for Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at TMK: (2)2-7-007:008 (Por.), Haiku, Maui

This letter is to inform you that the Department of Hawaiian Home Lands (DHHL) has received your letter of November 17, 2009 regarding the County of Maui's request to construct a new fire station in Haiku.

After a review of your proposed action by our Land Management Division, it is believed that Hawaiian home lands will not be directly impacted by this project. However, the department supports your efforts to improve fire and emergency services to the area. The department has no significant comments to offer at this time. Please keep us informed of your progress.

Mahalo for the opportunity to provide our comments.

Should you have any questions, please call Todd Gray, Land Agent, at (808) 620-9460.

Aloha and mahalo,

Kaulana H. R. Park, Chairman
Hawaiian Homes Commission

LINDA LINGLE
GOVERNOR OF HAWAII

DEC 14 2009

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

12043PJF.09

December 10, 2009

Mr. Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

SUBJECT: Early Consultation Request for Proposed Haiku Fire Station and Related Improvements TMK Nos. (2) 2-7-007:008 (Por.) Haiku, Island of Maui, Hawaii

The Department of Health, Clean Water Branch (CWB), has reviewed the subject document and offers these comments on your project.

Please note that our review is based solely on the information provided in the subject document and its compliance with the Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at: http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

12043PJF.09

2. You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for an NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

   a. Storm water associated with 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 start of the construction activities.

   b. Hydrotesting water.

   c. Construction dewatering effluent.

   You must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html.

3. For types of wastewater not listed in Item No. 2 above or wastewater discharging into Class 1 or Class AA waters, you may need an NPDES individual permit. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. The NPDES application forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

12043PJF.09

If you have any questions, please visit our website at:
http://www.hawaii.gov/health/environmental/water/cleanwater/index.html, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

JF:rg

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Alec Wong, P.E., Chief
Clean Water Branch
Department of Health
State of Hawaii
P.O. Box 3378
Honolulu, Hawaii 96801-3378

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui (12043PJF.09)

Dear Mr. Wong:

Thank you for your letter dated December 10, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

Any project and its potential impacts to State waters must meet the following criteria:

a. *Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.*
b. *Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.*
c. *Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).*

Response: We note your comments that the proposed project must meet the criteria set forth in Sections 11-54-1.1 (Antidegradation Policy), 11-54-3 (Designated Uses) and 11-54-4 through 11-54-8 (Water Quality Criteria) of the Hawaii Administrative Rules (HAR).

Comment No. 2:

You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters (HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for an NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

a. *Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (l) 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 start of the construction activities.*
b. *Hydrotesting water.*
c. *Construction dewatering effluent.*

Response: The applicant's civil engineer will coordinate with the Clean Water Branch to address applicable NPDES permit requirements for the project.

Comment No. 3:

For types of wastewater not listed in Item No.2 above or wastewater discharging into Class 1 or Class AA waters, you may need an NPDES individual permit. An application for an NPDES individual permit must be submitted at least 180 calendar days before the commencement of the discharge. The NPDES application forms may be picked up at our office or downloaded from our website at: http://www.hawaii.gov/health/environmental/water/cleanwater/forms/indiv-index.html.

Response: As noted above, the applicant's civil engineer will coordinate with the Clean Water Branch to address applicable NPDES individual permit requirements for the project.

Comment No. 4:

Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting *requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.*

<u>Response:</u> The project will comply with all applicable State Water Quality Standards as specified in Chapter 11-54, HAR.

We appreciate the input provided by your office and will include a copy of your letter in the Draft Environmental Assessment (EA) for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.
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DEC 07 2009

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

December 3, 2009

Mr. Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Roy:

Subject: Early Consultation Request for Proposed Haiku Fire Station and Related Improvements, Haiku Maui. Hawaii
TMK: (2) 2-7-007:008 (Por.)

Thank you for giving us the opportunity to review and comment on this project. The following comments are offered:

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

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

It is strongly recommended that the Standard Comments found at the Department's website: http://hawaii.gov/health/environmental/env-planning/landuse/landuse.html be reviewed, and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please call me at 808 984-8230 or e-mail me at patricia.kitkowski@doh.hawaii.gov.

Sincerely,

Patti Kitkowski

Patti Kitkowski
Acting District Environmental Health Program Chief

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Patti Kitkowski, Acting District
Environmental Health Program Chief
Department of Health
Maui District Health Office
54 High Street
Wailuku, Hawaii 96793-2102

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Ms. Kitkowski:

Thank you for your letter dated December 3, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

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

Response: Pursuant to Hawaii Administrative Rules (HAR), Chapter 11-46, "Community Noise Control", a noise permit will be secured prior to commencement of construction, as applicable.

Comment No. 2:

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

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

Response: The applicant's civil engineer will coordinate with the Clean Water Branch to address applicable NPDES permit requirements for the project.

We appreciate the input provided by your office and will include a copy of your letter in the Draft Environmental Assessment (EA) for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp

cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.

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LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 8, 2009

Munekiyo & Hiraga, Inc.
305 High Street Suite 104
Wailuku, Hawaii 96793

Attention: Mr. Mark Alexander Roy, AICP

Ladies and Gentlemen:

Subject: Early Consultation for Proposed Haiku Fire Station and Related Improvements

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comment.

Other than the comments from Commission on Water Resource Management, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki

for Morris M. Atta
Administrator

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

December 1, 2009

TO: Morris Atta, Administrator
Land Division

FROM: Ken C. Kawahara, P.E., Deputy Director
Commission on Water Resource Management

Ken C. Kawahara

SUBJECT: Proposed Haiku Fire Station, Maui

FILE NO.: N/A
TMK NO.: (2) 2-7-007:008 (por)

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore, all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at http://www.hawaii.gov/dlnr/cwrm.

Our comments related to water resources are checked off below.

☒ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☐ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EPA as having high water efficiency can be found at http://www.epa.gov/watersense/pp/index.htm.

☐ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

☒ 6. We recommend the use of alternative water sources, wherever practicable.

☐ 7. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

Permits required by CWRM:
Additional information and forms are available at http://hawaii.gov/dlnr/cwrm/resources_permits.htm.

☐ 8. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water.

☐ 9. A Well Construction Permit(s) is (are) required any well construction work begins.

☐ 10. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 11. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 12. Ground water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☐ 13. A Stream Channel Alteration Permit(s) is (are) required before any alteration(s) can be made to the bed and/or banks of a stream channel.

☐ 14. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is (are) constructed or altered.

☐ 15. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 16. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☐ OTHER:

If there are any questions, please contact Charley Ice at 587-0218.

DEC 11 2009

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 9, 2009

Munekiyo & Hiraga, Inc.
305 High Street Suite 104
Wailuku, Hawaii 96793

Attention: Mr. Mark Alexander Roy, AICP

Ladies and Gentlemen:

Subject: Early Consultation for Proposed Haiku Fire Station and Related Improvements

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR), Land Division distributed or made available a copy of your report pertaining to the subject matter to Division of Aquatic Resources and Division of Forestry & Wildlife for their review and comment.

The Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki

for Morris M. Atta
Administrator

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION

2009 DEC -9 A 9:04

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 6, 2008

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
~~x Engineering Division~~
x Div. of Forestry & Wildlife
~~__Div. of State Parks~~
x Commission on Water Resource Management
__Office of Conservation & Coastal Lands
__Land Division –
x Historic Preservation

FROM: Morris M. Atta
SUBJECT: Early Consultation for Proposed Haiku Fire Station and Related Improvements
LOCATION: Island of Maui
APPLICANT: Munekiyo & Hiraga, Inc. on behalf of County of Maui, Department of Fire & Public Safety

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by December 6, 2009.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

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

Signed:
Date: 12/4/09

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

AQUATIC RESOURCES: 2713

DIRECTOR	
COMM. FISH.	
AQ RES/ENV	
AQ REC	
PLANNER	
STAFF SVCS	
RCUH/UH	
STATISTICS	
AFRC/FED AID	
EDUCATION	
SECRETARY	
OFFICE SVCS	
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 6, 2008

RECEIVED NOV 23 2009 AQUATIC RESOURCES

RECEIVED LAND DIVISION 2009 DEC -9 P 2:43 DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
_Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
_Div. of State Parks
x Commission on Water Resource Management
_Office of Conservation & Coastal Lands
_Land Division –
x Historic Preservation

FROM: Morris M. Atta
SUBJECT: Early Consultation for Proposed Haiku Fire Station and Related Improvements
LOCATION: Island of Maui
APPLICANT: Munekiyo & Hiraga, Inc. on behalf of County of Maui, Department of Fire & Public Safety

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by December 6, 2009.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

(X) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed:
Date: 8 Dec. 09

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Morris M. Atta, Administrator
Land Division
Department of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Mr. Atta:

Thank you for your letters dated December 8, 2009, and December 9, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety (DF&PS), we offer the following information in response to the comments noted in your letters:

Comment No. 1 (Commission on Water Resources Management):

We recommend coordination with the county to incorporate this project into the County's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

Response: We note your comment regarding the County of Maui's Water Use and Development Plan (WUDP). Coordination with the Planning Department and/or Department of Water Supply will be undertaken through the Chapter 343, HRS Environmental Assessment (EA), County land use entitlements and construction plans review processes. It is through these coordination processes that the project will be recognized as a relevant component of the WUDP.

Comment No. 2 (Commission on Water Resources Management):

We recommend the use of alternative water sources, wherever practicable.

Response: We acknowledge your comment regarding use of alternative water sources. An evaluation of alternative water sources and water conservation planning resources will be completed as part of the Leadership in Energy and Environmental Design (LEED) certification process for the project.

In addition to the above noted comments, we received input from your department's Division of Forestry & Wildlife (DOFW) and Division of Aquatic Resources (DAR). The applicant acknowledges that DOFW has no comments on the proposed project. The applicant also acknowledges that the DAR has no objections to the proposed project.

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited

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DEC 2 3 2009

LINDA LINGLE
GOVERNOR

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

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

STP 8.3479

December 18, 2009

Mr. Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

Subject: Haiku Fire Station and Related Improvements
Early Consultation (EC) for a Draft Environmental Assessment (DEA)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project to construct a new fire station and related improvements on a 6-acre parcel that is owned by Maui County and is located at the intersection of East Kuiaha Road and the State highway, Hana Highway.

DOT understands that the Maui County Department of Fire and Public Safety's new station will consist of a 7,528 square foot administrative building, vehicle storage and utility building facilities for the six personnel that will be assigned to the station. Primary access for emergency vehicles will be via Hana Highway. A secondary access driveway for non-emergency vehicles will be from either Hana Highway or East Kuiaha Road.

Given the potential impacts to Hana Highway, DOT requests the following comments be addressed in the DEA:

1. The applicant shall coordinate access requirements with the DOT Highways Division, Rights-of-Way Branch.

2. The proposed subject fire station and related improvements, especially parking spaces for emergency vehicles and personnel, should be designed and oriented in such a way as to preclude vehicle back-ups onto Hana Highway.

3. Given that the proposed project site is located on a rolling terrain, the applicant must submit a drainage report and grading plans to the DOT Highways Division for review and approval. Diversion of additional surface water run-off onto Hana Highway is not permitted.

4. The DEA should assess the traffic impacts to Hana Highway and address issues such as, but not limited to, access improvements, project generated traffic, traffic safety controls measures or warning signs and the safety of approaching motorists and bicycles at the fire station, especially when there is an emergency call. A copy of the DEA and any traffic assessment should also be forwarded to the DOT Highways Division Maui District Engineer for concurrent review.

5. A permit is required from DOT Highways Division to transport oversized and overweight equipment/loads within the State highway facilities.

6. Construction plans for all work done within the State highway rights-of-way must be submitted to DOT Highways Division for review and approval.

DOT appreciates the opportunity to provide comments and requests four (4) copies of the DEA. If there are any questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 587-2356.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

c: David Thyne, Maui County Department of Fire and Public Safety

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Office of the Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui (STP 8.3479)

Dear Sir or Madame:

Thank you for your department's letter dated December 18, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

The applicant shall coordinate access requirements with the DOT Highways Division, Rights-of-Way Branch.

Response: The applicant acknowledges your comment. Access requirements for the proposed project will be coordinated with Department of Transportation (DOT) Highways Division, Rights-of-Way Branch.

Comment No. 2:

The proposed subject fire station and related improvements, especially parking spaces for emergency vehicles and personnel, should be designed and oriented in such a way as to preclude vehicle back-ups onto Hana Highway.

Response: The applicant acknowledges your concerns regarding the need to avoid vehicle back-ups onto Hana Highway. Your comments will be forwarded to the project architect and engineer so that these concerns are reflected in the site plan for the project.

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

Comment No. 3:

Given that the proposed project site is located on a rolling terrain, the applicant must submit a drainage report and grading plans to the DOT Highways Division for review and approval. Diversion of additional surface water run-off onto Hana Highway is not permitted.

Response: A drainage report and grading plans will be submitted to the DOT Highways Division for review and approval. The drainage system for the project will be designed to retain all increases in stormwater runoff, such that there are no impacts on downstream properties, including Hana Highway.

Comment No. 4:

The DEA should assess the traffic impacts to Hana Highway and address issues such as, but not limited to, access improvements, project generated traffic, traffic safety controls measures or warning signs and the safety of approaching motorists and bicycles at the fire station, especially when there is an emergency call. A copy of the DEA and any traffic assessment should also be forwarded to the DOT Highways Division Maui District Engineer for concurrent review.

Response: The applicant recognizes your concerns regarding the project's potential impact of traffic on Hana Highway. A Traffic Impact Assessment Report (TIAR) has been prepared by the traffic engineer, Wilson Okamoto Corporation, and will be included in the Draft Environmental Assessment (EA). A copy of the Draft EA will be forwarded to both your office and the DOT Highways Division Maui District Engineer for concurrent review.

Comment No. 5:

A permit is required from DOT Highways Division to transport oversized and overweight equipment/loads within the State highway facilities.

Response: A permit from DOT Highways Division to transport oversized and overweight equipment/loads within the State highway facilities will be obtained for the project, as applicable.

Comment No. 6:

Construction plans for all work done within the State highway rights-of-way must be submitted to DOT Highways Division for review and approval.

Response: Construction plans for wall work proposed to be completed within the State right-of-way along Hana Highway will be submitted to DOT Highways Division for review and approval.

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.
Cathy Leong, Wilson Okamoto Corporation

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DEC 07 2009

LINDA LINGLE
GOVERNOR

MAJOR GENERAL ROBERT G. F. LEE
DIRECTOR OF CIVIL DEFENSE

EDWARD T. TEIXEIRA
VICE DIRECTOR OF CIVIL DEFENSE

PHONE (808) 733-4300
FAX (808) 733-4287

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

December 4, 2009

Mr. Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

Early Consultation Request, Proposed Haiku Fire Station
Haiku, Maui, Hawaii

Thank you for the opportunity to comment on this project. After review of your letter and the maps sent for this project, we have no suggestions to make at this time.

We anticipate reviewing the Environmental Assessment when it is completed and will make any appropriate recommendations at that time.

If you have any questions, please contact Mr. Richard Stercho, Hazard Mitigation Planner, at (808) 733-4300, extension 583.

Sincerely,

EDWARD T. TEIXEIRA
Vice Director of Civil Defense

DEC 15 2009

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

HRD09/4142 B

December 8, 2009

Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

RE: Early consultation Environmental Assessment for the proposed Ha'ikū Fire Station and related improvements; Ha'ikū, Maui; TMK: (2) 2-7-007:008.

Aloha e Mark Alexander Roy,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-mentioned request for comment, dated November 17, 2009. According to the letter, Munekiyo & Hiraga, Inc. is preparing a Draft Environmental Assessment (EA) for the proposed Ha'ikū Fire Station, which would include a low-rise administrative facility, access roads, two wind turbines and a new off-site waterline of about 4,200 feet. OHA has reviewed the proposed project and offers the following comments at this time.

We appreciate the applicant's environmental intentions of following the Leadership in Energy and Environmental Design green building rating system, with a variety of environmental elements. In addition to those design features that were listed in the early consultation letter, we would urge the applicant to use native vegetation in its landscaping plan for the subject parcel. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place.

OHA also reminds the applicant that Chapter 343 of the Hawaii Revised Statues (HRS) requires that the forthcoming Draft EA include a Cultural Impact Assessment (CIA). The CIA should include information relating to the traditional and customary practices and beliefs of the area's Native Hawaiians, and the community should be involved in this assessment. Consideration must also be afforded to any individuals accessing the project area for constitutionally protected traditional and customary purposes, in accordance with the Hawai'i State Constitution, Article XII, Section 7.

OHA further requests clarification whether an archaeological inventory survey for the project will be submitted to the State Historic Preservation Division for review and approval. If so, OHA should be allowed the opportunity to comment on the criteria assigned to any cultural or archaeological sites identified within the archaeological inventory survey.

We also request the applicant's assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be found during ground disturbance for the project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Thank you for the opportunity to comment. We look forward to reviewing and providing more detailed comments on the forthcoming Draft EA. If you have further questions, please contact Heidi Guth by phone at (808) 594-1962 or e-mail her at heidig@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Clyde W. Nāmu'o, Administrator
Office of Hawaiian Affairs
State of Hawaii
711 Kapi'olani Boulevard, Suite 500
Honolulu, Hawaii 96813

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui (HRD09/4142 B)

Dear Mr. Nāmu'o:

Thank you for your letter dated December 8, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

We appreciate the applicant's environmental intentions of following the Leadership in Energy and Environmental Design green building rating system, with a variety of environmental elements. In addition to those design features that were listed in the early consultation letter, we would urge the applicant to use native vegetation in its landscaping plan for the subject parcel. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place.

Response: We appreciate your positive feedback regarding the sustainable design elements that are being incorporated in the project and the commitment to the Leadership in Energy and Environmental Design (LEED) certification process. The applicant also notes that various native plants are to be utilized in the landscaping design for the project. A copy of the preliminary landscaping plan for the project will be included in the Draft Environmental Assessment (EA).

Comment No. 2:

OHA also reminds the applicant that Chapter 343 of the Hawaii Revised Statues (HRS) requires that the forthcoming Draft EA include a Cultural Impact Assessment (CIA). The CIA should include information relating to the traditional and customary practices and beliefs of the area's Native Hawaiians, and the community should be involved in this assessment. Consideration must also be afforded to any individuals accessing the project area for constitutionally protected traditional and customary purposes, in accordance with the Hawai'i State Constitution, Article XII, Section 7.

Response: The Draft EA for the project will include a CIA, prepared in accordance with Chapter 343, HRS. The CIA will address Native Hawaiian practices and beliefs associated with the area of the proposed project, as well as traditional and customary access rights, in accordance with the Hawaii State Constitution, Article XII, Section 7.

Comment No. 3:

OHA further requests clarification whether an archaeological inventory survey for the project will be submitted to the State Historic Preservation Division for review and approval. If so, OHA should be allowed the opportunity to comment on the criteria assigned to any cultural or archaeological sites identified within the archaeological inventory survey.

Response: An Archaeological Inventory Survey (AIS) has been prepared for the project. The AIS was accepted by the State Historic Preservation Division (SHPD) on November 12, 2010. A copy of the AIS and the SHPD acceptance letter will be included in the Draft EA for the project, a copy of which will be provided to OHA for review and comment.

Comment No. 4:

We also request the applicant's assurances that should iwi kopuna or Native Hawaiian cultural or traditional deposits be found during ground disturbance for the project, work will cease, and the appropriate agencies will be contacted pursuant to applicable law.

Response: We note your comment regarding the discovery of iwi kupuna or Native Hawaiian cultural or traditional deposits during the construction of the project. In the event that these deposits are found, construction work will cease in the immediate vicinity of the find, and SHPD will be contacted immediately to establish the appropriate level of mitigation.

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp

cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Michael Dega, Scientific Consulting Services, Inc.

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DEC 11 2009

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
HOUSING DIVISION
COUNTY OF MAUI

CHARMAINE TAVARES
Mayor

LORI TSUHAKO
Director

JO-ANN T. RIDAO
Deputy Director

35 LUNALILO STREET, SUITE 102 • WAILUKU, HAWAII 96793 • PHONE (808) 270-7351 • FAX (808) 270-6284

December 8, 2009

Mr. Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Mark Alexander Roy

Subject: Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (Por.), Haiku, Maui, Hawaii

The Department has reviewed the Early Consultation Request for the above subject project. Based on our review, we have determined that the subject project is not subject to chapter 2.96, Maui County Code. At the present time, the Department has no additional comments to offer.

Please call Ms. Cara Bohne of our Housing Division at 270-5748 if you have any questions.

Sincerely,

Wayde T. Oshiro

WAYDE T. OSHIRO
Housing Administrator

cc: Director of Housing and Human Concerns

DEC 11 2009

CHARMAINE TAVARES
Mayor

TAMARA HORCAJO
Director

ZACHARY Z. HELM
Deputy Director

(808) 270-7230
FAX (808) 270-7934

DEPARTMENT OF PARKS & RECREATION
700 Hali'a Nakoa Street, Unit 2, Wailuku, Hawaii 96793

December 7, 2009

Mr. Mark Alexander Roy, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

SUBJECT: Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at TMK: 2-7-007:008 (Por.), Haiku, Maui, Hawaii

Dear Mr. Roy:

We have reviewed the proposed subject project and have no comments or objections to the proposed project.

Thank you for the opportunity to review and comment on this matter. Please feel free to contact me or Mr. Robert Halvorson, CIP Coordinator, Planning and Development Division at 270-8017 should you have any other questions.

Sincerely,

Tamara Horcajo

TAMARA HORCAJO
Director of Parks & Recreation

c: Patrick Matsui, Chief of Parks Planning and Development

TH:RH:do

CHARMAINE TAVARES
Mayor

JEFFREY S. HUNT
Director

KATHLEEN ROSS AOKI
Deputy Director

DEC 18 2009

COUNTY OF MAUI
DEPARTMENT OF PLANNING

December 15, 2009

Mr. Mark Roy, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

SUBJECT: PRE-CONSULTATION COMMENTS IN PREPARATION OF A DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED HAIKU FIRE STATION AND RELATED IMPROVEMENTS LOCATED MAUKA OF HANA HIGHWAY AT EAST KUIAHA ROAD, HAIKU, MAUI, HAWAII; TMK: (2) 2-7-007:008 (POR.) (EAC 2009/0044)

The Department of Planning (Department) is in receipt of the above-referenced request for early consultation comments for the Haiku Fire Station Draft EA. The Department understands the proposed action includes the following:

- The Applicant is County of Maui, Department of Fire and Public Safety and the project is proposed on land owned by the County of Maui;
- The project will consist of administrative, vehicle storage, and utility buildings on approximately 6.1 acres; and
- The fire station will be designed to U.S. Green Building Council's LEED green building rating system.

Based on the foregoing, the Department provides the following comments in preparation of the Draft EA:

1. The land use designations for the project area are as follows:

    - State Land Use: Agriculture
    - Paia-Haiku Community Plan: Agriculture
    - County Zoning: Agriculture
    - Other: Outside the Special Management Area (SMA)

    Please have these designations confirmed through the Department's Zoning Administration and Enforcement Division (ZAED) via a Zoning and Flood Confirmation Form.

2. The Department concurs that the proposed Community Plan Amendment and use of county funds and lands are "triggers" that require compliance with Chapter 343, Hawaii Revised Statutes (HRS);

3. If the fire station is to be built on State Agricultural land, a Land Use Commission Special Use Permit would be required to be processed through the Maui Planning Commission (Commission) or a Land Use District Boundary Reclassification to Rural or Urban and a Change in Zoning to Public/Quasi-Public would be obtained;

4. Please provide the level of LEEDS certification you plan to pursue and describe in detail how you plan to achieve this level. This will prove helpful when your project goes before the Commission;

5. Please note that the Department is currently revising Chapter 19.31, Public/Quasi-Public Districts of the Maui County Code. It may prove prudent to contact the Department's Administrative Planning Officer Joseph Alueta at (808) 270-7735 to obtain a draft copy of the proposed revisions. It is likely the code revisions will be processed before your proposal is processed and you would be subject to these revisions; and

6. The County owned parcel is 27.9 acres in size. Provide some information on future uses of the rest of the parcel not to be utilized for the proposed fire station. Maybe the entire 27.9 acres should be re-designated concurrently rather than piece-emailing future re-designations.

Thank you for the opportunity to comment. Should you require further clarification, please contact Staff Planner Joseph Prutch at joseph.prutch@mauicounty.gov or at 270-7512.

Sincerely,

Clayton I. Yoshida

CLAYTON I. YOSHIDA, AICP
Planning Program Administrator

for JEFFREY S. HUNT, AICP
Planning Director

xc: Joseph M. Prutch, Staff Planner
Joseph W. Alueta, Administrative Planning Officer
EAC File
General File
JSH:CIY:JMP:vb
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MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Kathleen Aoki, Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Ms. Aoki:

Thank you for your letter dated December 15, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety (DF&PS), we offer the following information in response to the comments noted in your letter:

Comment No. 1:

The land use designations for the project area are as follows:

- *State Land Use: Agriculture*
- *Paia-Haiku Community Plan: Agriculture*
- *County Zoning: Agriculture*
- *Other: Outside the Special Management Area (SMA)*

Please have these designations confirmed through the Department's Zoning Administration and Enforcement Division (ZAED) via a Zoning and Flood Confirmation Form.

Response: We note the information on land use designations provided in your comment. A Zoning and Flood Confirmation Form has been completed for confirmation of these designations.

Comment No. 2:

The Department concurs that the proposed Community Plan Amendment and use of county funds and lands are "triggers" that require compliance with Chapter 343, Hawaii Revised Statutes (HRS);

Response: We acknowledge your comment. These triggers of the Chapter 343, HRS process will be discussed in the Draft EA.

Comment No. 3:

If the fire station is to be built on State Agricultural land, a Land Use Commission Special Use Permit would be required to be processed through the Maui Planning Commission (Commission) or a Land Use District Boundary Reclassification to Rural or Urban and a Change in Zoning to Public/Quasi-Public would be obtained;

Response: We note your comment regarding the land use entitlements required for the proposed project to proceed. Based on previous discussions with the Department of Planning (Department), it is our understanding that applications for District Boundary Amendment, Community Plan Amendment and Change in Zoning will be initiated by the Department of Planning for the project.

Comment No. 4:

Please provide the level of LEEDS certification you plan to pursue and describe in detail how you plan to achieve this level. This will prove helpful when your project goes before the Commission;

Response: The DF&PS is currently pursuing the Platinum rating under the Leadership in Energy and Environmental Design (LEED) certification process. This is the highest LEED rating currently available. A number of sustainable design strategies will be implemented within the scope of the project in pursuit of the LEED Platinum objective for the project. Such strategies include, but are not limited to, energy efficiency, onsite renewable energy using photovoltaics/wind turbines, innovative wastewater treatment technologies, water efficiency, and construction waste diversion away from landfills. A description of the sustainable design considerations for the project will be included in the Draft EA.

Comment No. 5:

Please note that the Department is currently revising Chapter 19.31, Public/Quasi-Public Districts of the Maui County Code. It may prove prudent to contact the Department's Administrative Planning Officer Joseph Alueta at (808) 270-7735 to obtain a draft copy of the proposed revisions. It is likely the code revisions will be processed before your proposal is processed and you would be subject to these revisions; and

Response: We acknowledge your comment and as part of this response respectfully request that a copy of the draft revisions proposed for Chapter 19.31, Public/Quasi-Public Districts of the Maui County Code (MCC) be provided to the DF&PS for review.

Comment No. 6:

The County owned parcel is 27.9 acres in size. Provide some information on future uses of the rest of the parcel not to be utilized for the proposed fire station. Maybe the entire 27.9 acres should be re-designated concurrently rather than piece-emailing future re-designations.

Response: We note your comment. At this time the applicant has no definitive plans for future uses of the remaining portions of the subject parcel and, as such, will be limiting the scope of land use entitlement applications for the subject project, to just the 6.1-acre project site.

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Terry McFarland, Architects Hawaii Limited
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DEC 0 7 2009

POLICE DEPARTMENT

COUNTY OF MAUI

CHARMAINE TAVARES
MAYOR

OUR REFERENCE

YOUR REFERENCE

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

GARY A. YABUTA
CHIEF OF POLICE

CLAYTON N.Y.W. TOM
DEPUTY CHIEF OF POLICE

November 27, 2009

Mr. Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Roy:

SUBJECT: Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at TMK (2) 2-7-007:008 (Por.), Haiku

Thank you for your letter of November 17, 2009, requesting comments on the above subject.

We have reviewed the information submitted for this project and have enclosed a copy of our comments. Thank you for giving us the opportunity to comment on this project.

Very truly yours,

Assistant Chief Danny J. Matsuura
for: Gary A. Yabuta
Chief of Police

c: Jeffrey Hunt, Planning Department

COPY

TO : GARY YABUTA, CHIEF OF POLICE, COUNTY OF MAUI

Concur w/ Sgt. Orikasa
A. Matsuura
11/24/09

VIA : CHANNELS

FROM : STEPHEN ORIKASA, ADMINISTRATIVE SERGEANT, WAILUKU PATROL DIVISION

SUBJECT : RESPONSE TO A REQUEST FOR COMMENTS REGARDING THE PROPOSED HAIKU FIRE STATION PROJECT

This communication is submitted as a response to a request for early consultation comments, by Munekiyo & Hiraga, Inc., Project Manager, Mr. Mark Alexander Roy, AICP, regarding the following subject;

SUBJECT : Early Consultation Request for Proposed Haiku Fire Station and Related Improvements at TMK (2) 2-7-007:008 (Por.), Haiku, Maui, Hawaii

RESPONSE:

In review of the submitted documents, the focus from the police perspective would be upon the safety of pedestrian and vehicular movement.

The ingress and egress locations appear to be at a reasonable location as to not adversely impact the existing normal vehicular movement. Parking also appears to be adequate for the buildings proposed usage and additional vehicular movement should not have a significant impact upon existing service levels.

During the construction phases, extreme efforts should be made to minimize noise, dust & debris so not to inhibit those whose health and well being may be affected. Adequate traffic control devices and personnel should also be utilized to minimize the impact of heavy equipment and vehicles traveling in and out of the area.

CONCLUSION:

There are no objections to the progression of this project at this time. Although, it is of utmost importance to be cognizant of any health and safety impacts, directly and indirectly, which may arise from this project.

Respectfully submitted for your review and approval.

Concur. with Sgt. Orikasa's comments - no major concerns with the proposed plans.
Capt. J Simpson 8467
11/25/09 1000 hrs.

Stephen T. Orikasa E#716
Administrative Sergeant/Wailuku Patrol Division
11/24/09 @ 0830 Hours

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Gary Yabuta, Chief of Police
Police Department
County of Maui
55 Mahalani Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Mr. Yabuta:

Thank you for your letter dated November 27, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

The ingress and egress locations appear to be at a reasonable location as to not adversely impact the existing normal vehicular movement. Parking also appears to be adequate for the buildings proposed usage and additional vehicular movement should not have a significant impact upon existing service levels.

Response: We note the comments from your Department that parking and vehicular movements at the project site should not have a significant impact on existing service levels along Hana Highway and East Kuiaha Road. We look forward to your continued support and cooperation in completion of this project.

Comment No. 2:

During the construction phases, extreme efforts should be made to minimize noise, dust & debris so not to inhibit those whose health and well being may be affected. Adequate traffic control devices and personnel should also be utilized to minimize the impact of heavy equipment and vehicles traveling in and out of the area.

Response: The applicant will ensure that traffic control devices and personnel will be utilized during construction to minimize the impacts of large equipment traveling in and out of the area. Best Management Practices (BMPs) developed by the project's civil engineer will also be implemented to minimize dust and debris which may result during construction of the project.

We appreciate the input provided by your office and will include a copy of your letter in the Draft Environmental Assessment (EA) for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.
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DEC 17 2009

CHARMAINE TAVARES
Mayor

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

MICHAEL M. MIYAMOTO
Deputy Director

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

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

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET, ROOM NO. 434
WAILUKU, MAUI, HAWAII 96793

December 14, 2009

Mr. Mark Alexander Roy, A.I.C.P.
MUNEKIYO & HIRAGA, INC.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Dear Mr. Roy:

SUBJECT: EARLY CONSULTATION REQUEST FOR PROPOSED HAIKU FIRE STATION AND RELATED IMPROVEMENTS; TMK: (2) 2-7-007:008 (POR.)

We reviewed your early consultation request and have no comments to offer at this time.

Please call Michael Miyamoto at 270-7845 if you have any questions regarding this letter.

Sincerely,

MILTON M. ARAKAWA, A.I.C.P.
Director of Public Works

MMA:MMM:ls
xc: Highways Division
Engineering Division
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JAN 27 2010

CHARMAINE TAVARES
Mayor

CHERYL K. OKUMA, Esq.
Director

GREGG KRESGE
Deputy Director

TRACY TAKAMINE, P.E.
Solid Waste Division

DAVID TAYLOR, P.E.
Wastewater Reclamation
Division

COUNTY OF MAUI
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
2200 MAIN STREET, SUITE 100
WAILUKU, MAUI, HAWAII 96793

January 25, 2010

Mr. Mark Alexander Roy
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

SUBJECT: **HAIKU FIRE STATION AND RELATED IMPROVEMENTS**
EARLY CONSULTATION
TMK (2) 2-7-007:008, HAIKU

We reviewed the subject project as a pre-application consultation and have the following comments:

1. Solid Waste Division comments:

   a. Include options for construction waste disposal/recycling/reuse in the discussion of potential impacts and mitigation measures.

2. Wastewater Reclamation Division (WWRD) comments:

   a. None. There is no County wastewater system in the area of the subject project.

If you have any questions regarding this memorandum, please contact Gregg Kresge at 270-8230.

Sincerely,

Cheryl K. Okuma

Cheryl K. Okuma, Director

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Cheryl Okuma, Director
Department of Environmental Management
County of Maui
2200 Main Street, Suite 100
Wailuku, Hawaii 96793

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Ms. Okuma:

Thank you for your letter dated January 25, 2010, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1 (Solid Waste Division):

Include options for construction waste disposal/recycling/reuse in the discussion of potential impacts and mitigation measures.

Response: The applicant acknowledges your comment. A Construction Waste Management Plan will be prepared for the project prior to initiation of construction. It is anticipated that existing concrete slabs, walkways, and driveways present on the project site will be crushed and reused on site for fill and/or base course. Other items that are not anticipated to be reused will be diverted away from the landfill or recycled. Diverted items may be reused by other projects should they be deemed fit for reuse. In addition, the applicant will be using Leadership in Energy and Environmental Design (LEED) guidelines on construction waste management and will be aiming at a possible diversion target of 50 percent of demolition and construction waste away from landfills and incineration. A summary of these and other solid waste management measures being evaluated for implementation in the project, will be included in the Draft Environmental Assessment (EA).

Comment No. 2 (Wastewater Reclamation Division):

None. There is no County wastewater system in the area of the subject project

Response: We note your comment that there is no County wastewater system in the area of the subject project. In this regard, an ecological wastewater treatment system and water reuse plan is being proposed for the new fire station. Details regarding this system will be included in the Draft EA,

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited

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CHARMAINE TAVARES
MAYOR

DON A. MEDEIROS
Director
WAYNE A. BOTEILHO
Deputy Director
Telephone (808) 270-7511
Facsimile (808) 270-7505

DEPARTMENT OF TRANSPORTATION

COUNTY OF MAUI
200 South High Street
Wailuku, Hawaii, USA 96793-2155

November 24, 2009

Mr. Mark Alexander Roy
Munekiyo & Hiraga Inc.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Subject: Haiku Fire Station

Dear Mr. Roy,

Thank you for the opportunity to comment on this project. We have no comments to make at this time.

Please feel free to contact me if you have any questions.

Sincerely,

Don Medeiros
Director

DEC 1 1 2009

CHARMAINE TAVARES
Mayor

JEFFREY K. ENG
Director

ERIC H. YAMASHIGE, P.E., L.S.
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauiwater.org

December 4, 2009

Munekiyo & Hiraga, Inc.
Mr. Mark Alexander Roy, AICP, Project Manager
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Roy:

RE:	Project Name:	Proposed Haiku Fire Station and Related Improvements
	Applicant:	Department of Fire and Public Safety, County of Maui
	Permit I.D.:	Early Consultation Request
	TMK:	(2) 2-7-007:008 (por.)

Thank you for the opportunity to comment on this early consultation request.

Source Availability and Consumption
The project site is within the Department of Water Supply's Haiku service area.

The project site covers approximately 6.1 acres located within a County property of 27.9 acres. One 5/8-inch water meter is located on the property. The property also has water meter reservations for 3 (three) 5/8-inch water meters for a subdivision.

System Infrastructure
There is a 6-inch waterline and a fire hydrant located more than 1,000 feet from the project site on East Kuiaha Road near the east end of the County property. Storage is provided by the 0.5 million gallon (MG) Kaupakalua tank. These are inadequate for the proposed project.

The project scope proposes the installation of approximately 4,200 feet of waterline, beginning at a location approximately 2,300 feet south of the project site, to address domestic use and fire protection concerns.

During the building permit process, the applicant will be required to submit domestic, irrigation and fire flow calculations to determine water meter capacity and adequate fire protection. Approved fire flow calculation methods currently used by the Department of

Water Supply are the "Guidance for Determination of Required Fire Flow" as published by the Insurance Services Office in 1974, 2001 and 2006, or "Fire Flow" as published by the Hawaii Insurance Bureau in 1991. Also required is the installation of a reduced pressure back-flow prevention device, approved by the DWS. For more information or clarification on the device, please contact our Engineering Division at 270-7835 or our Backflow and Cross-Connection Control Section at 270-6132.

Pollution Prevention
The site overlies the Haiku aquifer which has a sustainable yield of 27 million gallons per day. The Department of Water Supply's goal is to protect the integrity of surface and groundwater resources. To achieve this, mitigation measures must be implemented to prevent any water pollution related impacts. Best management practices for construction should, therefore, be applied.

Conservation Measures
The Department of Water Supply encourages the applicant to consider the following conservation measures in the project design, as well as during construction:

1. Utilize reclaimed or non-potable water for dust control, irrigation and other non-potable uses.
2. Water after 7:00 p.m. at night and before 10:00 a.m. in the morning.
3. Utilize low-flow fixtures and devices - Maui County Code Subsection 16.20A.680 requires the use of low-flow fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Even more efficient and consumer tested models are available. Check WaterSense listings at http://www.epa.gov/watersense/pp/index.htm for efficient fixture listings when buying or replacing fixtures.
4. Prevent over-Watering by automated systems - Provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evaporation rates at the site. As an alternative, provide more automated, soil-moisture sensors on controllers.
5. Maintain fixtures to prevent leaks - A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons per day.
6. Limit irrigated turf - Low-water use shrubs and ground cover can be equally attractive and require substantially less water than turf.
7. Select climate adapted native plant species for landscaping - Native plants adapted to the area conserve water and protect the watershed from degradation due to invasive alien species.
8. Look for opportunities to conserve water - Here are a few samples: 1) When clearing debris, use a broom instead of a hose and water; 2) Check for leaks in pipes, faucets and toilets.

Should you have any questions, please contact our Water Resources & Planning Division at 244-8550.

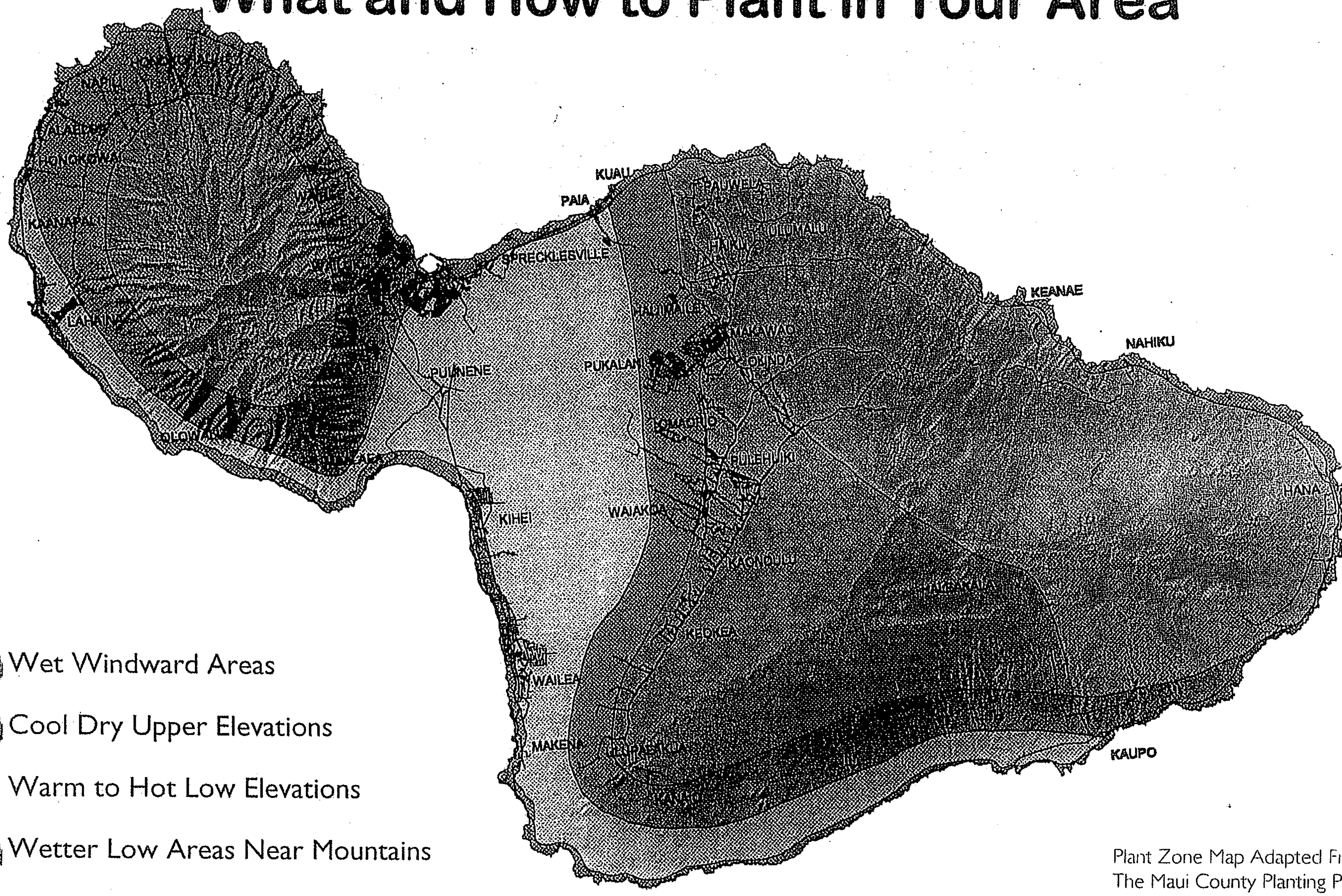
Sincerely,

Jeffrey K. Eng

JEFFREY K. ENG, DIRECTOR
ayi
Enclosures: Maui County Planting Plan - Saving Water in the Yard - What and How to Plant in your Area
c: DWS Engineering Division
WRPD Project File
WRPD Reading File

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

Zone-specific Native and Polynesian plants for Maui County

Zone 1

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
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia arecina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
P	Pritchardia forbesiana	lo'ulu	15'			
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	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Cordyline fruticosa	ti, ki	6			
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Tr	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	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	Charpentiera obovata		15'			
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
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
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 2

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
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	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 - 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
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	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	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	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	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 - 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	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	Charpentiera obovata		15'			
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

Zone-specific Native and Polynesian plants for Maui County

Zone 2

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 3

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

Zone-specific Native and Polynesian plants for Maui County

Zone 3

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

Zone-specific Native and Polynesian plants for Maui County

Zone 3

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

Zone-specific Native and Polynesian plants for Maui County

Zone 4

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
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
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	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	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	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
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia arecina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
P	Pritchardia forbesiana	lo'ulu	15'			
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

Zone-specific Native and Polynesian plants for Maui County

Zone 4

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3'		
Sh	Cordyline fruticosa	ti, ki	6			
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
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	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	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	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	Charpentiera obovata		15'			
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	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 4

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
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	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 5

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

Zone-specific Native and Polynesian plants for Maui County

Zone 5

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 kauaiensis kauaiensis	'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 laponicum	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)

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[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.

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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.

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[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

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[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.

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[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 MAUI:

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.

1.	Hoolawa Farms P O Box 731 Haiku HI 96708	575-5099
2.	The Hawaiian Collection 1127 Manu Street Kula HI 96790	878-1701
3.	Kula Botanical Gardens RR4, Box 228 Kula HI 96790	878-1715
4.	Maui Botanical Gardens Kanaloa Avenue, Kahului across from stadium	249-2798
5.	Kula Forest Reserve access road at the end of Waipoli Rd Call the Maui District Office	984-8100
6.	Wailea Point, Private Condominium residence 4000 Wailea Alanui, Kihei public access points at Four Seasons Resort or Polo Beach	875-9557
7.	Kahanu Gardens, National Tropical Botanical Garden Alau Place, Hana HI 96713	248-8912
8.	Kahului Library Courtyard 20 School Street Kahului HI 96732	873-3097

PLACES TO BUY NATIVE PLANTS ON MAUI

1. Ho'olawa Farms
   Anna Palomino
   P O Box 731
   Haiku HI 96708
   575-5099

   * The largest and best collection of natives in the state. They will deliver, but worth the drive to go and see! Will propagate upon request

2. Kahanu Gardens
   National Tropical Botanical Garden
   Alau Place, Hana
   248-8912

3. Kihana Nursery
   1708 South Kihei Road
   Kihei HI 96753
   879-1165

4. Kihei Garden and Landscape
   Waiko Road, Wailuku
   P O Box 1058
   Puunene HI 96784
   244-3804

5. Kula Ace Hardware and Nursery
   3600 Lower Kula Road
   Kula HI 96790
   876-0734
   * many natives in stock
   * get most of their plants from Ho'olawa Farms
   * they take special requests

6. Kulamanu Farms - Ann Carter
   Kula HI 96790
   878-1801

7. Maui Nui Botanical Gardens
   Kanaloa Avenue
   (Across from stadium)
   Kahului HI 96732
   249-2798

8. Native Gardenscapes
   Robin McMillan
   1330 Lower Kimo Drive
   Kula HI 96790
   870-1421

   * grows native plants and installs landscapes including irrigation.

9. Native Hawaiian Tree Source
   1630 Piiholo Road
   Makawao HI 96768
   572-6180

10. Native Nursery, LLC
    Jonathan Keyser
    250-3341

11. New Moon Enterprises - Pat Bily
    47 Kahoea Place
    Kula HI 96790
    878-2441

12. Waiakoa Tree Farm - Kua Rogoff
    Pukalani HI 96768
    Cell - 264-4166

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Jeffrey K. Eng, Director
Department of Water Supply
County of Maui
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Mr. Eng:

Thank you for your letter dated December 4, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1 (Source Availability and Consumption):

The project site is within the Department of Water Supply's Haiku service area.

The project site covers approximately 6.1 acres located within a County property of 27.9 acres. One 5/8-inch water meter is located on the property. The property also has water meter reservations for 3 (three) 5/8-inch water meters for a subdivision.

Response: We note the information provided on source availability and consumption, and that the subject property currently possesses water meter reservations for three (3) 5/8-inch water meters.

Comment No. 2 (System Infrastructure):

There is a 6-inch waterline and a fire hydrant located more than 1,000 feet from the project site on East Kuiaha Road near the east end of the County property. Storage is provided by the 0.5 million gallon (MG) Kaupakalua tank. These are inadequate for the proposed project.

The project scope proposes the installation of approximately 4,200 feet of waterline, beginning at a location approximately 2,300 feet south of the project site, to address domestic use and fire protection concerns.

During the building permit process, the applicant will be required to submit domestic, irrigation and fire flow calculations to determine water meter capacity and adequate fire protection. Approved fire flow calculation methods currently used by the Department of Water Supply are the "Guidance for Determination of Required Fire Flow" as published by the Insurance Services Office in 1974, 2001 and 2006, or "Fire Flow" as published by the Hawaii Insurance Bureau in 1991. Also required is the installation of a reduced pressure back-flow prevention device, approved by the DWS. For more information or clarification on the device, please contact our Engineering Division at 270-7835 or our Backflow and Cross-Connection Control Section at 270-6132.

Response: We note your comment regarding system infrastructure. The applicant will coordinate with your Department during the building permit application process to address water meter capacity and fire protection requirements for the site, as well as the installation of a reduced pressure back-flow prevention device for the project.

Comment No. 3 (Pollution Prevention):

The site overlies the Haiku aquifer which has a sustainable yield of 27 million gallons per day. The Department of Water Supply's goal is to protect the integrity of surface and groundwater resources. To achieve this, mitigation measures must be implemented to prevent any water pollution related impacts. Best management practices for construction should, therefore, be applied.

Response: We note your comment regarding pollution prevention. A program of Best Management Practices (BMPs) will be implemented for the project and will be discussed in the Draft Environmental Assessment (EA).

Comment No. 4 (Conservation Measures):

The Department of Water Supply encourages the applicant to consider the following conservation measures in the project design, as well as during construction:

1. *Utilize reclaimed or non-potable water for dust control, irrigation and other non-potable uses.*
2. *Water after 7:00 p.m. at night and before 10:00 a.m. in the morning.*
3. *Utilize low-flow fixtures and devices - Maui County Code Subsection 16.20A.680 requires the use of low-flow fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Even more efficient and consumer tested models are available. Check WaterSense listings at http://www.epa.gov/watersense/pp/index.htm for efficient fixture listings when buying or replacing fixtures.*
4. *Prevent over-Watering by automated systems - Provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evaporation rates at the site. As an alternative, provide more automated, soil-moisture sensors on controllers.*
5. *Maintain fixtures to prevent leaks - A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons per day.*
6. *Limit irrigated turf - Low-water use shrubs and ground cover can be equally attractive and require substantially less water than turf.*
7. *Select climate adapted native plant species for landscaping - Native plants adapted to the area conserve water and protect the watershed from degradation due to invasive alien species.*
8. *Look for opportunities to conserve water - Here are a few samples: 1) When clearing debris, use a broom instead of a hose and water; 2) Check for leaks in pipes, faucets and toilets.*

Response: The suggested water conservation measures will be forwarded to the applicant for the review and possible incorporation into the design of the project, as applicable. We also note that the proposed project aims to undergo certification by the Leadership in Energy and Environmental Design (LEED) green building rating system. Proposed water conservation measures for the project will include water use reduction measures, water efficient landscaping, and innovative wastewater technologies.

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp

cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.

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Ken Fukuoka

COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793
www.mauicounty.gov/council

November 20, 2009

Munekiyo & Hiraga, Inc.
Mark Alexander Roy, AICP, Project Manager
305 High Street, Suite 104
Wailuku, Hawai'i 96793

Dear Mr. Roy:

SUBJECT: **HAIKU FIRE STATION AND RELATED IMPROVEMENTS**

I am happy to see that LEED certification will be sought and of all the water conservation planning. The proposed new waterlines are also reassuring.

The unanswered question that remains for me and my Upcountry constituents is "where will the water come from" for this project.

Please be sure that the Draft EA adequately addresses this issue. Thank you for the opportunity to provide some input.

Aloha and mahalo,

Gladys C. Baisa

GLADYS C. BAISA
Council Member

GCB:amm

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Honorable Gladys Baisa
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Councilmember Baisa:

Thank you for your letter dated November 20, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

I am happy to see that LEED certification will be sought and of all the water conservation planning. The proposed new waterlines are also reassuring.

Response: We appreciate your support for the Leadership in Energy and Environmental Design (LEED) certification process and water conservation planning aspects for the proposed project. We look forward to your continued support in completion of this project.

Comment No. 2:

The unanswered question that remains for me and my Upcountry constituents is "where will the water come from" for this project.

Please be sure that the Draft EA adequately addresses this issue. Thank you for the opportunity to provide some input

Response: Based on information provided by the County of Maui, Department of Water Supply, the subject property currently possesses a water meter reservation for three (3) 5/8-inch water meters. A 4,200 feet waterline will connect the project site to an existing waterline approximately 2,300 feet south of the project site. A description of the water system requirements for the proposed project will be included in the Draft Environmental Assessment (EA).

We appreciate the input provided by your office and will include a copy of your letter in the Draft EA for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
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COUNTY COUNCIL
COUNTY OF MAUI
200 S. HIGH STREET
WAILUKU, MAUI, HAWAII 96793
www.mauicounty.gov/council

December 7, 2009

Munekiyo and Hiraga, Inc.
Attention: Mark Alexander Roy, Project Manager
305 High Street, Suite 104
Wailuku, HI 96793

SUBJECT: EARLY CONSULTATION COMMENTS FOR PROPOSED HAIKU FIRE STATION AND RELATED IMPROVEMENTS at TMK (2) 2-7-007:008 (Por.), HAIKU, MAUI, HAWAII

Dear Mr. Roy:

Thank you for the opportunity to provide early comments in preparation for the Draft Environmental Assessment for the Proposed Haiku Fire Station and Related Improvements at TMK (2) 2-7-007:008 (Por.), HAIKU, MAUI, HAWAII.

After review of the information presented, I have no specific comments at this time.

Sincerely,

Joseph Pontanilla

JOSEPH PONTANILLA,
COUNCIL MEMBER

DEC 0 1 2009

Hawaiian Telcom

November 30, 2009

Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

ATTN: Mark Alexander Roy, AICP, Project Manager

SUBJECT: PROPOSED HAIKU FIRE STATION; HAIKU, ISLAND OF MAUI
EARLY CONSULTATION REQUEST AND RELATED IMPROVEMENTS AT
TMK: (2) 2-7-007:009 (POR), HAIKU, MAUI, HAWAII
COUNTY OF MAUI, DEPT. OF FIRE AND PUBLIC SAFETY (applicant)

Dear Mr. Roy:

Thank you for providing Hawaiian Telcom Incorporated, the opportunity to comment on the Early Consultation and Related Improvements for the Proposed Haiku Fire Station off of Hana Hwy., Haiku, on the Island of Maui.

With regards to Figure 4, specifically the proposed placement of the Wind Turbines, please note that the proximity of the placement of the proposed turbines with relation to the existing aerial telephone facilities along Hana Highway must take into consideration OSHA regulations.

If there are any questions, please call Sheri Tihada at (808) 242-5258.

Sincerely,

Lynette Yoshida

Lynette Yoshida
Senior Manager –
Network Engineering & Planning

C: File (3005 0911-085)
S. Tihada

1177 Bishop Street • Honolulu • Hi 96813

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Lynette Yoshida, Senior Manager
Network Engineering & Planning
Hawaiian Telcom
1177 Bishop Street
Honolulu, Hawaii 96813

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Ms. Yoshida:

Thank you for your letter dated November 30, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

With regards to Figure 4, specifically the proposed placement of the Wind Turbines, please note that the proximity of the placement of the proposed turbines with relation to the existing aerial telephone facilities along Hana Highway must take into consideration OSHA regulations.

Response: The National Electrical Safety Code (NESC) and Occupational Safety and Health Administration (OSHA) codes require that equipment energized at 50 kV or less (such as the proposed wind turbines) be placed a minimum of ten (10) feet away from electrically charged power lines. As the current design plans of the proposed project place the wind turbines are approximately thirty (30) feet away from the existing aerial telephone facilities along Hana Highway, the conditions of the NESC and OSHA codes are satisfied.

We also note that the proposed wind turbines will utilize a vertical axis design instead of the conventional horizontal axis (windmill/propeller) design. These turbines will have the capability to utilize wind from any direction.

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

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We appreciate the input provided by your office and will include a copy of your letter in the Draft Environmental Assessment (EA) for the project.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp

cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited
Diane Kodama, AECOM Pacific, Inc.

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

November 20, 2009

Mr. Mark Alexander Roy, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Subject: Early Consultation for the Proposed Haiku Fire Station and Related Improvements
Hana Highway
Haiku, Maui, Hawaii
Tax Map Key: (2) 2-7-007: 008 (por.)

Dear Mr. Roy,

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

1 In reviewing our records and the information received, Maui Electric Company (MECO) has no objection to the subject project at this time. However, we highly encourage the customer's electrical consultant to submit an electrical service request so that any service can be provided on a timely basis.

2 We also suggest that the customer or their consultant make contact with our Renewable Energy Department at 871-8461 for the installation of the wind turbine system.

Should you have any questions or concerns, please call me at 871-2340.

Sincerely,

Ray Okazaki

Ray Okazaki
Staff Engineer

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 7, 2010

Ray Okazaki
Maui Electric Company, Ltd.
P. O. Box 398
Kahului, Hawaii 96733-6898

SUBJECT: Proposed Haiku Fire Station and Related Improvements at TMK (2)2-7-007:008 (por.), Haiku, Maui

Dear Mr. Okazaki:

Thank you for your letter dated November 20, 2009, responding to our Chapter 343, Hawaii Revised Statutes (HRS) early consultation request for the subject project. On behalf of the applicant, the County of Maui, Department of Fire and Public Safety, we offer the following information in response to the comments noted in your letter:

Comment No. 1:

In reviewing our records and the information received, Maui Electric Company (MECO) has no objection to the subject project at this time. However, we highly encourage the customer's electrical consultant to submit an electrical service request so that any service can be provided on a timely basis.

Response: The applicant notes that MECO has no objection to the proposed project. The project's electrical consultant will coordinate with MECO to submit an electrical service request so that service can be provided on a timely basis.

Comment No. 2:

We also suggest that the customer or their consultant make contact with our Renewable Energy Department at 871-8461 for the installation of the wind turbine system.

Response: The applicant acknowledges your comment and will consult with MECO's Renewable Energy Department regarding installation of the wind turbine system.

We appreciate the input provided by your office and will include a copy of your letter in the Draft Environmental Assessment (EA) for the project.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Mark Alexander Roy, AICP
Program Manager

MAR:yp
cc: Lee Mainaga, County of Maui, Department of Fire and Public Safety
Wendy Taomoto, County of Maui, Department of Management
Kathleen Aoki, County of Maui, Department of Planning
Terry McFarland, Architects Hawaii Limited

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IX. REFERENCES

IX. REFERENCES

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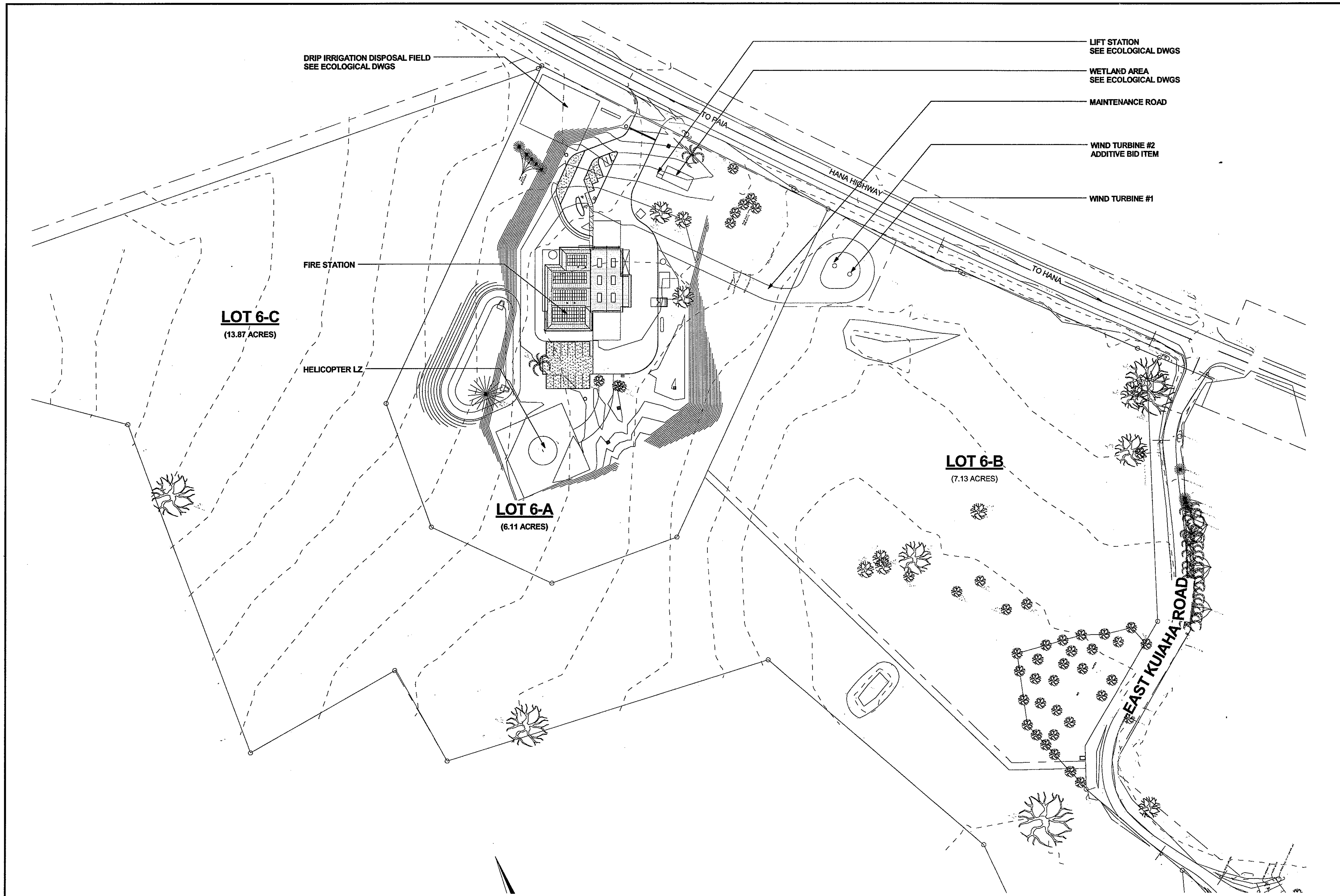
APPENDIX A.

Preliminary Development Plans



1 **OVERALL SITE PLAN**
SCALE: 1" = 60'-0"

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3550 HANA HWY
HAIKU, MAUI

50% CONSTRUCTION DOCUMENTS SEPTEMBER 27, 2010

OVERALL SITE PLAN

1" = 60'-0"

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No. 7418
HAWAII, U.S.A.

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signature | 04/10/2010 expiration date of the license

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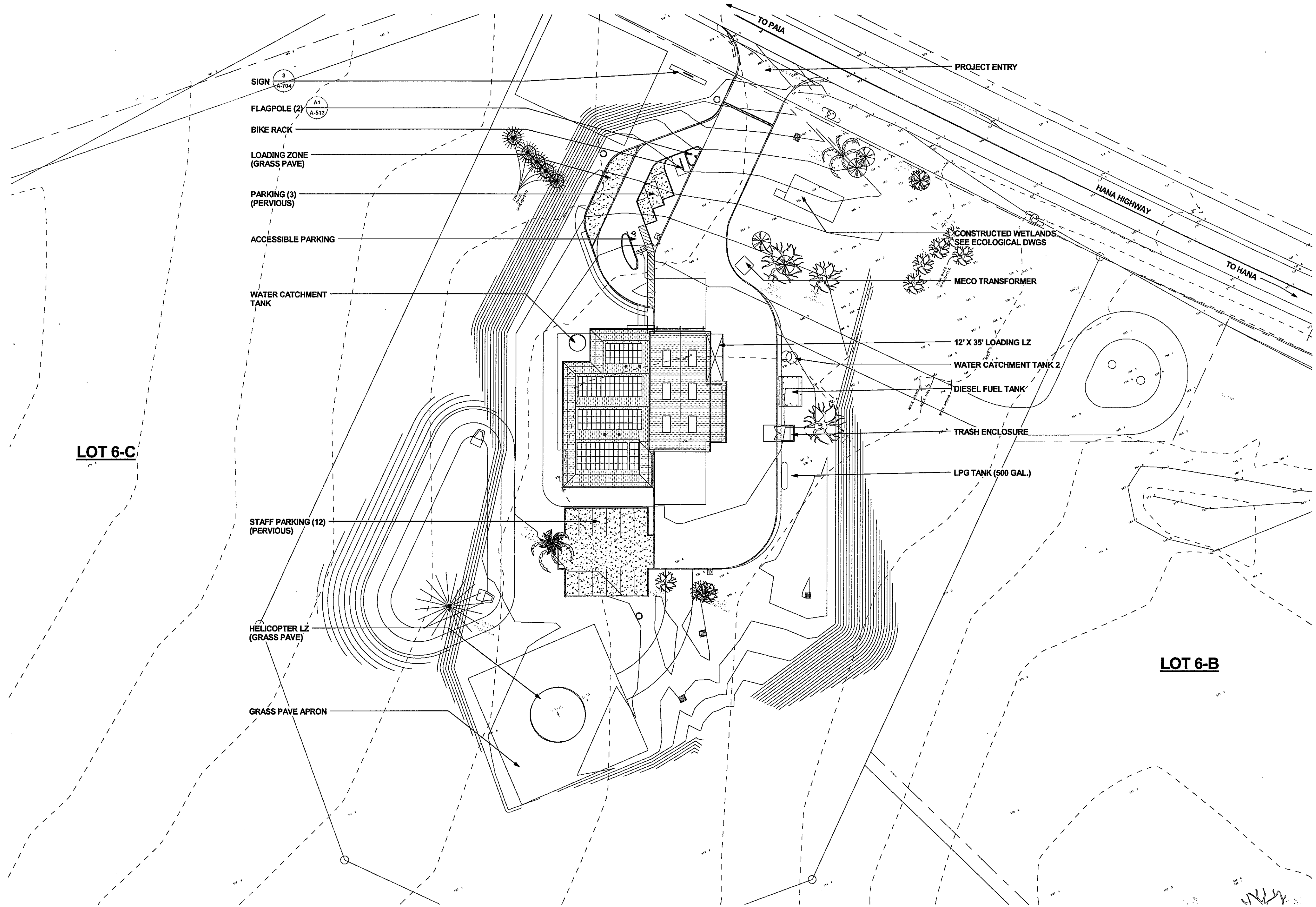

1 ARCHITECTURAL SITE PLAN
SCALE: 1/32" = 1'-0"

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1/32" = 1'-0"

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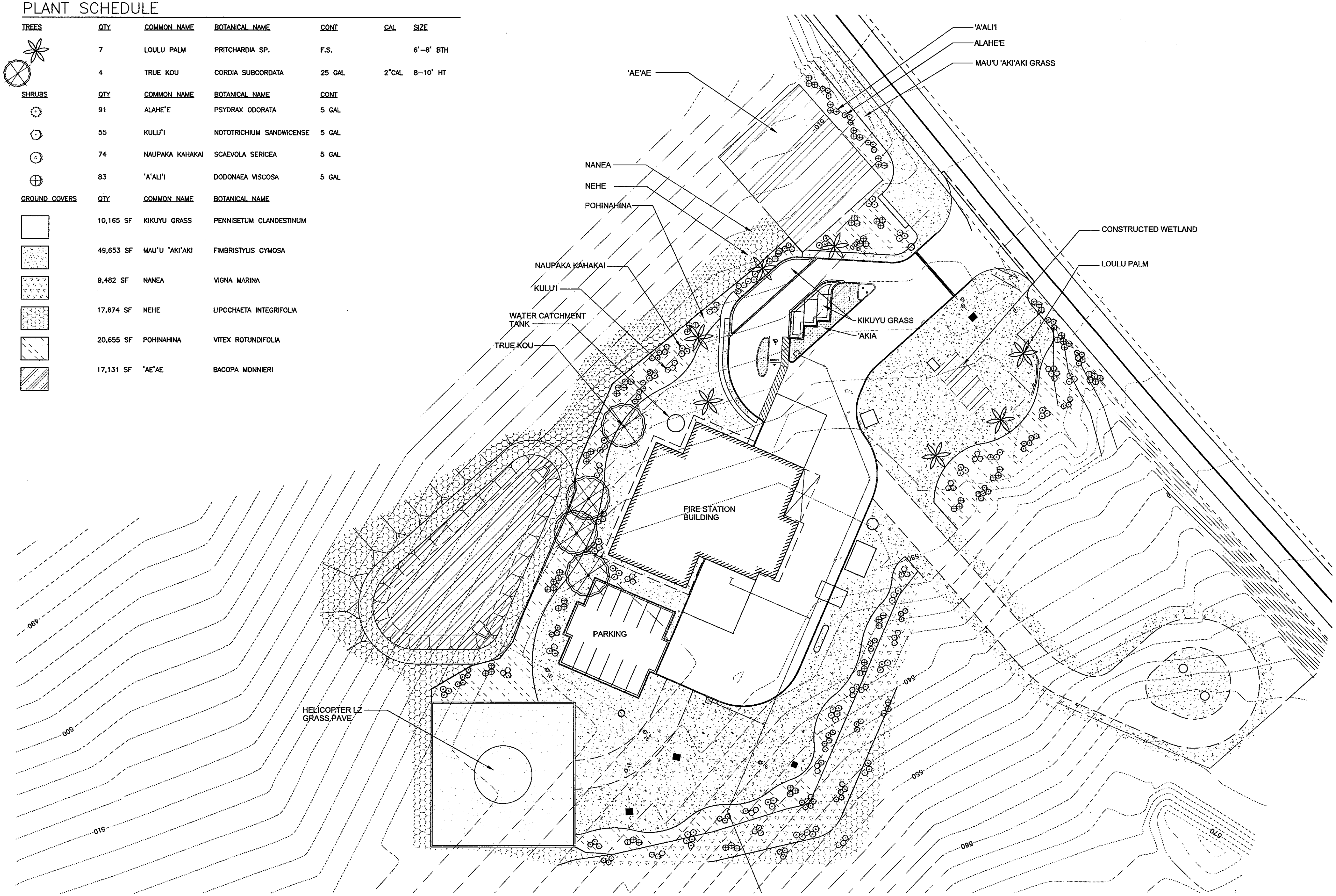
PLANT SCHEDULE

TREES	QTY	COMMON NAME	BOTANICAL NAME	CONT	CAL	SIZE
	7	LOULU PALM	PRITCHARDIA SP.	F.S.		6'–8' BTH
	4	TRUE KOU	CORDIA SUBCORDATA	25 GAL	2"CAL	8–10' HT
SHRUBS	**QTY**	**COMMON NAME**	**BOTANICAL NAME**	**CONT**		
	91	ALAHE'E	PSYDRAX ODORATA	5 GAL		
	55	KULU'I	NOTOTRICHIUM SANDWICENSE	5 GAL		
	74	NAUPAKA KAHAKAI	SCAEVOLA SERICEA	5 GAL		
	83	'A'ALI'I	DODONAEA VISCOSA	5 GAL		
GROUND COVERS	**QTY**	**COMMON NAME**	**BOTANICAL NAME**			
	10,165 SF	KIKUYU GRASS	PENNISETUM CLANDESTINUM			
	49,653 SF	MAU'U 'AKI'AKI	FIMBRISTYLIS CYMOSA			
	9,482 SF	NANEA	VIGNA MARINA			
	17,674 SF	NEHE	LIPOCHAETA INTEGRIFOLIA			
	20,655 SF	POHINAHINA	VITEX ROTUNDIFOLIA			
	17,131 SF	'AE'AE	BACOPA MONNIERI			



1 OVERALL LANDSCAPE PLAN

SCALE: 1" = 30'-0"

N

30' 0 30'

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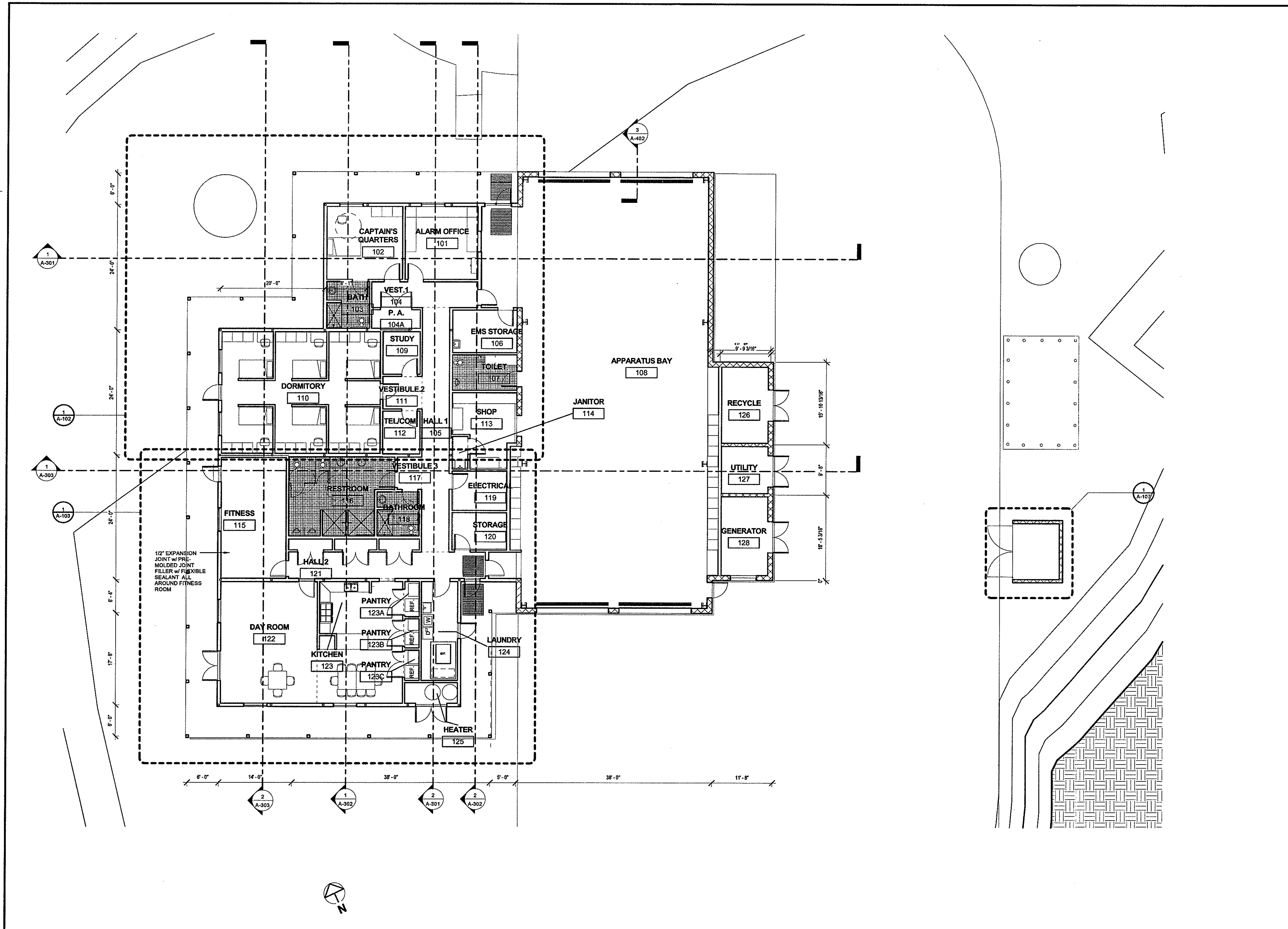

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FLOOR PLAN - LEVEL 1

1/8" = 1'-0"

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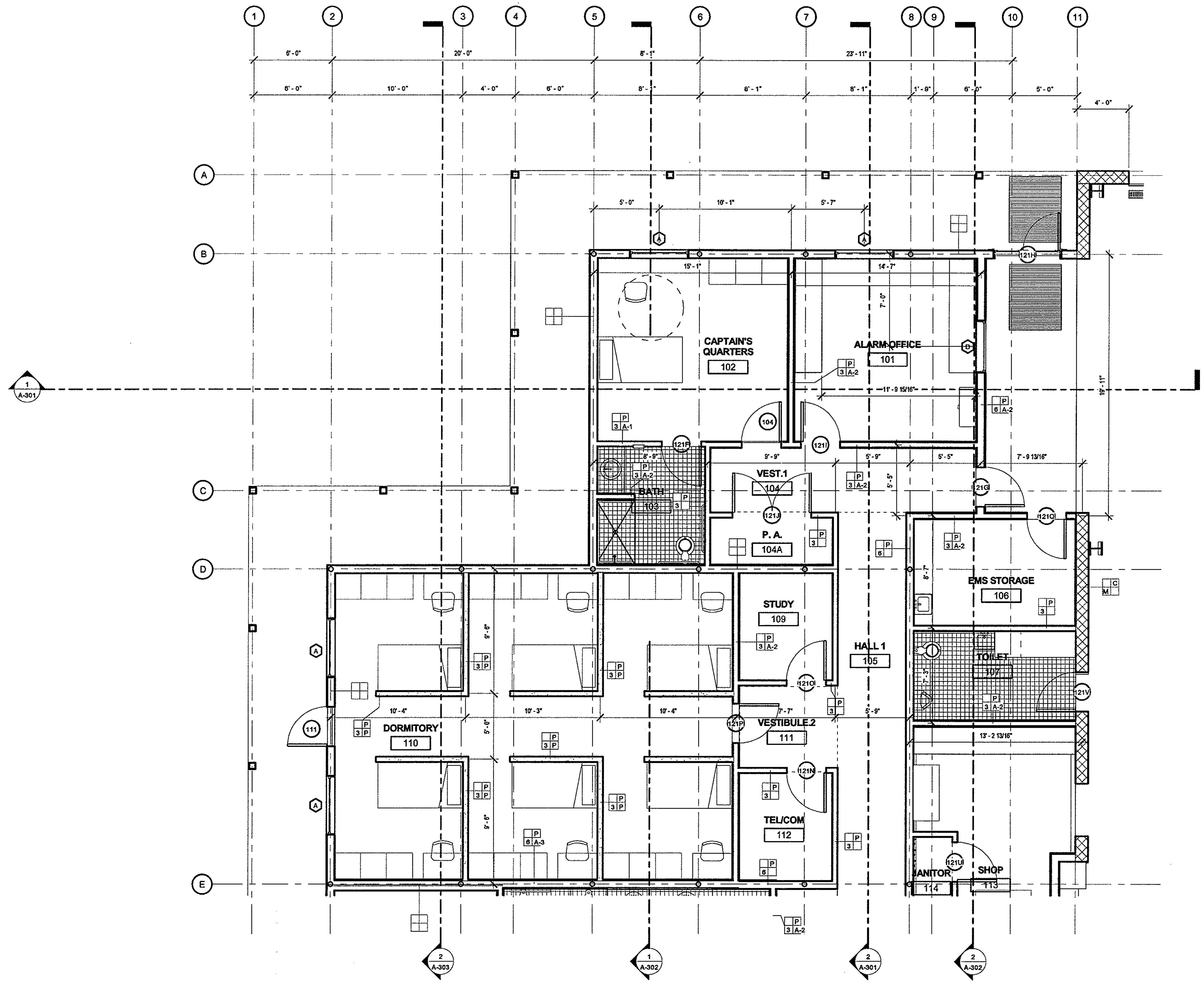
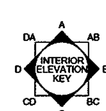
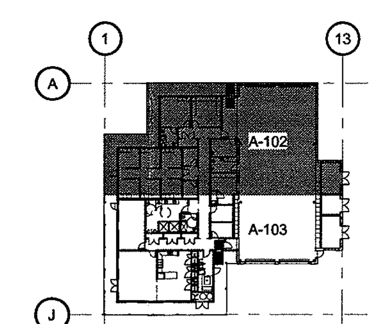


1 ENLARGED FLOOR PLAN - AREA 1

SCALE: 1/4" = 1'-0"



SEE SHEETS A-501 - A-509



KEYPLAN

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ENLARGED FLOOR PLAN

As indicated

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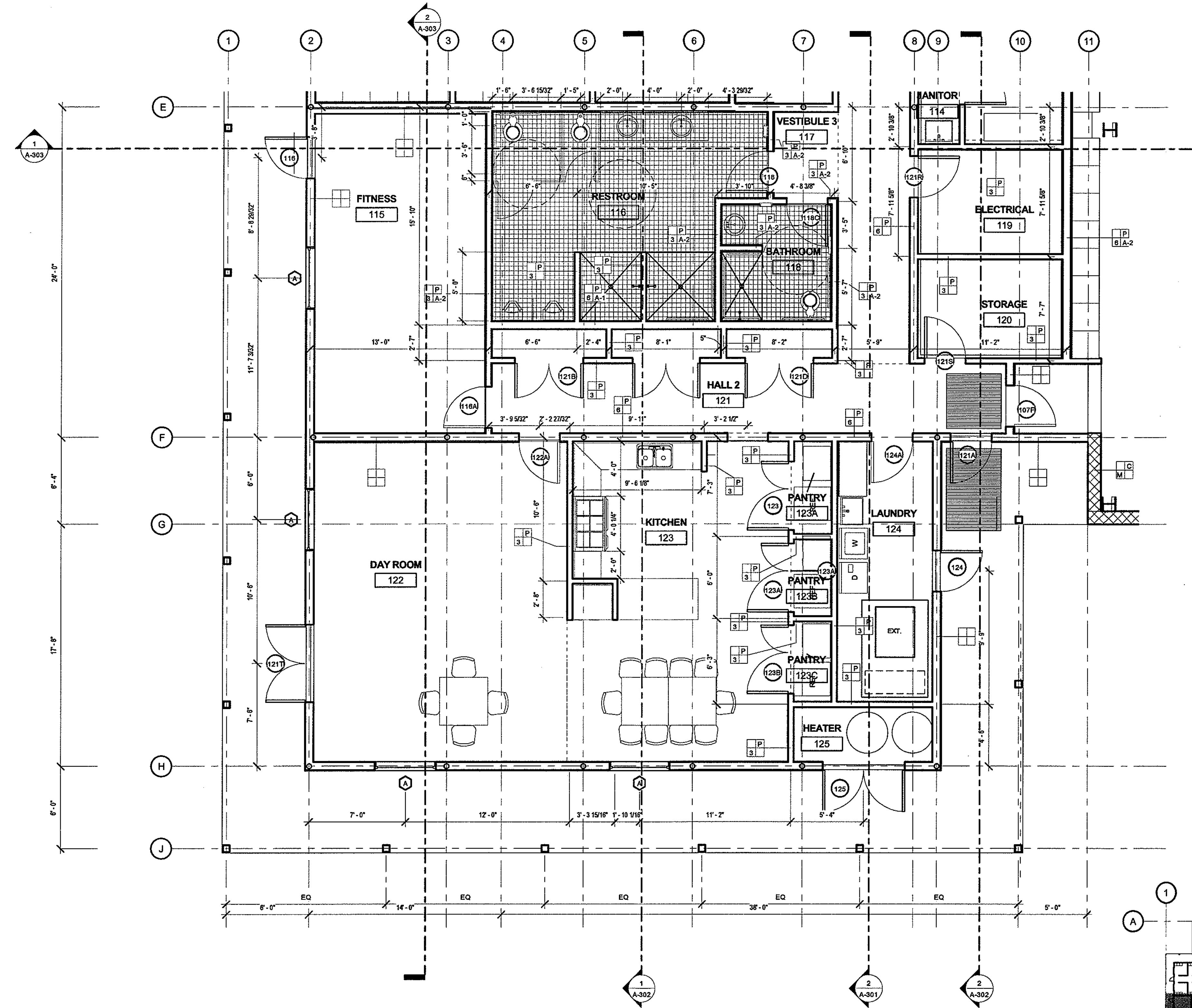
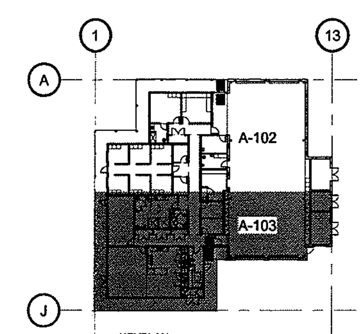


1 ENLARGED FLOOR PLAN - AREA 2

SCALE: 1/4" = 1'-0"

INTERIOR ELEVATION KEY

SEE SHEETS A-501 - A-509



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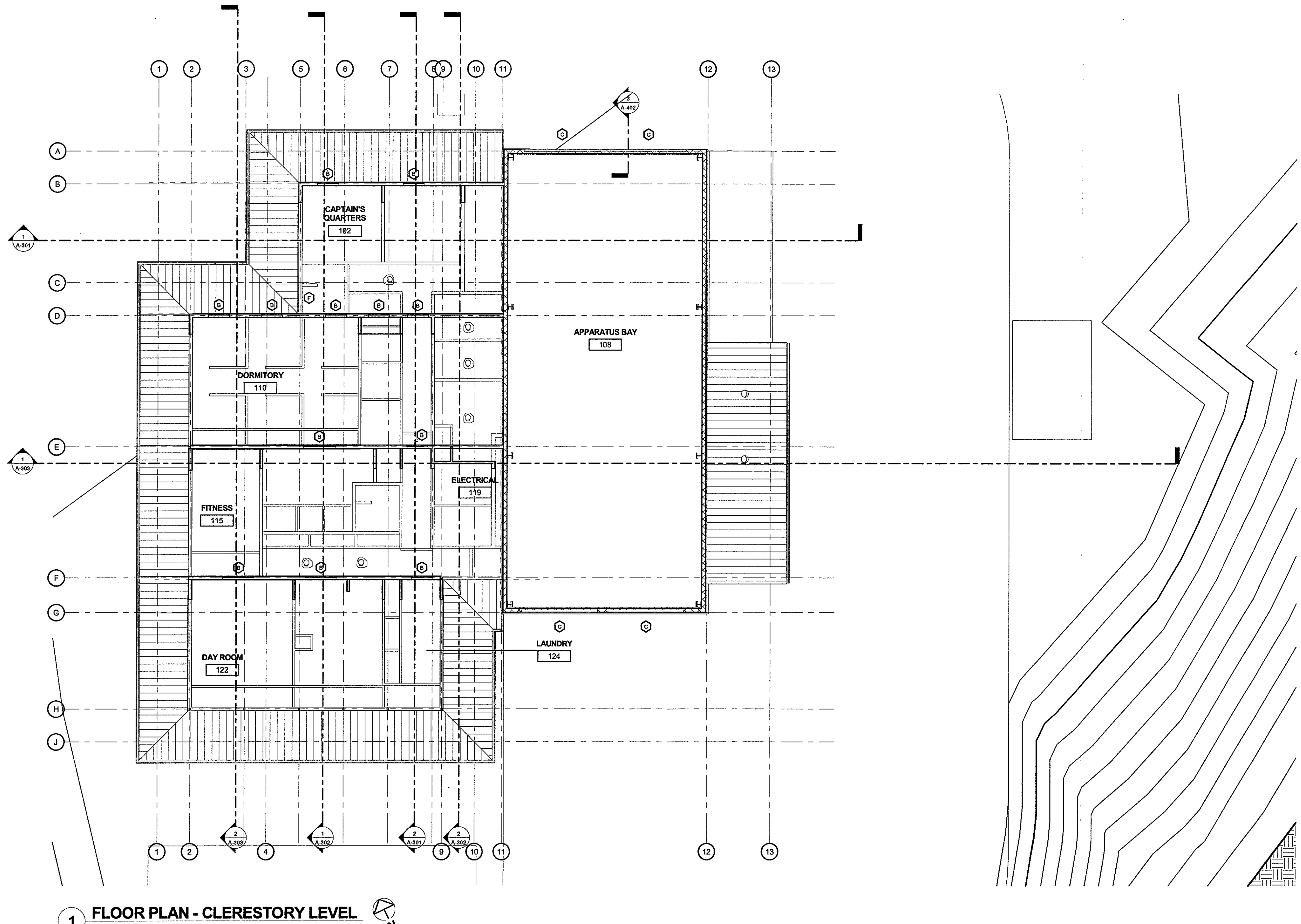

1 FLOOR PLAN - CLERESTORY LEVEL

SCALE: 1/8" = 1'-0"

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FLOOR PLAN - CLERESTORY LEVEL

1/8" = 1'-0"

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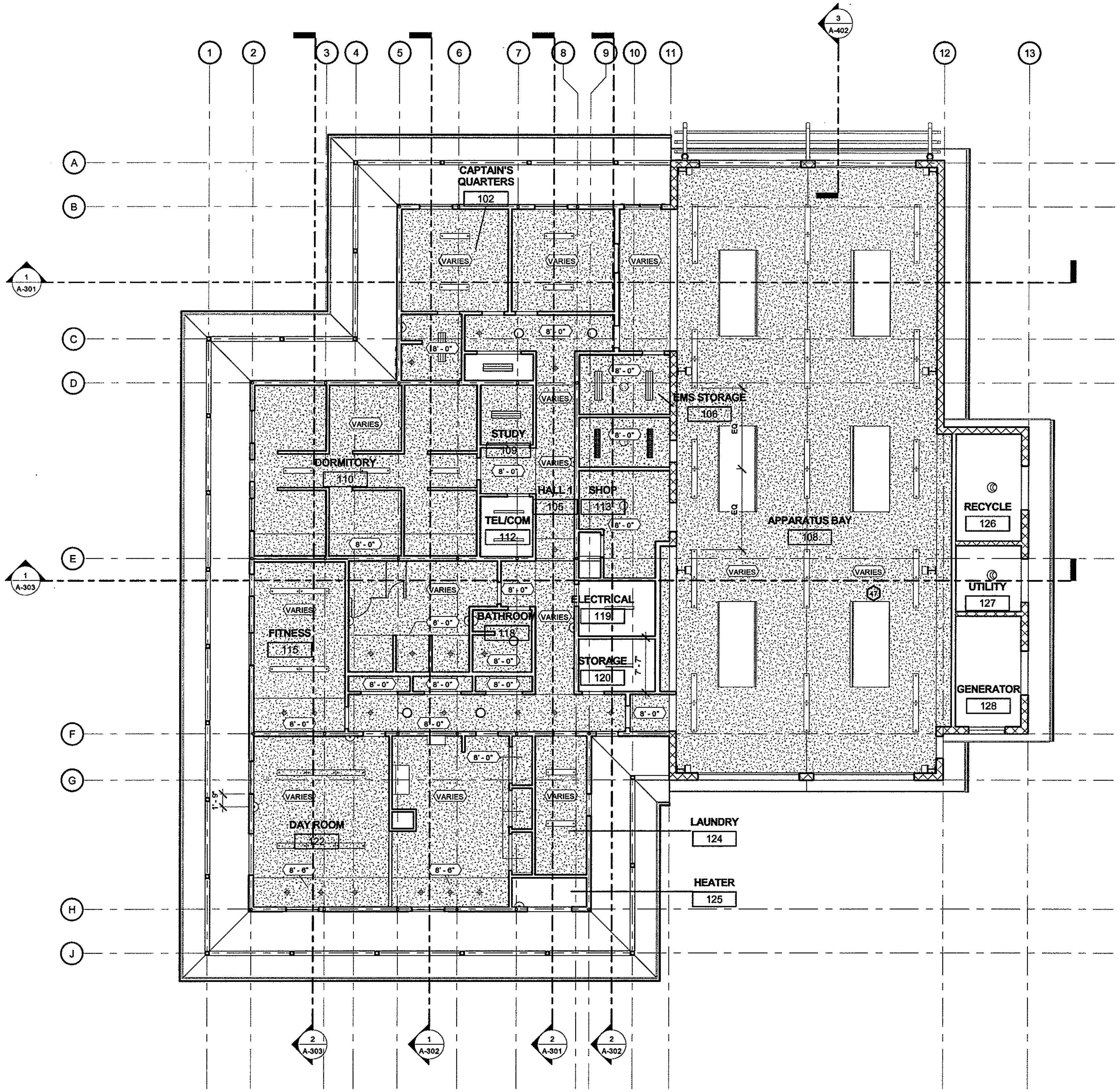

1 REFLECTED CEILING PLAN

SCALE: 1/8" = 1'-0"

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REFLECTED CEILING PLAN - LEVEL 1

1/8" = 1'-0"

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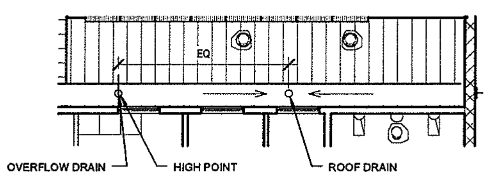
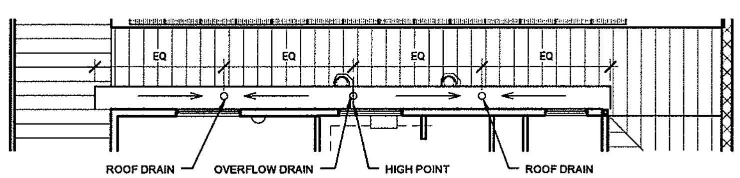


2 PARTIAL ROOF DRAIN

SCALE: 1/8" = 1'-0"



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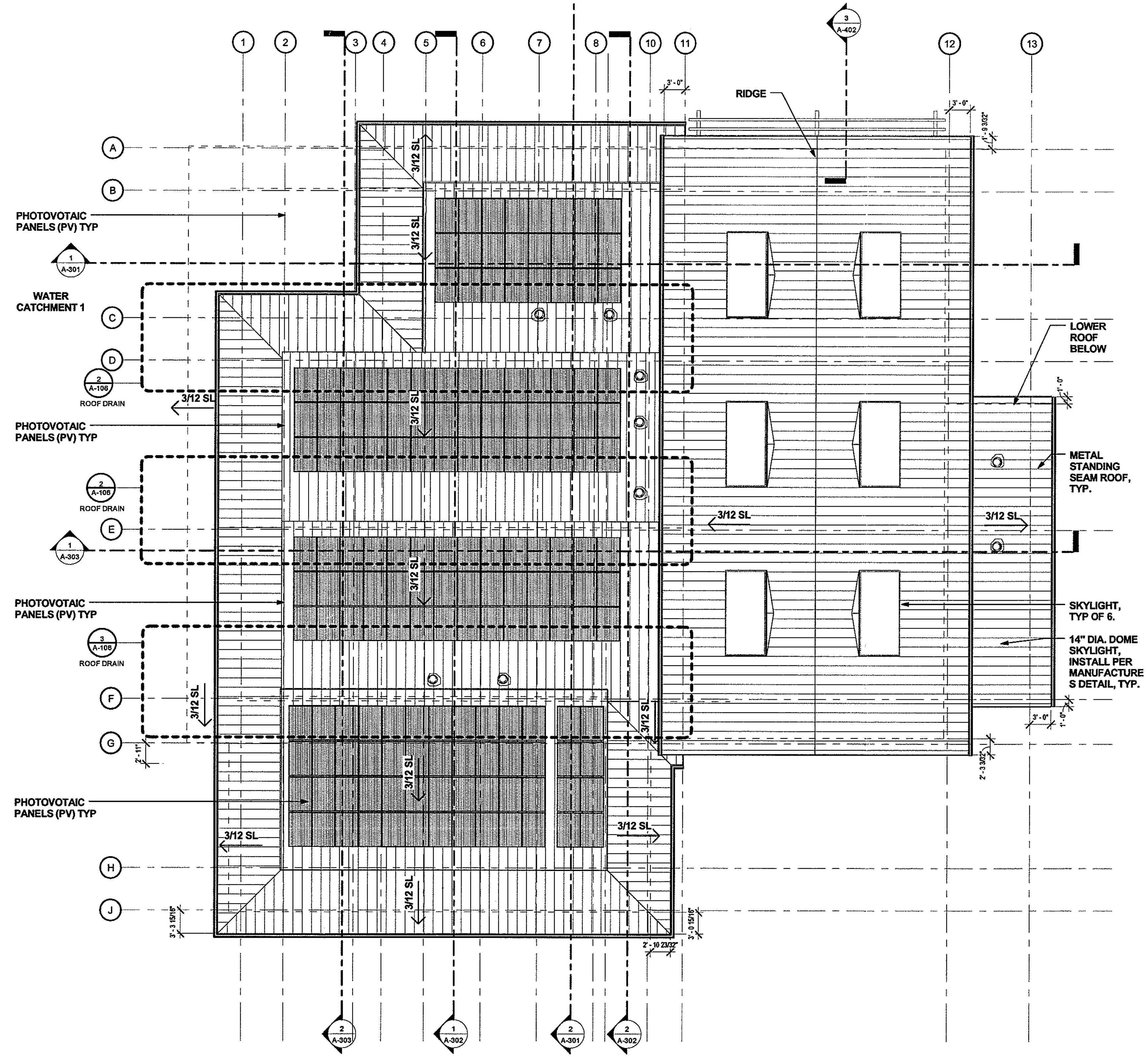

1 ROOF PLAN

SCALE: 1/8" = 1'-0"

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ROOF PLAN

1/8" = 1'-0"

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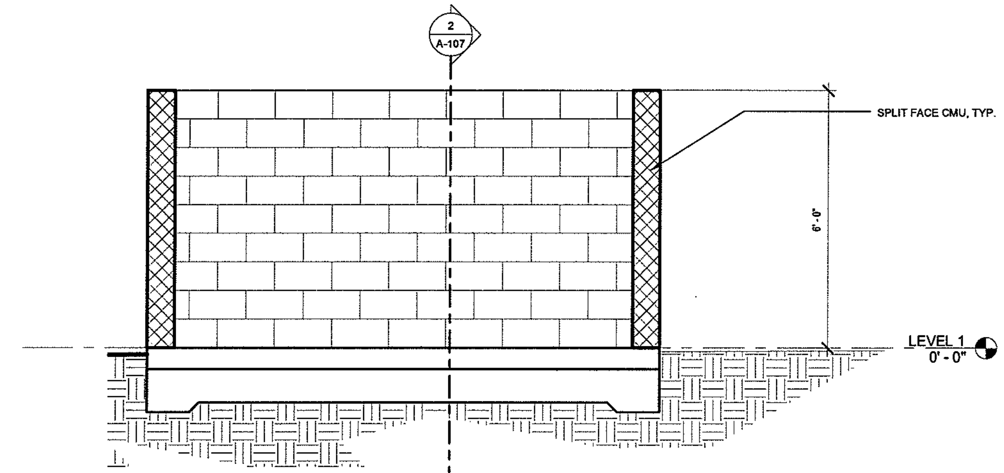
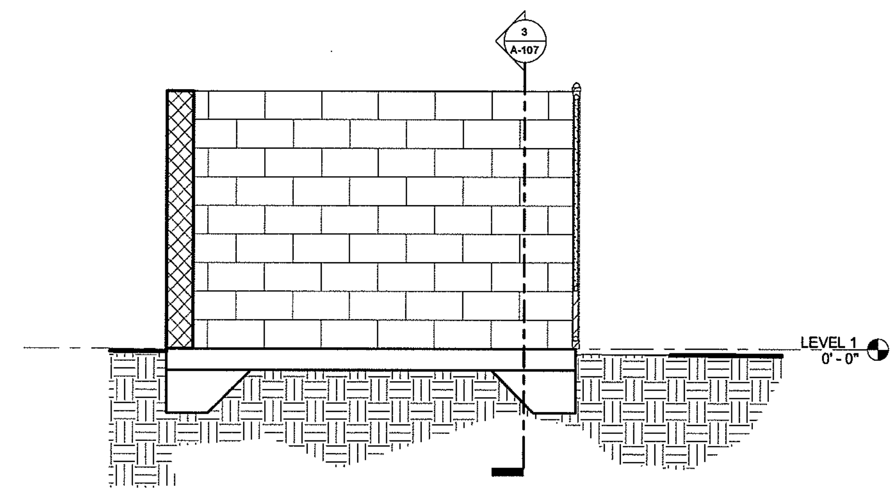


3 **SECTION @ TRASH ENCLOSURE**
SCALE: 1/2" = 1'-0"



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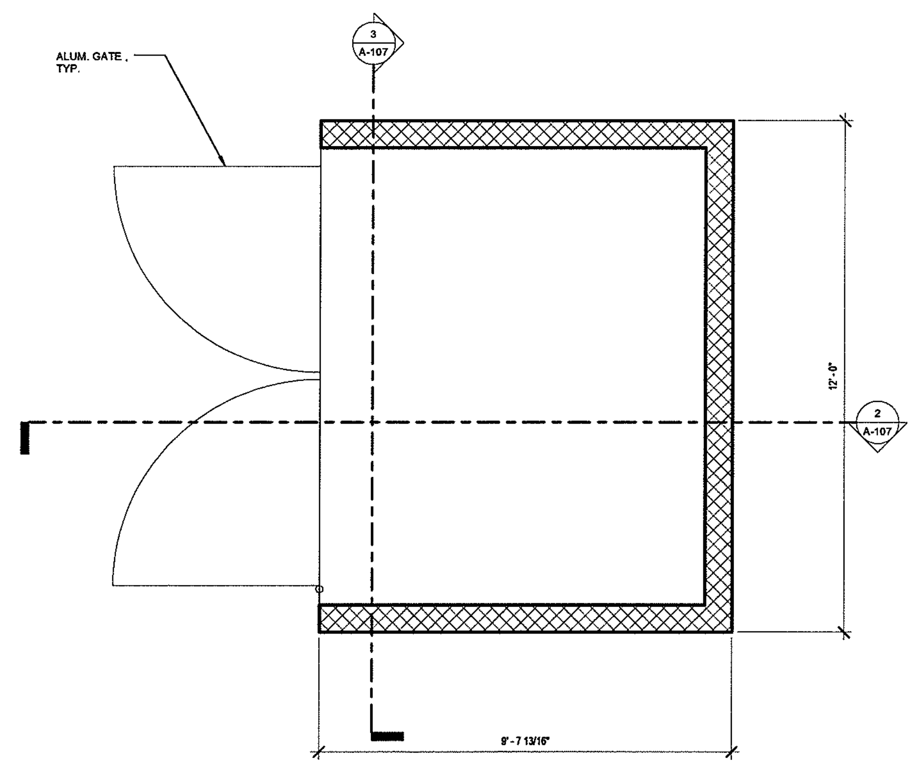

1 **TRASH ENCLOSURE**
SCALE: 1/2" = 1'-0"

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TRASH ENCLOSURE

1/2" = 1'-0"

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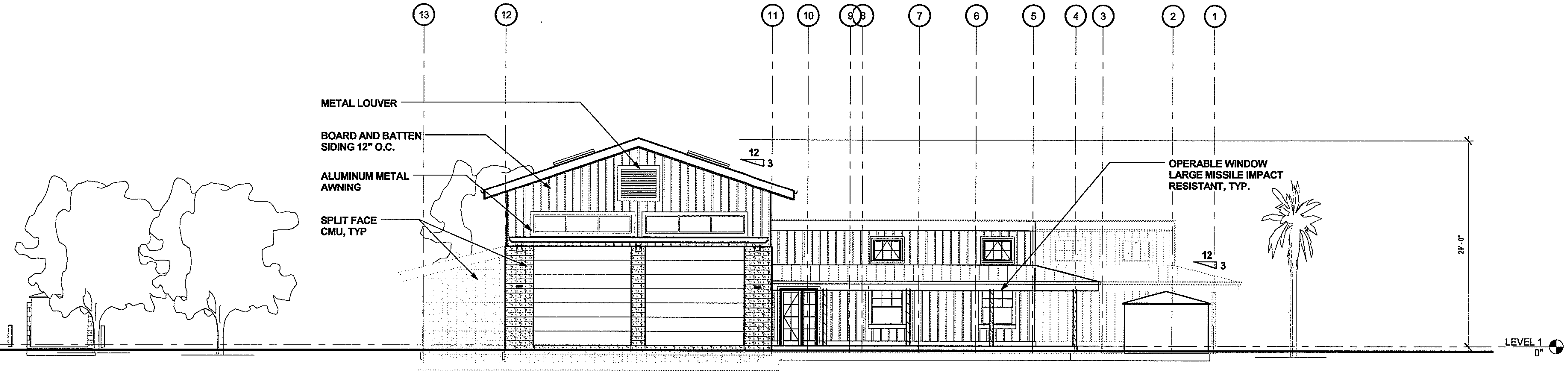
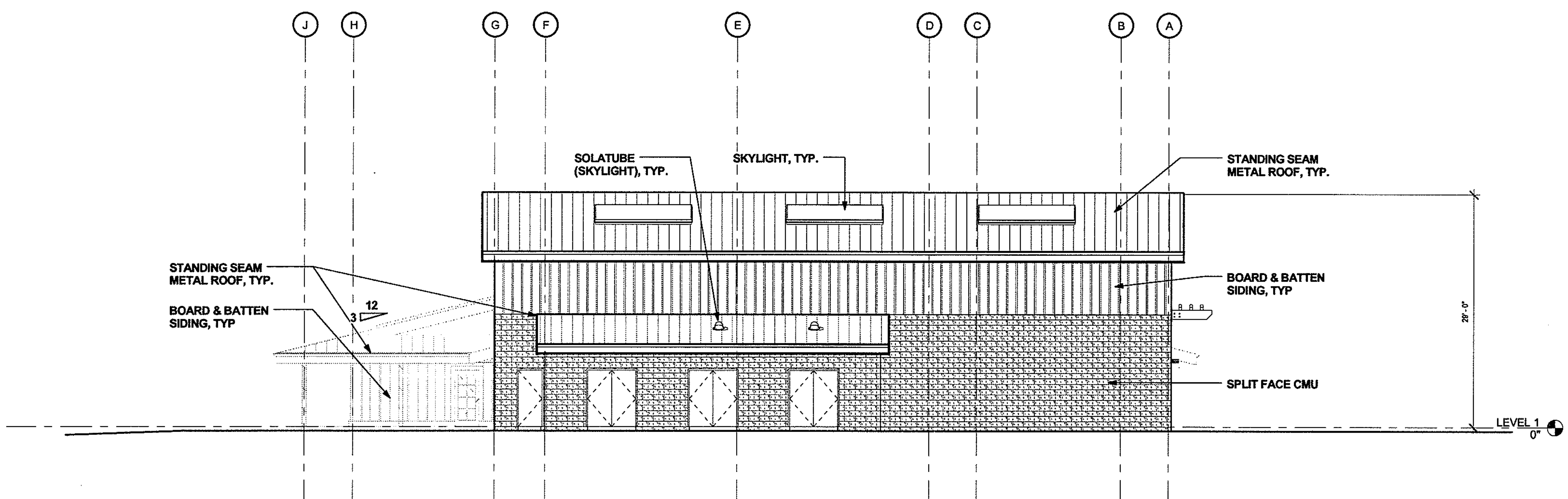


1 MAIN BUILDING - NORTH ELEVATION

SCALE: 1/8" = 1'-0"



2 MAIN BUILDING - EAST ELEVATION

SCALE: 1/8" = 1'-0"

EXTERIOR FINISHES						
Material: Name	CODE	DESCRIPTION	MANUFACTURER (OR APPROVED EQUAL)	PATTERN / STYLE / COLOR	Material: Comments	Material: Keynote
Interior Paint, P-1	P-1	??, Columns	??	?? Green	Exterior	
Interior Paint, P-2	P-2	??, Columns	??	?? Green	Exterior	
Interior Paint, P-4	P-4	??, Columns	??	?? Green	Exterior	
Interior Paint, P-5	P-5	??, Columns	??	?? Green	Exterior	
Masonry - Concrete Masonry Units, Split Face, CM1	CMF1	Colorless masonry sealer	??	?? Grey	Exterior	
Paint, P2	P2	??, Metal Coating	??	?? White	Exterior	
Paint, P3	P3	??, Trim	??	??	Exterior	
Roofing - Metal Standing Seam 12", MR1	MR1	Exterior finish, roofing	??	?? White	Exterior	
Siding - Board and Batten	WS1	Hardie Board, Exterior finish	Hardie	?? Green	Exterior	

140

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HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

EXTERIOR ELEVATIONS

1/8" = 1'-0"

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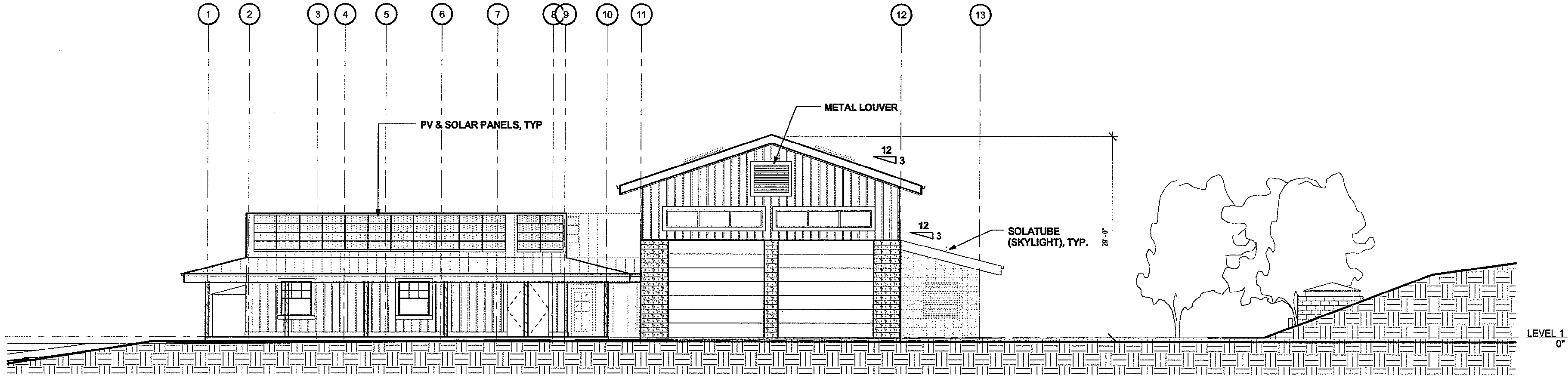
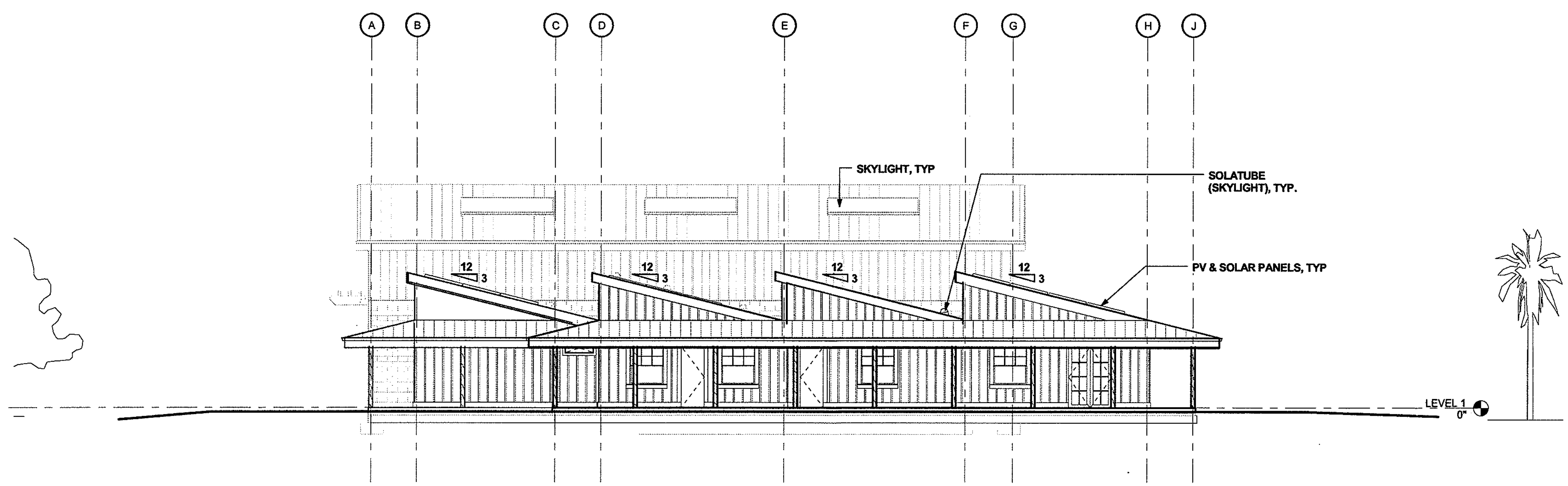


1 MAIN BUILDING - SOUTH ELEVATION

SCALE: 1/8" = 1'-0"



4 MAIN BUILDING - WEST ELEVATION

SCALE: 1/8" = 1'-0"

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NOTE: Contractor to check and verify dimensions at job before proceeding with work.

PROJECT NO:	5898.001
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DRAWN BY:	Author
DATE:	Issue Date
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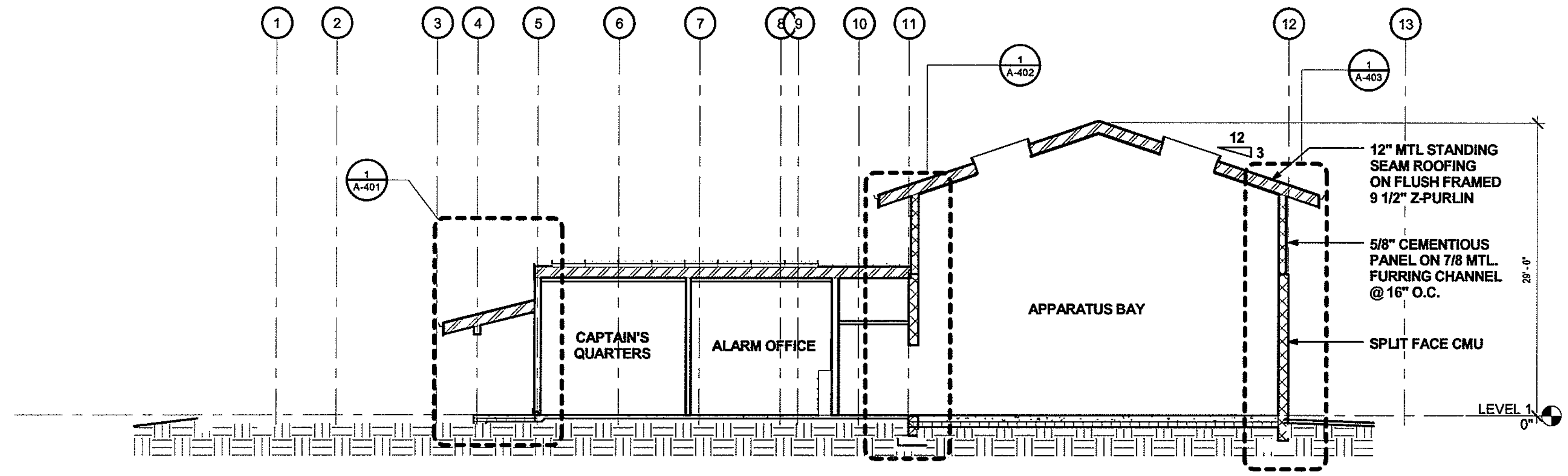
of Sheets



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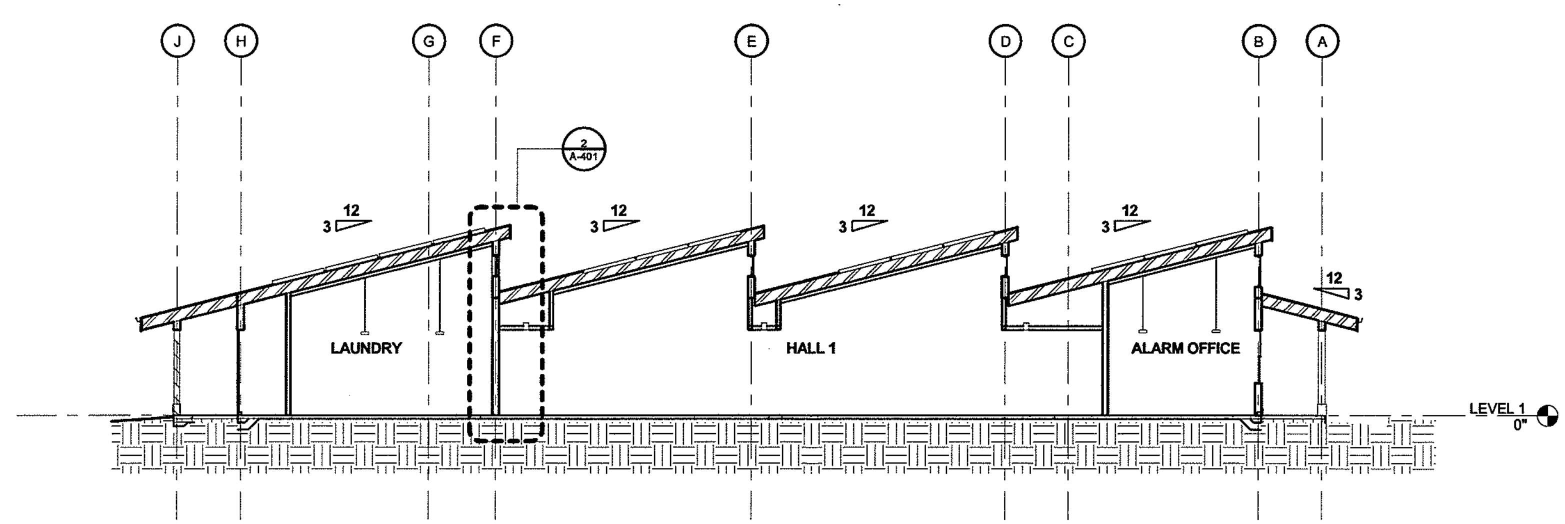

2 **SECTION @ GRIDLINE 10**

SCALE: 1/8" = 1'-0"

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www.ahldesign.com

HAIKU FIRE STATION

3550 HANA HWY
HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

BUILDING SECTIONS

1/8" = 1'-0"

TERRY McFARLAND ★ LICENSED PROFESSIONAL ARCHITECT No. 7418 ★ HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation. (observations of construction as defined in Chapter 16-115, Subchapter 1 Definitions of the Hawaii Administrative Rules, "Professional Engineers, Architects, Surveyors, and Landscape Architects.")

signature — 04/10/2010 expiration date of the license

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PROJECT NO:	5898.001
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DATE:	Issue Date
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A-301

of Sheets

DATE: 6/6/2010 1:23:20 PM

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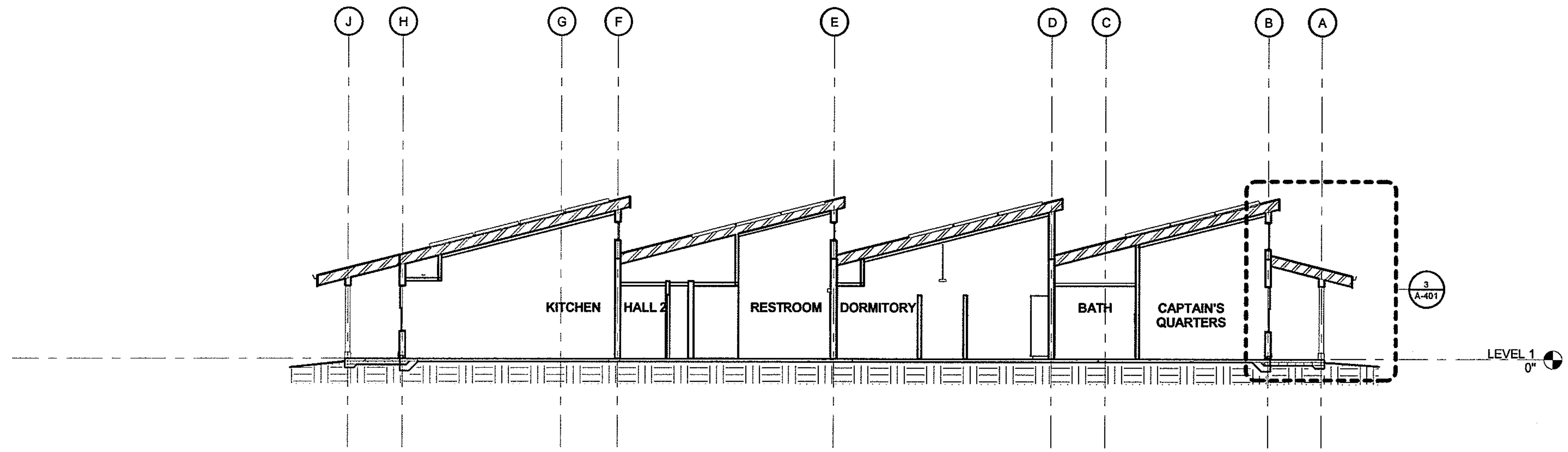

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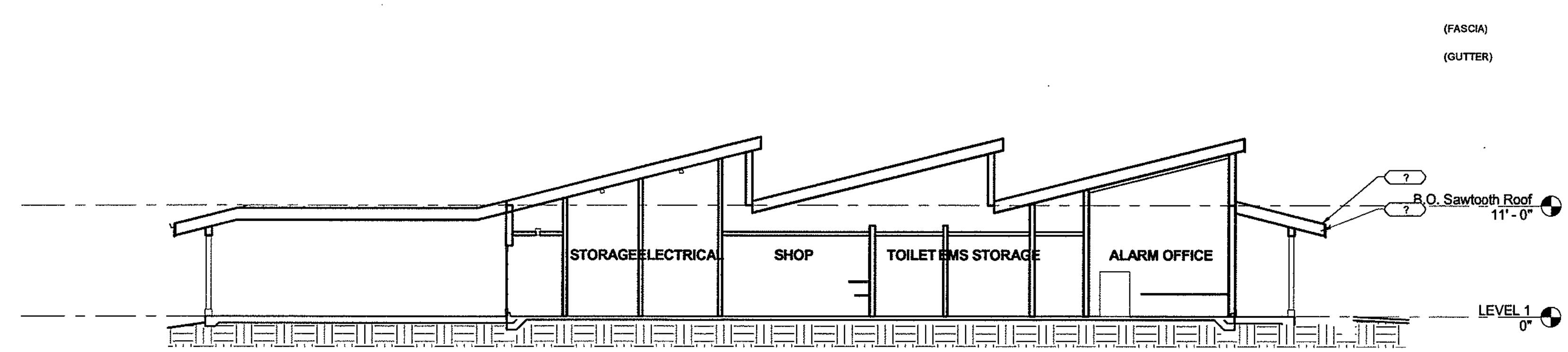

2 SECTION @ GRIDLINE 7
SCALE: 1/8" = 1'-0"

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HAIKU FIRE STATION
3550 HANA HWY
HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

BUILDING SECTIONS

1/8" = 1'-0"

TERRY McFARLAND
LICENSED PROFESSIONAL ARCHITECT
No. 7418
HAWAII, U.S.A.

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04/30/2010

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PROJECT NO: 5898.001
BIM FILE:
DRAWN BY: Author
DATE: Issue Date
DRAWING NO

A-302

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DATE: 8/6/2010 1:23:22 PM

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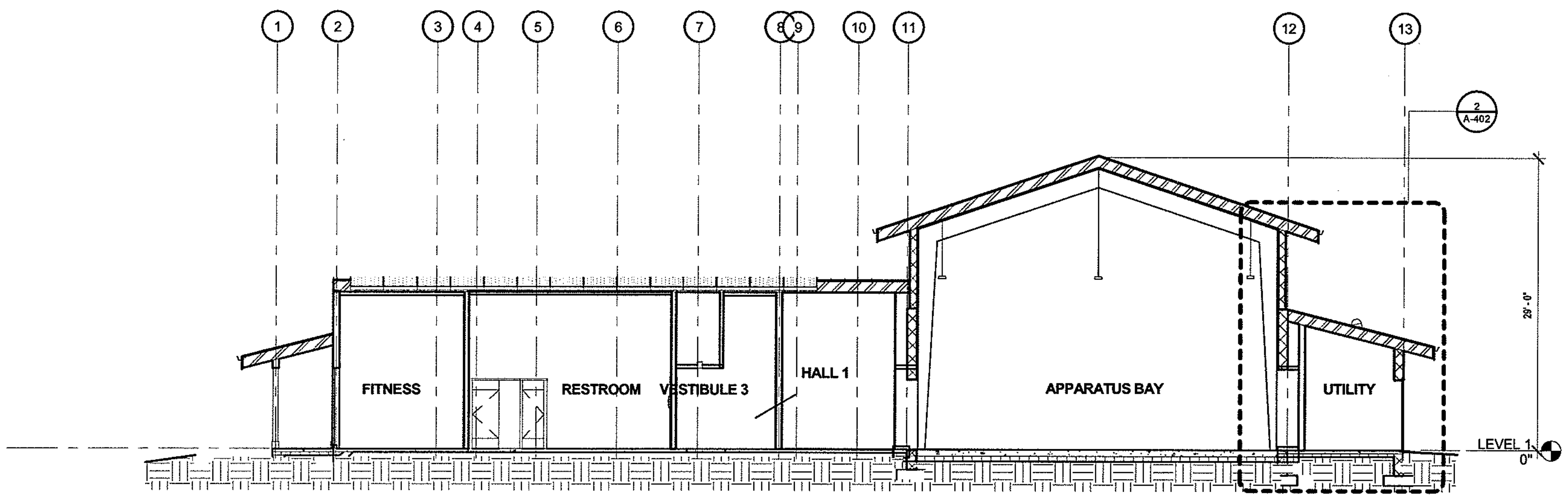

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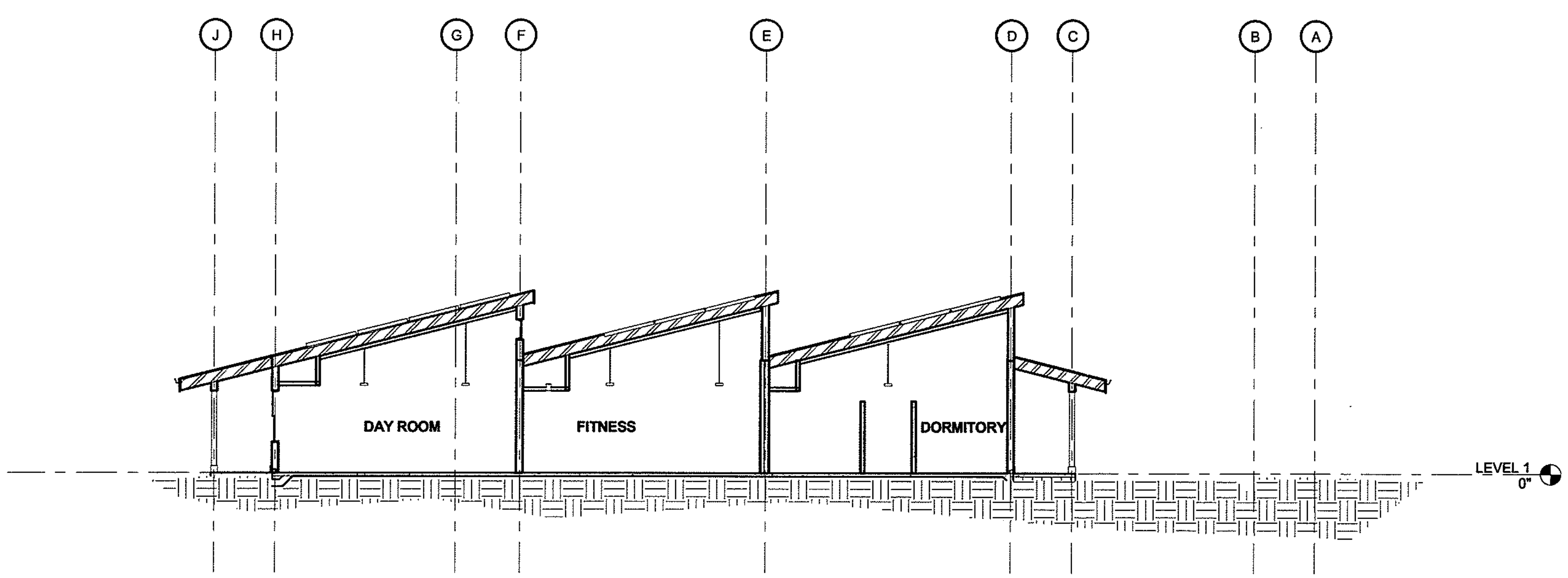

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HAIKU FIRE STATION

3550 HANA HWY
HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

BUILDING SECTIONS

1/8" = 1'-0"

TERRY McFARLAND
LICENSED PROFESSIONAL ARCHITECT
No. 7418
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation. (observations of construction as defined in Chapter 16-115, Subchapter 1 Definitions of the Hawaii Administrative Rules, "Professional Engineers, Architects, Surveyors, and Landscape Architects.")

04/10/2010

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GENERAL NOTES:

1. ALL CONSTRUCTION WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, DATED SEPTEMBER 1986, AND THE STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION, DATED SEPTEMBER 1984, AS AMENDED, OF THE DEPARTMENT OF PUBLIC WORKS, COUNTY OF MAUI.

2. VERIFY AND CHECK ALL DIMENSIONS AND DETAILS ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.

3. WORK INCIDENTAL TO THE CONTRACT AND NECESSARY TO COMPLETE THE PROJECT, ALTHOUGH NOT SPECIFICALLY REFERRED TO ON THE CONTRACT DOCUMENTS, SHALL BE FURNISHED AND PERFORMED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

4. IN PERFORMING ALL WORK, THE CONTRACTOR SHALL EXERCISE DUE CARE AND CAUTION NECESSARY TO AVOID ANY DAMAGE INFLICTED TO AND IMPAIRMENT IN THE USE OF ANY EXISTING UTILITY LINE. ANY DAMAGE INFLICTED ON EXISTING UTILITY LINES RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE IMMEDIATELY REPAIRED OR RESTORED AS DIRECTED BY THE ENGINEER AT THE CONTRACTOR'S EXPENSE.

5. THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY; AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER.

6. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AREA AND SURROUNDING AREA FREE FROM RUBBISH, DUST, NOISE, EROSION, ETC. THE WORK SHALL BE DONE IN CONFORMANCE WITH THE AIR AND WATER POLLUTION CONTROL STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH.

7. THE UNDERGROUND PIPES, CABLES OR DUCTLINES KNOWN TO EXIST BY THE ENGINEER FROM HIS SEARCH OF RECORDS ARE INDICATED ON THE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS AND DEPTHS OF THE FACILITIES AND EXERCISE PROPER CARE IN EXCAVATING IN THE AREA. WHEREVER CONNECTIONS OF NEW UTILITIES TO EXISTING UTILITIES ARE SHOWN ON THE PLANS, THE CONTRACTOR SHALL EXPOSE THE EXISTING LINES AT THE PROPOSED CONNECTIONS TO VERIFY THEIR LOCATIONS AND DEPTHS PRIOR TO EXCAVATION FOR NEW LINES.

8. THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS, LIGHTS, FLARES, BARRICADES, MARKERS, CONES, AND OTHER PROTECTIVE FACILITIES, AND SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION, CONVENIENCE AND SAFETY OF THE PUBLIC.

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE WATER QUALITY AND WATER POLLUTION CONTROL STANDARDS CONTAINED IN HAWAII ADMINISTRATIVE RULES, CHAPTER 11-54, "WATER QUALITY STANDARDS" AND CHAPTER 11-55, "WATER POLLUTION CONTROL". BEST MANAGEMENT PRACTICES SHALL BE EMPLOYED AT ALL TIMES DURING CONSTRUCTION.

10. WHEN TRENCH EXCAVATION IS ADJACENT TO OR UNDER EXISTING STRUCTURES OR FACILITIES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY SHEETING AND BRACING THE EXCAVATION AND STABILIZING THE EXISTING GROUND TO RENDER IT SAFE AND SECURE FROM POSSIBLE SLIDES, CAVE-INS AND SETTLEMENT AND FOR PROPERLY SUPPORTING EXISTING STRUCTURES AND FACILITIES WITH BEAMS, STRUTS OR UNDERPINNING TO FULLY PROTECT THEM FROM DAMAGE.

11. NO CONTRACTOR SHALL PERFORM ANY CONSTRUCTION OPERATION SO AS TO CAUSE FALLING ROCKS, SOIL OR DEBRIS IN ANY FORM TO FALL, SLIDE OR FLOW INTO EXISTING CITY DRAINAGE SYSTEMS, OR ADJOINING PROPERTIES, STREETS OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATIONS OCCUR, THE CONTRACTOR MAY BE CITED AND THE CONTRACTOR SHALL IMMEDIATELY MAKE ALL REMEDIAL ACTIONS NECESSARY AND BEAR ALL COSTS INCURRED FOR ANY REMEDIAL ACTIONS.

12. PRIOR TO START OF EXCAVATION, THE CONTRACTOR SHALL NOTIFY ALL AGENCIES AND UTILITIES AND HAVE THEM LOCATE THEIR RESPECTIVE LINES AFFECTED. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ALL OF HIS CONSTRUCTION AND SHALL PAY FOR ALL DAMAGES TO AND FOR THE PROTECTION OF EXISTING UTILITIES AND STRUCTURES.

13. THE CONTRACTOR SHALL RESTORE TO THEIR ORIGINAL OR BETTER CONDITION, ALL IMPROVEMENTS DAMAGED AS A RESULT OF THE CONSTRUCTION, INCLUDING PAVEMENTS, EMBANKMENTS, CURBS, SIGNS, LANDSCAPING, STRUCTURES, UTILITIES, WALLS, FENCES, ETC. UNLESS PROVIDED FOR SPECIFICALLY IN THE PROPOSAL. DEMOLITION AND RESTORATION OF EXISTING ITEMS SHALL BE INCIDENTAL AND INCLUDED WITHIN THE AMOUNT PAID FOR UNCLASSIFIED TRENCH EXCAVATION.

14. THE CONTRACTOR SHALL PROVIDE A LAND SURVEYOR, LICENSED IN THE STATE OF HAWAII, TO STAKE OUT BENCHMARK, BASELINE, CONSTRUCTION STAKES FOR THE NEW WORK. THE CONTRACTOR SHALL VERIFY AND CHECK ALL DIMENSIONS AND DETAILS ON THE DRAWING PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCY SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE ENGINEER FOR CLARIFICATION.

15. THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED PERMITS FROM APPROPRIATE GOVERNMENT AGENCIES.

16. THE BENCH MARK FOR THIS PROJECT IS SHOWN ON DRAWING C-3.

17. ALL ABANDONED PIPE OPENINGS SHALL BE PLUGGED WITH CLASS C 2000 CONCRETE TO A DEPTH OF 1.50 TIMES THE DIAMETER OF THE PIPE. PAYMENT FOR CUTTING AND PLUGGING SHALL NOT BE MADE DIRECTLY BUT SHALL BE INCIDENTAL TO THE VARIOUS ITEMS OF THE PROPOSAL. THE CONTRACTOR SHALL VERIFY THE SIZE AND TYPE OF LINE TO BE PLUGGED.

18. THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH DEPARTMENT OF HEALTH REGULATIONS TITLE 11, CHAPTER 46 REGARDING NOISE CONTROL FOR OAHU.

19. THE CONTRACTOR IS ALERTED TO THE ENCOUNTERING OF OBSTACLES WHETHER SHOWN ON THE PLANS OR NOT, OR WHICH MAY DIFFER IN LOCATION FROM THAT SHOWN ON THE PLANS WHICH MAY INTERFERE WITH HIS NORMAL METHOD OF OPERATIONS. THE CONTRACTOR SHALL TAKE INTO ACCOUNT ANY ADDITIONAL COSTS ANTICIPATED DUE TO THESE CONDITIONS AND SHALL HAVE THESE COSTS INCLUDED IN THE BID ITEMS WHICH HE FEELS MOST APPROPRIATE.

GENERAL NOTES CONT.:

20. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL ASSUMPTIONS, DEDUCTIONS, OR CONCLUSIONS HE MAY MAKE OR DERIVE FROM THE SUBSURFACE INFORMATION OR DATA FURNISHED ON THE PLANS. THE CONTRACTOR MUST SATISFY HIMSELF THROUGH HIS OWN INVESTIGATIONS AS TO WHAT SUBSURFACE CONDITIONS ARE TO BE ENCOUNTERED.

21. IN THE EVENT ANY ARTIFACTS OR HUMAN REMAINS ARE UNCOVERED DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE STATE DEPARTMENT OF LAND AND NATURAL RESOURCES-HISTORIC PRESERVATION DIVISION (692-8015).

22. IF THE CONTRACTOR ELECTS NOT TO EXPOSE AND VERIFY ALL EXISTING UNDERGROUND UTILITIES AND STRUCTURES AT CROSSINGS PRIOR TO PIPELINE EXCAVATION, HE FORFEITS HIS RIGHTS FOR ANY CLAIMS FOR COMPENSATION CAUSED BY ANY CONFLICTS WITH EXISTING UTILITIES AND STRUCTURES.

23. A SOILS REPORT BY HIRATA & ASSOCIATES, INC. DATED OCTOBER 7, 2008, CAN BE OBTAINED FROM THE OWNER.

24. ALL CONSTRUCTION WORK SHALL BE DONE IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES (ADAAG). THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS AND OTHER PROTECTIVE FACILITIES WHICH SHALL CONFORM WITH THE ADAAG.

25. THE CONTRACTOR SHALL NOTIFY THE DEPARTMENT OF PUBLIC WORKS' DIVISION OF ENGINEERING BRANCH SEVEN (7) DAYS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

GRADING NOTES:

1. ALL GRADING WORK SHALL CONFORM TO CHAPTER 20.08 OF THE MAUI COUNTY CODE, 1983, AS AMENDED, AS RELATED TO GRADING, SOIL EROSION AND SEDIMENT CONTROL, AND SOIL REPORT BY HIRATA & ASSOCIATES, INC. DATED OCTOBER 7, 2008, WHERE APPLICABLE.

2. NO CONTRACTOR SHALL PERFORM ANY GRADING OPERATION SO AS TO CAUSE FALLING ROCKS, SOIL OR DEBRIS IN ANY FORM TO FALL, SLIDE OR FLOW ONTO ADJOINING PROPERTIES, STREETS OR NATURAL WATERCOURSES. SHOULD SUCH VIOLATIONS OCCUR, THE COSTS INCURRED FOR ANY REMEDIAL ACTION BY THE CHIEF ENGINEER SHALL BE PAYABLE BY THE CONTRACTOR.

3. THE CONTRACTOR, AT HIS OWN EXPENSE, SHALL KEEP THE PROJECT AREA AND SURROUNDING AREA FREE FROM DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION CONTROL STANDARDS CONTAINED IN THE AIR POLLUTION CONTROL STANDARDS AND REGULATIONS OF THE STATE HEALTH DEPARTMENT.

4. ADEQUATE PROVISIONS SHALL BE MADE TO PREVENT SURFACE WATERS FROM DAMAGING THE CUT FACE OF AN EXCAVATION OR THE SLOPED SURFACES OF A FILL. FURTHERMORE, ADEQUATE PROVISIONS SHALL BE MADE TO PREVENT SEDIMENT-LADEN RUNOFF FROM LEAVING THE SITE.

5. ALL SLOPES AND EXPOSED AREAS SHALL BE SODDED OR PLANTED AS SOON AS FINAL GRADES HAVE BEEN ESTABLISHED. PLANTING SHALL NOT BE DELAYED UNTIL ALL GRADING WORK HAS BEEN COMPLETED. GRADING TO FINAL GRADE SHALL BE CONTINUOUS, AND ANY AREA WITHIN WHICH WORK HAS BEEN INTERRUPTED OR DELAYED SHALL BE PLANTED.

6. FILLS ON SLOPES STEEPER THAN 5:1 SHALL BE KEYED.

7. THE COUNTY SHALL BE INFORMED OF THE LOCATION OF THE BORROW/DISPOSAL SITE FOR THE PROJECT WHEN THE APPLICATION FOR A GRADING PERMIT IS MADE. THE BORROW/DISPOSAL SITE MUST ALSO FULFILL THE REQUIREMENTS OF THE GRADING ORDINANCE.

8. NO GRADING WORK SHALL BE DONE ON SATURDAYS, SUNDAYS AND HOLIDAYS AT ANY TIME WITHOUT PRIOR NOTICE TO THE ENGINEER.

9. THE LIMITS OF THE AREA TO BE GRADED SHALL BE FLAGGED BEFORE THE COMMENCEMENT OF THE GRADING WORK.

10. ALL GRADING OPERATIONS SHALL BE PERFORMED IN CONFORMANCE WITH THE APPLICABLE PROVISIONS OF THE WATER POLLUTION CONTROL AND WATER QUALITY STANDARDS CONTAINED IN HAWAII ADMINISTRATIVE RULES, CHAPTER 11-55, "WATER POLLUTION CONTROL" AND CHAPTER 11-54, "WATER QUALITY STANDARDS" AND THE NPDES PERMIT FOR THE PROJECT.

11. WHERE APPLICABLE AND FEASIBLE THE MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE ANY EARTH MOVING PHASE OF THE GRADING IS INITIATED.

12. TEMPORARY EROSION CONTROLS SHALL NOT BE REMOVED BEFORE PERMANENT EROSION CONTROLS ARE IN-PLACE AND ESTABLISHED.

13. TEMPORARY EROSION CONTROL PROCEDURES SHALL BE SUBMITTED FOR APPROVAL PRIOR TO APPLICATION FOR GRADING PERMIT.

14. IF THE GRADING WORK INVOLVES CONTAMINATED SOIL, THEN ALL GRADING WORK SHALL BE DONE IN CONFORMANCE WITH APPLICABLE STATE AND FEDERAL REQUIREMENTS.

15. NON-COMPLIANCE TO ANY OF THE ABOVE REQUIREMENTS SHALL MEAN IMMEDIATE SUSPENSION OF ALL WORK, AND REMEDIAL WORK SHOULD COMMENCE IMMEDIATELY. ALL COSTS INCURRED SHALL BE BILLED TO THE PERMITEE. FURTHERMORE, VIOLATORS SHALL BE SUBJECTED TO ADMINISTRATIVE, CIVIL AND/OR CRIMINAL PENALTIES.

EROSION/TEMPORARY DUST CONTROL NOTES:

1. DURING CONSTRUCTION, PREVENTIVE MEASURES SHALL BE USED TO CONTROL FORESEEABLE DUST, EROSION OR SEDIMENTATION PROBLEMS, WHICH MAY ARISE AS THE JOB PROGRESSES.

2. ALL FILL, SUBBASE AND BASE MATERIAL PLACED WITHIN THE ROAD PAVEMENT PRISM SHALL BE SUBSTANTIALLY COMPACTED BY THE END OF THE DAY.

3. THE CONTRACTOR SHALL CONDUCT HIS GRADING OPERATIONS SO THAT EXCAVATION EMBANKMENT AND IMPORTED MATERIAL SHALL BE DAMPENED WITH WATER DURING HIS GRADING OPERATIONS AT ALL TIMES.

4. WATER TRUCK AND/OR TEMPORARY SPRINKLERS SHALL BE AVAILABLE ON THE JOB SITE AT ALL TIMES TO ENSURE BARE EARTH DOES NOT CREATE A DUST PROBLEM.

5. FUGITIVE DUST AND SOLID WASTE DISPOSAL DURING GRUBBING AND GRADING ACTIVITIES SHALL MEET REQUIREMENTS OF ADMINISTRATIVE RULES, TITLE II, CHAPTER 60.1, "AIR POLLUTION CONTROL," AND CHAPTER 56, "SOLID WASTE MANAGEMENT CONTROL."

6. TEMPORARY VEGETATIVE COVER SHALL BE PLANTED WITHIN A PERIOD OF THIRTY (30) CALENDAR DAYS AFTER THE SITE HAS BEEN GRADED OR BARED OF VEGETATION OR IF FINAL GRADING OR LANDSCAPING OF THE SITE WILL BE SUSPENDED FOR MORE THAN THIRTY (30) CALENDAR DAYS, TEMPORARY VEGETATIVE COVER SHALL CONSIST OF 40-LB COMMON RYE GRASS SEED PER ACRE. 400 LB PER ACRE 10-10-10 OR EQUIVALENT FERTILIZER WORKED INTO SEED BED BEFORE PLANTING. TEMPORARY SPRINKLER SYSTEM TO BE INSTALLED CONCURRENTLY WITH ALL PLANTINGS. PLANTING AND MAINTENANCE TO GRASS SHALL CONFORM TO THE "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION," DATED SEPTEMBER 1986.

PUBLIC HEALTH, SAFETY AND CONVENIENCE:

1. THE CONTRACTOR SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE, AND LOCAL LAWS REQUIRED FOR THE PROTECTION OF PUBLIC HEALTH AND SAFETY AND ENVIRONMENTAL QUALITY.

2. THE CONTRACTOR SHALL REMOVE ALL SILT AND DEBRIS RESULTING FROM HIS WORK AND DEPOSITED IN DRAINAGE FACILITIES, ROADWAYS AND OTHER AREAS. THE COSTS INCURRED FOR ANY NECESSARY REMEDIAL ACTION BY THE CHIEF ENGINEER SHALL BE PAYABLE BY THE CONTRACTOR.

3. THE CONTRACTOR, AT HIS EXPENSE, SHALL KEEP THE PROJECT AREA AND SURROUNDING AREA FREE OF DUST NUISANCE. THE WORK SHALL BE IN CONFORMANCE WITH THE AIR POLLUTION CONTROL STANDARDS AND REGULATIONS OF THE STATE DEPARTMENT OF HEALTH.

4. AS REQUIRED BY THE COUNTY, THE CONTRACTOR SHALL HIRE SPECIAL DUTY POLICE OFFICERS TO CONTROL THE FLOW OF TRAFFIC.

5. DURING NON-WORKING HOURS ALL LANES SHALL BE OPEN AND ALL EXCAVATIONS ON THE ROADWAY SHALL BE COVERED WITH A SAFE NON-SKID BRIDGING MATERIAL. DRIVEWAYS SHALL BE KEPT OPEN UNLESS THE OWNERS TO THE PROPERTY USING THESE RIGHTS-OF-WAYS ARE OTHERWISE PROVIDED FOR SATISFACTORILY.

6. DURING WORKING HOURS, THE CONTRACTOR SHALL MAINTAIN A ROADWAY SUITABLE FOR ONE LANE OF TRAFFIC WITH FLAGMEN AT BOTH ENDS, ALTERNATING DIRECTION OF TRAFFIC FLOW.

7. THE CONTRACTOR SHALL PROVIDE, INSTALL AND MAINTAIN ALL NECESSARY SIGNS, LIGHTS, FLARES, BARRICADES, MARKERS, CONES, AND OTHER PROTECTIVE FACILITIES AND SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION, CONVENIENCE, AND SAFETY OF THE PUBLIC.

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HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

NOTES - 1

DIANE Y. KODAMA
LICENSED PROFESSIONAL ENGINEER
No. 8688-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation. (Observation of construction as defined in Chapter 16-115, Subchapter 1 Definitions of the Hawaii Administrative Rules, "Professional Engineers, Architects, Surveyors, and Landscape Architects.")

signature — expiration date of the license

NOTE: Contractor to check and verify dimensions at job before proceeding with work.

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of Sheets

NOTES FOR CONSTRUCTION WITHIN THE STATE RIGHT-OF-WAY:

1. THE CONTRACTOR SHALL OBTAIN A PERMIT TO PERFORM WORK UPON STATE HIGHWAYS FROM THE MAUI DISTRICT ENGINEER, STATE HIGHWAYS, AT 650 PALAPALA DRIVE, PRIOR TO COMMENCEMENT OF WORK WITHIN THE STATE'S HIGHWAY RIGHT-OF-WAY.

2. CONSTRUCTION AND RESTORATION OF ALL EXISTING HIGHWAY FACILITIES WITHIN STATE RIGHT-OF-WAY SHALL BE DONE IN ACCORDANCE WITH ALL APPLICABLE SECTIONS OF THE CURRENT <u>STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND PUBLIC WORKS CONSTRUCTION</u>, AND THE <u>SPECIFICATIONS FOR INSTALLATION OF MISCELLANEOUS IMPROVEMENTS WITHIN STATE HIGHWAYS</u>, OF THE STATE DEPARTMENT OF TRANSPORTATION'S HIGHWAYS DIVISION.

3. ALL LANES SHALL BE OPEN TO TRAFFIC DURING THE MORNING PEAK HOURS FROM 6:30 A.M. TO 8:30 A.M. AND DURING THE AFTERNOON PEAK HOURS FROM 3:30 P.M. TO 5:30 P.M., AND DURING OFF-WORK HOURS. ONLY ONE LANE OF TRAFFIC SHALL BE CLOSED AT ANY OTHER TIME.

4. THE CONTRACTOR SHALL PROVIDE, INSTALL, AND MAINTAIN ALL NECESSARY SIGNS, LIGHTS, FLARES, BARRICADES, MARKERS, CONES, AND OTHER PROTECTIVE FACILITIES AND SHALL TAKE ALL NECESSARY PRECAUTIONS FOR THE PROTECTION, CONVENIENCE, AND SAFETY OF THE TRAVELING PUBLIC. ALL SUCH PROTECTIVE FACILITIES AND PRECAUTIONS SHALL CONFORM WITH THE "<u>ADMINISTRATIVE RULES OF HAWAI'I GOVERNING THE USE OF TRAFFIC CONTROL DEVICES AT WORK SITES ON, OR ADJACENT TO, PUBLIC STREETS AND HIGHWAYS</u>", ADOPTED BY THE DIRECTOR OF TRANSPORTATION, AND THE CURRENT US FEDERAL HIGHWAY ADMINISTRATION "<u>MANUAL ON THE UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS, PART VI – STANDARDS AND GUIDES FOR TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION, MAINTENANCE, UTILITY, AND INCIDENTAL MANAGEMENT OPERATIONS</u>". IF LANE CLOSURES ARE REQUIRED DURING CONSTRUCTION, A TRAFFIC CONTROL PLAN SHALL BE INCORPORATED INTO THE CONSTRUCTION PLANS AND MUST BE APPROVED BY THE DIVISION PRIOR TO THE ISSUANCE OF THE PERMIT.

5. THE MINIMUM PAVEMENT STRUCTURE SHALL CONSIST OF:

   A. RESIDENTIAL DRIVEWAYS

      a. 2" ASPHALT CONCRETE ON 6" AGGREGATE BASE COURSE OR 2" ASPHALT CONCRETE ON 2-1/2" GLASSPHALT BASE COURSE OR ASPHALT CONCRETE.

      b. 4" OF CLASS "A" CONCRETE REINFORCED WITH 6"x6"-W2.9xW2.9 WIRE MESH 12" AGGREGATE SUBBASE IF DEEMED NECESSARY BY THE ENGINEER.

   B. COMMERCIAL DRIVEWAYS, SIDE ROADS AND UTILITY INSTALLATIONS ON MINOR HIGHWAYS:

      a. 2-1/2" ASPHALT CONCRETE, 8" AGGREGATE BASE COURSE ON 12" AGGREGATE SUBBASE, OR 2-1/2" ASPHALT CONCRETE ON 8" GLASSPHALT CONCRETE BASE COURSE OR ASPHALT CONCRETE.

      b. 6" OF CLASS "A" CONCRETE REINFORCED WITH 6"x6"-W2.9xW2.9 WIRE MESH ON 12" AGGREGATE SUBBASE IF DEEMED NECESSARY BY ENGINEER.

   C. CHANNELIZED INTERSECTIONS AND UTILITY INSTALLATIONS ON MAJOR HIGHWAYS:

      a. 4" ASPHALT CONCRETE, 8" AGGREGATE BASE COURSE ON 12" AGGREGATE SUBBASE, OR 4" ASPHALT CONCRETE ON 8" GLASSPHALT CONCRETE BASE COURSE OR ASPHALT CONCRETE OR, MATCH EXISTING PAVEMENT STRUCTURE, WHICH EVER IS GREATER.

6. NO MATERIAL AND/OR EQUIPMENT SHALL BE STOCKPILED OR OTHERWISE STORED WITHIN HIGHWAY RIGHT-OF-WAY, EXCEPT AT LOCATIONS DESIGNATED IN WRITING AND APPROVED BY THE DISTRICT ENGINEER.

7. COMPACTION TESTS SHALL BE TAKEN IN ACCORDANCE WITH THE CURRENT "SPECIFICATIONS FOR INSTALLATION OF MISCELLANEOUS IMPROVEMENTS WITHIN STATE HIGHWAYS", AS FOLLOWS:

   A. SUBBASE: <u>ONE (1)</u> COMPACTION TEST PER LIFT <u>EACH 300 LINEAL FEET</u>.

   B. BASE COURSE: <u>ONE (1)</u> COMPACTION TEST PER LIFT <u>EACH 200 LINEAL FEET</u>.

   C. <u>ONE (1)</u> COMPACTION TEST(S) PER LIFT FOR EACH <u>200</u> LINEAL FEET OF TRENCH.

8. NO TRENCH SHALL BE OPENED MORE THAN <u>500</u> FEET IN ADVANCE OF THE INSTALLED AND TESTED PIPE AND/OR DUCTLINE.

9. PRIOR TO COMMENCING TRENCH EXCAVATION WORK, THE CONTRACTOR SHALL TAKE A SURFACE PROFILE ALONG THE CENTERLINE OF THE PROPOSED UTILITY TRENCH. THIS INFORMATION SHALL BE USED IN VERIFYING THAT THE ROADWAY HAS BEEN RESTORED TO ITS ORIGINAL CONDITION. A COPY OF THE TRENCH PROFILE SHALL BE SUBMITTED TO THE DISTRICT ENGINEER.

10. THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADEQUATE, SAFE, NON-SKID BRIDGING MATERIAL OVER THE TRENCH, INCLUDING SHORING, WHEN TRENCHING IN PAVEMENT AREAS TO HANDLE ALL TYPES OF VEHICULAR TRAFFIC. SMOOTH RIDING TAPERS SHALL BE PROVIDED FOR PAVEMENT TRANSITIONS AND ADVANCED WARNING SIGNS SHALL BE POSTED. PRIOR TO INSTALLING SUCH BRIDGING MATERIAL, THE CONTRACTOR SHALL SUBMIT TO THE DISTRICT ENGINEER FOR ACCEPTANCE, DRAWINGS STAMPED BY A LICENSED STRUCTURAL ENGINEER.

11. LONGITUDINAL DRAINAGE ALONG THE HIGHWAY SHALL BE MAINTAINED AT ALL TIMES.

12. EXISTING HIGHWAY DRAINAGE SYSTEMS SHALL REMAIN FUNCTIONAL AT ALL TIMES.

13. PAVEMENT STRIPING SHALL BE DONE BY THE CONTRACTOR, AND SHALL BE REPLACED IN KIND.

14. APPROVAL OF PERMIT CONSTRUCTION PLANS SHALL BE VALID FOR A PERIOD OF ONE YEAR THEREOF FROM THE DATE OF NOTIFICATION OF APPROVAL TO THE APPLICANT. IN THE EVENT CONSTRUCTION DOES NOT COMMENCE WITHIN THIS ONE-YEAR PERIOD, THE APPLICANT WILL BE REQUIRED TO RESUBMIT HIS CONSTRUCTION PLANS FOR DIVISION'S REVIEW AND APPROVAL.

15. ALL REGULATORY, GUIDE, CONSTRUCTION SIGNS, AND BARRICADES SHALL BE OF HIGH INTENSITY REFLECTIVE SHEETING.

16. UNPROTECTED PAVEMENT DROP OFFS GREATER THAN 2" WITHIN 8 FEET OF THE TRAVEL WAY SHALL NOT BE ALLOWED DURING NON-WORKING HOURS, EXCEPT WHERE APPROVED BY THE ENGINEER IN WRITING.

NOTES FOR CONSTRUCTION WITHIN THE STATE RIGHT-OF-WAY CONT.:

17. NO OPEN TRENCHES SHALL BE PERMITTED WITHIN THE CLEAR ZONE, DEFINED BY THE CURRENT EDITION OF THE AASHTO ROADSIDE DESIGN GUIDE, EXCEPT WHERE SPECIFIED IN THE APPROVED TRAFFIC CONTROL PLAN, OR AS APPROVED BY THE ENGINEER IN WRITING.

18. FREE FLOW OF TRAFFIC SHALL BE MAINTAINED IN BOTH DIRECTIONS AT ALL TIMES. TEMPORARY STOPPAGES REQUIRE ADVANCE APPROVAL IN WRITING FROM THE OAHU DISTRICT ENGINEER AND A NOTICE TO MOTORISTS MAY BE REQUIRED. SUBMIT THE NOTICE TO THE DISTRICT ENGINEER FOR REVIEW AND ACCEPTANCE A MINIMUM OF 6 WEEKS PRIOR TO PUBLICATION.

19. CLEAR SHOULDER AREAS SHALL BE MAINTAINED FOR BICYCLISTS AND PEDESTRIAN TRAFFIC AT ALL TIMES. IF ONE SHOULDER IS TO BE CLOSED, APPROPRIATE SIGNS SHALL BE POSTED DIRECTING BICYCLISTS AND PEDESTRIANS TO USE ALTERNATE SHOULDER AREA.

20. CONTRACTOR SHALL PROVIDE THE DISTRICT ENGINEER WITH "AS-BUILT" DRAWINGS UPON COMPLETION OF WORK. THIS SHALL BE DONE PRIOR TO THE DEPARTMENT'S RELEASE OF THE PERMIT BOND.

21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND REPAIR ALL DAMAGE CAUSED BY THE CONTRACTOR'S OPERATIONS. ANY SUCH, REPAIR WORK SHALL BE DONE BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE STATE. DAMAGES TO ANY EXISTING FACILITIES SHALL BE IMMEDIATELY REPORTED TO THE RESPECTIVE UTILITY COMPANIES, CITY OR STATE AGENCY.

WATER NOTES:

1. THE CONTRACTOR SHALL NOTIFY THE DEPARTMENT OF WATER SUPPLY (DWS), IN WRITING, ONE (1) WEEK PRIOR TO COMMENCEMENT OF WORK.

2. ALL MATERIALS USED AND METHODS OF CONSTRUCTION OF WATER SYSTEM FACILITIES SHALL BE IN ACCORDANCE WITH THE LATEST REVISIONS OF DWS STANDARDS. CONTRACTOR SHALL OBTAIN THE LATEST REVISIONS OF THE DWS STANDARD DETAILS BEFORE COMMENCING CONSTRUCTION.

3. THE EXACT DEPTH AND LOCATION OF EXISTING WATERLINES, SERVICE LATERALS AND OTHER UTILITIES ARE NOT KNOWN. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO LOCATE SAME PRIOR TO TRENCHING FOR THE NEW WATERLINE. THE COST OF LOWERING, RELOCATING OR ADJUSTING EXISTING WATERLINES, SERVICE LATERALS AND OTHER UTILITIES SHALL BE CONSIDERED INCIDENTAL TO THE COST OF THE NEW WATERLINE, UNLESS NOTED OTHERWISE, AND WILL NOT BE PAID FOR SEPARATELY.

4. CONCRETE FOR REACTION BLOCKS AND ANCHOR BLOCKS SHALL BE DWS CLASS 2500.

5. THE MAXIMUM DISTANCE BETWEEN VALVE NUT AND TOP OF MANHOLE COVER SHALL BE THREE (3) FEET.

6. THE CONTRACTOR SHALL SUBMIT A MATERIALS LIST TO DWS FOR APPROVAL PRIOR TO CONSTRUCTION.

7. CONNECTION TO DWS SYSTEM:

   A. THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION, DEPTH, TYPE, AND CONDITION OF THE EXISTING LINE BEFORE ORDERING MATERIALS FOR THE HOOK-UP. HE SHALL, HOWEVER, CHECK WITH DWS BEFORE EXCAVATING FOR VERIFICATION PURPOSES. HE SHALL BE RESPONSIBLE FOR FURNISHING ALL NECESSARY FITTINGS AND OTHER MATERIALS REQUIRED FOR THE HOOK-UP.

   B. WHENEVER FEASIBLE, MECHANICAL JOINT FITTINGS SHALL BE USED FOR BURIED APPLICATIONS, FLANGED JOINT FITTINGS SHALL BE USED FOR EXPOSED APPLICATIONS.

   C. AUTHORIZED DWS PERSONNEL WILL MAKE THE FINAL CONNECTION TO THE EXISTING LINE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS INCURRED BY DWS FOR SAID WORK, INCLUDING THE COST OF PRESSURE TESTING.

   D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL MATERIAL, EQUIPMENT AND LABOR FOR CHLORINATION, TRENCH EXCAVATION, BACKFILLING, PAVING, AND OTHER WORK NECESSARY TO COMPLETE THE HOOK-UP, AS DIRECTED BY AND TO THE SATISFACTION OF DWS.

8. FOR 316 STAINLESS STEEL BOLTING, HEAVY DUTY STAINLESS STEEL NUTS SHALL BE FURNISHED WITH TRIPAC 2000 BLUE COATING SYSTEM. ANTI-SEIZE NOT BE USED.

9. MINIMUM COVER OVER WATER MAIN, 6" DIAMETER OR LARGER, SHALL BE 3'-0". MINIMUM COVER FOR 4" DIAMETER SHALL BE 2'-6". MINIMUM COVER FOR DIAMETERS LESS THAN 4" SHALL BE 1'-6".

10. ALL BURIED METALS SHALL BE WRAPPED WITH POLY-WRAP. FOR ALL BURIED INSTALLATIONS OF DUCTILE IRON PIPE AND FITTINGS, POLY-WRAP IS REQUIRED EXCEPT WITHIN CONCRETE JACKETS.

11. LUBRICATE HYDRANT NOZZLE THREADS WITH NON-TOXIC GREASE.

12. THE CONTRACTOR SHALL PAINT AND NUMBER THE FIRE HYDRANT. NUMBERING TO BE FURNISHED BY DWS.

13. WATER MAINS AND APPURTENANCES SHALL BE SUBJECT TO HYDROSTATIC TESTING IN ACCORDANCE WITH THE LATEST REVISION OF AWWA C600, UNDER THE "HYDROSTATIC TESTING" SECTION, TO A PRESSURE OF AT LEAST 1.5 TIMES THE WORKING PRESSURE. UNLESS OTHERWISE STATED IN THE CONSTRUCTION DOCUMENTS OR LIMITED BY THE PRESSURE RATING OF EQUIPMENT, THE PRESSURE TEST AND LEAKAGE TEST SHALL BE PERFORMED AT 225 POUNDS PER SQUARE PER SQUARE INCH PRESSURE.

14. THE DEVELOPER SHALL SUBMIT A COST LIST ALONG WITH AN AFFIDAVIT FOR THE WATER SYSTEM PRIOR TO ACCEPTANCE.

15. THE CONTRACTOR SHALL SUBMIT TWO SETS OF RECORD DRAWINGS VIA A CONSULTANT PRIOR TO ACCEPTANCE OF THE WATER SYSTEM. AN ELECTRONIC IMAGE FILE IN TIF FORMAT SHALL BE PROVIDED TO THE DWS FOR ALL PROJECTS.

16. CONTRACTOR SHALL VERIFY THE MATERIALS OF THE EXISTING WATER MAINS TO THE NEW WATER SYSTEM. IN THE EVENT THAT AC PIPE IN DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY AND ENSURE THAT NO TAPPING VALVES ARE USED TO CONNECT TO THE EXISTING SYSTEM.

CHLORINATION OF WATER SYSTEMS

1. LIQUID CHLORINE OR CALCIUM HYPOCHLORITE, CONFORMING TO AWWA STANDARDS SHALL BE USED FOR THE CHLORINATION OF THE PROJECT.

2. PRIOR TO CHLORINATION, THE PROJECT SHALL BE THOROUGHLY CLEANED. CLEANING OF LINES 8" OR LARGER SHALL BE BY PIGGING USING FOAM PIGS. SMALLER LINES CAN BE FLUSHED IN ACCORDANCE WITH AWWA REQUIREMENTS IF ADEQUATE WATER SUPPLY IS PROVIDED, OTHERWISE BY PIGGING. THE CONTRACTOR SHALL SUBMIT HIS PLAN FOR PIPELINE CLEANING, INCLUDING FITTING REQUIREMENTS FOR PIGGING, FOR APPROVAL PRIOR TO PROCEEDING.

3. THE INTERIOR SURFACES OF THE PROJECT SHALL BE EXPOSED TO THE CHLORINATING SOLUTION FOR A MINIMUM OF 24 HOURS AND THE CHLORINE RESIDUAL SHALL NOT BE LESS THAN 10 PPM AFTER SUCH TIME.

4. SHOULD CALCIUM HYPOCHLORITE BE USED, NO SOLID AND/OR UNDISSOLVED PORTION OF THE COMPOUND SHALL BE INTRODUCED INTO ANY SECTION OF THE PROJECT TO BE CHLORINATED.

5. AT THE END OF THE 24-HOUR DISINFECTION PERIOD, REPRESENTATIVE SAMPLES SHALL BE TAKEN AND ANALYZED TO ASSURE A CHLORINE RESIDUAL OF AT LEAST 10 PPM.

6. SHOULD THE RESULTS INDICATE ADEQUATE CHLORINATION, THE PROJECT SHALL BE THOROUGHLY FLUSHED AND FILLED WITH WATER FROM THE EXISTING SYSTEM AND AGAIN TESTED FOR CHLORINE RESIDUAL. THE FLUSHING SHALL BE CONSIDERED ADEQUATE IF THE TEST RESULTS INDICATE THAT THE WATER IN THE PROJECT HAS A COMPARABLE CHLORINE RESIDUAL AS THE WATER IN THE EXISTING SYSTEM.

7. FOLLOWING THE ACCEPTABLE FLUSHING OF THE PROJECT, TWO (2) CONSECUTIVE SETS OF ACCEPTABLE SAMPLES, TAKEN AT LEAST 24 HOURS APART, FROM REPRESENTATIVE POINTS IN THE PROJECT SHALL BE TAKEN AND SUBJECTED TO MICROBIOLOGICAL TESTS. AT LEAST ONE (1) SET OF SAMPLES SHALL BE COLLECTED FROM EVERY 1,200 FEET OF THE NEW WATER MAIN, PLUS ONE FROM THE END OF THE LINE AND AT LEASE ONE (1) SET FROM EACH BRANCH. POSITIVE RESULTS WILL NOT BE ACCEPTABLE AND THE PROCESS WILL BE REPEATED.

8. ANALYSIS FOR RESIDUAL CHLORINE SHALL BE MADE IN ACCORDANCE WITH "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER," AMERICAN PUBLIC HEALTH ASSOCIATION, 20TH EDITION.

9. MICROBIOLOGICAL TESTS SHALL BE MADE IN ACCORDANCE WITH "STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTEWATER," AMERICAN PUBLIC HEALTH ASSOCIATION, 20TH EDITION.

10. ALL MEASUREMENTS FOR CHLORINE RESIDUAL AND MICROBIOLOGICAL TESTS SHALL BE PERFORMED BY A LABORATORY APPROVED BY THE DIRECTOR.

11. THE DEVELOPER/CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH ALL OF THE FOREGOING.

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HAIKU FIRE STATION
3550 HANA HWY
HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

NOTES - 2

DIANE Y. KODAMA
LICENSED PROFESSIONAL ENGINEER
No. 8888-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation. (Observation of construction as defined in Chapter 16-115, Subchapter 1 Definitions of the Hawaii Administrative Rules, "Professional Engineers, Architects, Surveyors, and Landscape Architects.")

signature | expiration date of the license

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C-2

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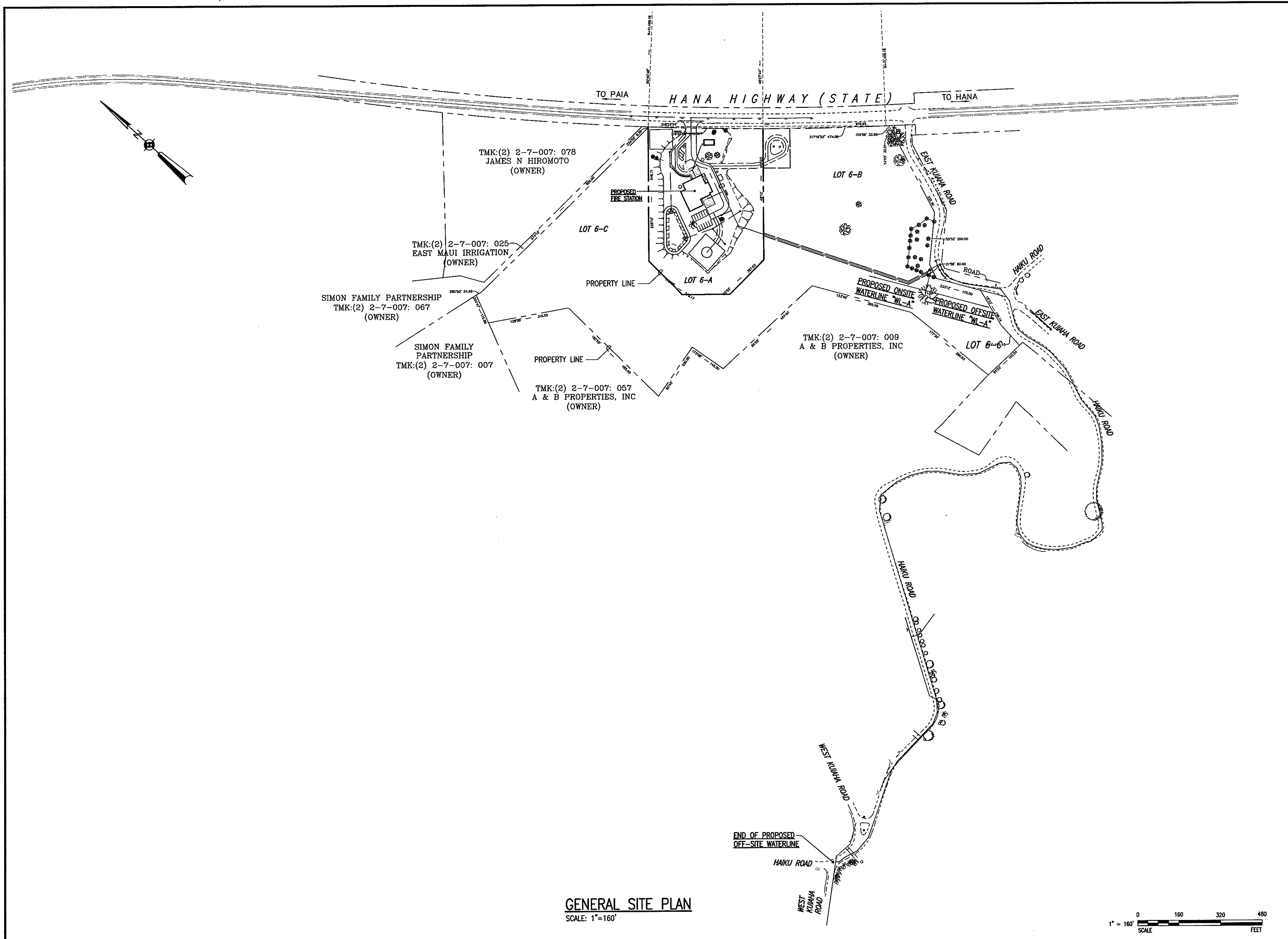

GENERAL SITE PLAN
SCALE: 1"=160'

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HAIKU, MAUI

GENERAL SITE PLAN

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

PROJECT NO: 5898.001
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DATE:
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C-3

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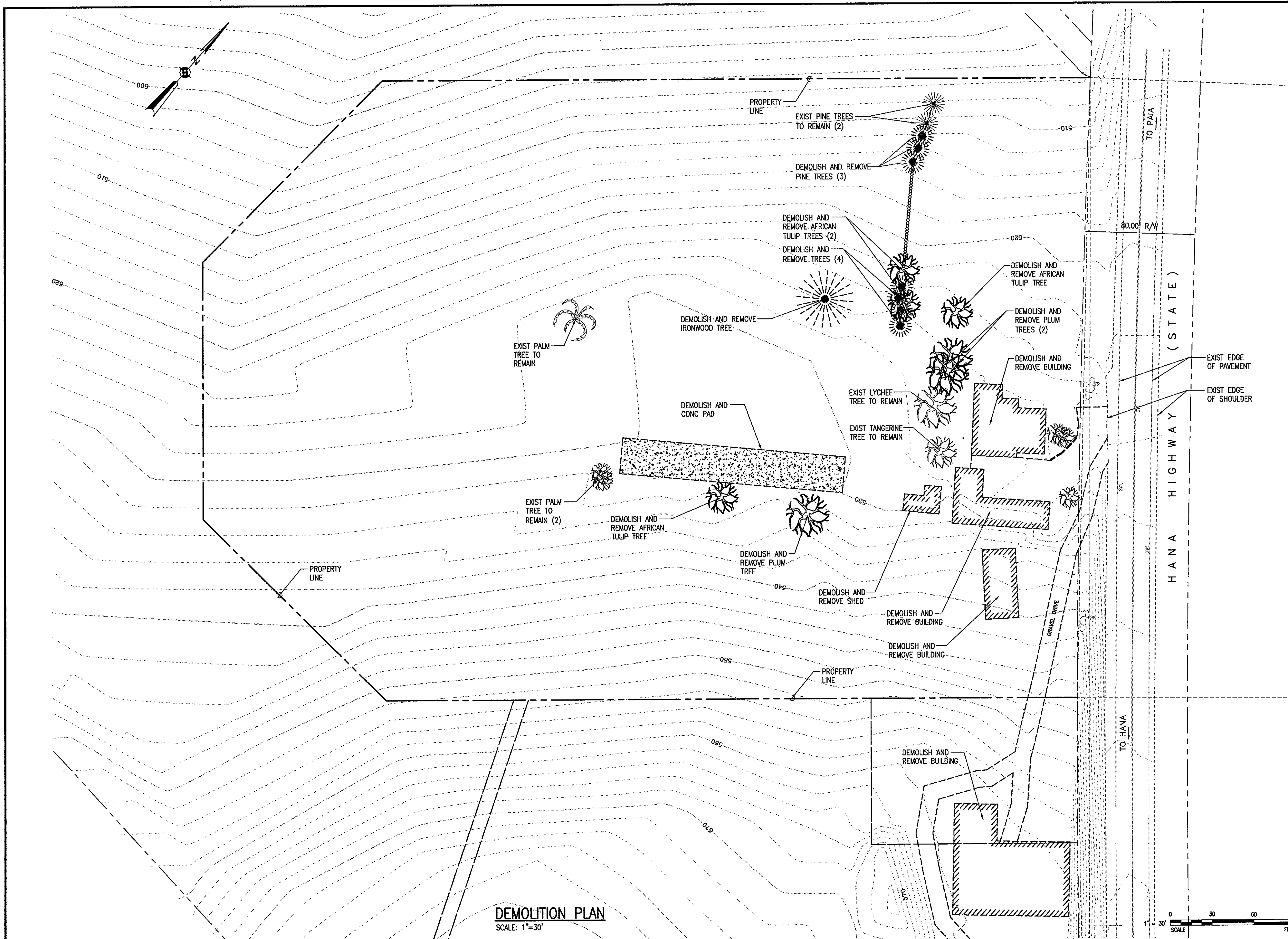

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DEMOLITION PLAN

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

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signature — expiration date of the license

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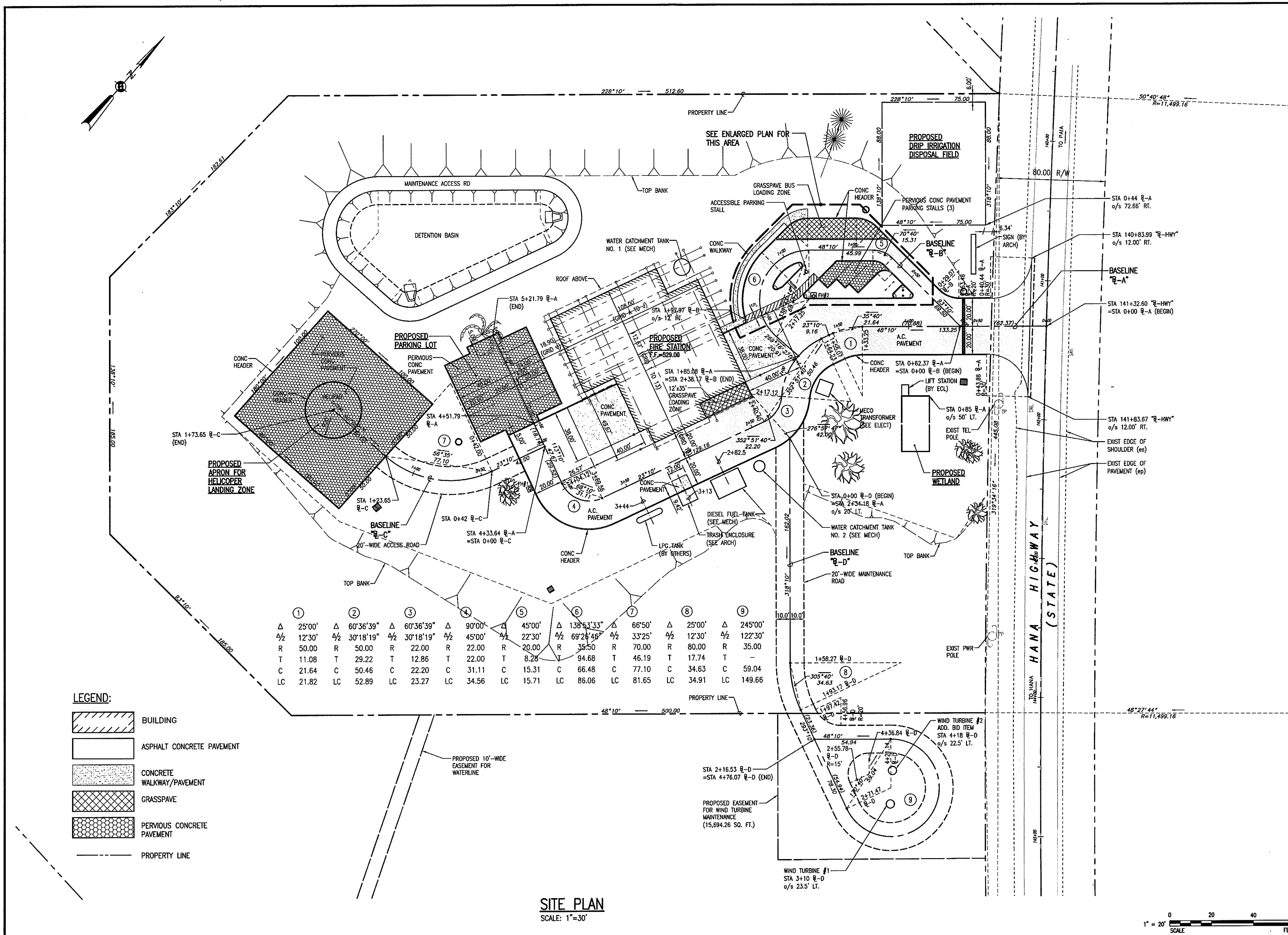

	1		2		3		4		5		6		7		8		9
Δ	25°00'	Δ	60°36'39"	Δ	60°36'39"	Δ	90°00'	Δ	45°00'	Δ	138°53'33"	Δ	66°50'	Δ	25°00'	Δ	245°00'
Δ/2	12°30'	Δ/2	30°18'19"	Δ/2	30°18'19"	Δ/2	45°00'	Δ/2	22°30'	Δ/2	69°26'46"	Δ/2	33°25'	Δ/2	12°30'	Δ/2	122°30'
R	50.00	R	50.00	R	22.00	R	22.00	R	20.00	R	35.50	R	70.00	R	80.00	R	35.00
T	11.08	T	29.22	T	12.86	T	22.00	T	8.28	T	94.68	T	46.19	T	17.74	T	–
C	21.64	C	50.46	C	22.20	C	31.11	C	15.31	C	66.48	C	77.10	C	34.63	C	59.04
LC	21.82	LC	52.89	LC	23.27	LC	34.56	LC	15.71	LC	86.06	LC	81.65	LC	34.91	LC	149.66

LEGEND:

- BUILDING
- ASPHALT CONCRETE PAVEMENT
- CONCRETE WALKWAY/PAVEMENT
- GRASSPAVE
- PERVIOUS CONCRETE PAVEMENT
- PROPERTY LINE

SITE PLAN

SCALE: 1"=30'

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SITE PLAN

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

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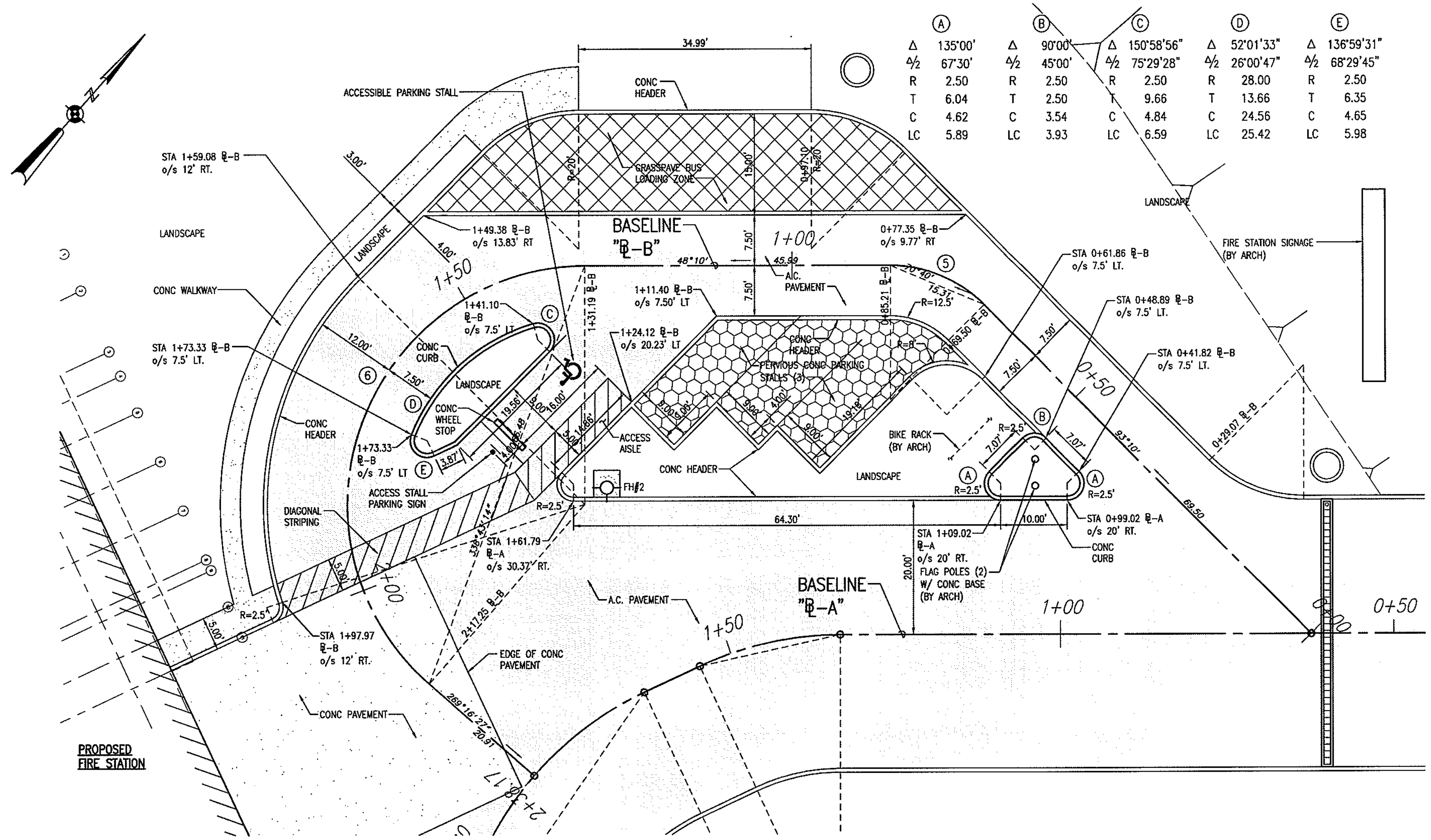

	A	B	C	D	E
Δ	135°00'	90°00'	150°58'56"	52°01'33"	136°59'31"
Δ/2	67°30'	45°00'	75°29'28"	26°00'47"	68°29'45"
R	2.50	2.50	2.50	28.00	2.50
T	6.04	2.50	9.66	13.66	6.35
C	4.62	3.54	4.84	24.56	4.65
LC	5.89	3.93	6.59	25.42	5.98

ENLARGED SITE PLAN - PARKING AREA

SCALE: 1"=10'

LEGEND:

- BUILDING
- ASPHALT CONCRETE PAVEMENT
- CONCRETE WALKWAY/PAVEMENT
- GRASSPAVE
- PERVIOUS CONCRETE PAVEMENT

1"=10' SCALE 0 20 20 30 FEET

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ENLARGED SITE PLAN

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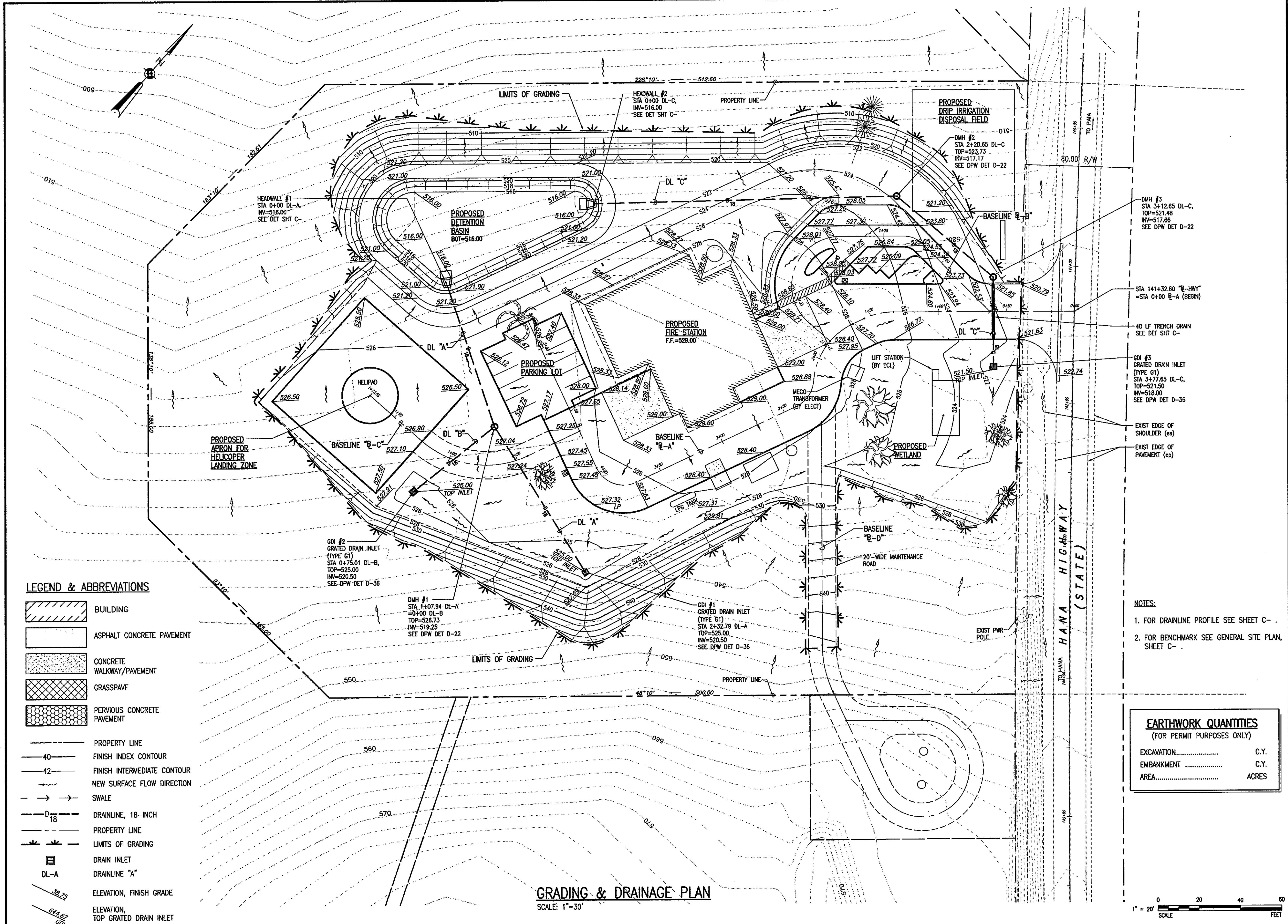

LEGEND & ABBREVIATIONS

	BUILDING
	ASPHALT CONCRETE PAVEMENT
	CONCRETE WALKWAY/PAVEMENT
	GRASSPAVE
	PERVIOUS CONCRETE PAVEMENT
	PROPERTY LINE
—40—	FINISH INDEX CONTOUR
—42—	FINISH INTERMEDIATE CONTOUR
	NEW SURFACE FLOW DIRECTION
	SWALE
—D 18—	DRAINLINE, 18-INCH
	PROPERTY LINE
	LIMITS OF GRADING
	DRAIN INLET
DL-A	DRAINLINE "A"
38.75	ELEVATION, FINISH GRADE
644.67 GDI	ELEVATION, TOP GRATED DRAIN INLET

GRADING & DRAINAGE PLAN

SCALE: 1"=30'

NOTES:

1. FOR DRAINLINE PROFILE SEE SHEET C- .
2. FOR BENCHMARK SEE GENERAL SITE PLAN, SHEET C- .

EARTHWORK QUANTITIES
(FOR PERMIT PURPOSES ONLY)

EXCAVATION....................	C.Y.
EMBANKMENT	C.Y.
AREA.........................	ACRES

1" = 20' 0 20 40 60 SCALE FEET

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GRADING & DRAINAGE PLAN

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

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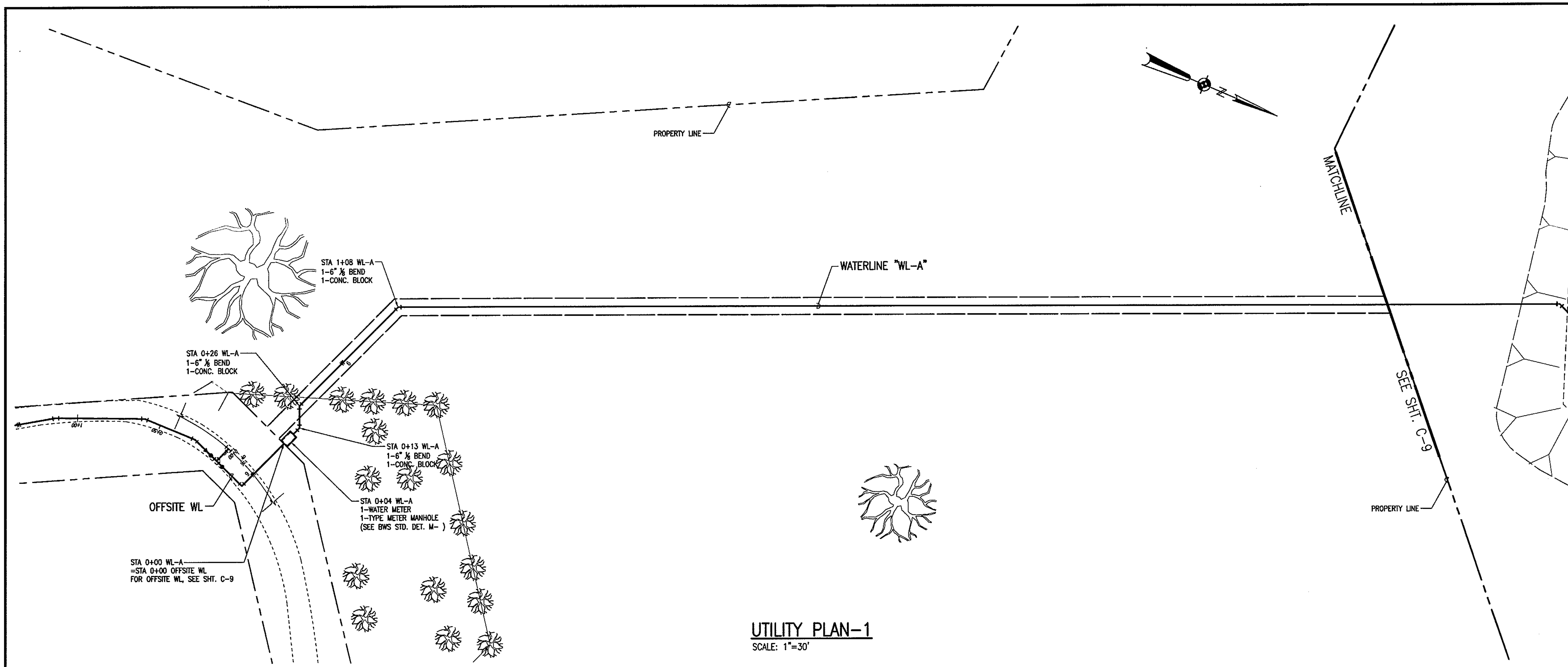

UTILITY PLAN-1

SCALE: 1"=30'

1" = 30' 0 30 60 90 SCALE FEET

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UTILITY PLAN - 1

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

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signature — expiration date of the license

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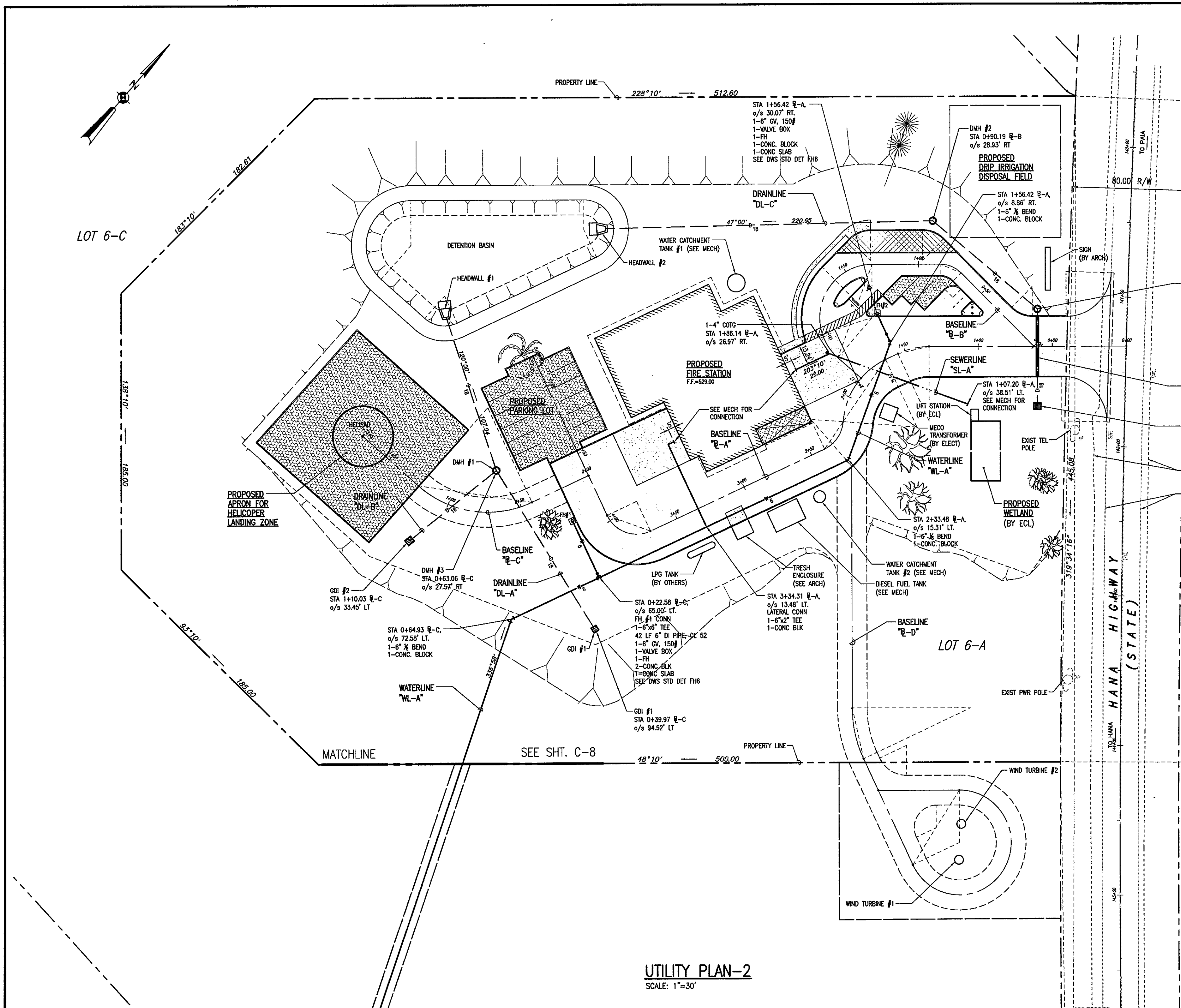

LEGEND:

- BUILDING
- ASPHALT CONCRETE PAVEMENT
- CONCRETE WALKWAY/PAVEMENT
- GRASSPAVE
- PERVIOUS CONCRETE PAVEMENT
- PROPERTY LINE

NOTES:
1. FOR DRAINAGE, SEE SHT. C-9.
2. FOR SEWER LATERAL CONN TO BLDG, SEE MECH DWGS.
3. FOR WATER LATERAL CONN TO BLDG, SEE MECH DWGS.

UTILITY PLAN-2

SCALE: 1"=30'

1" = 30' SCALE 0 30 60 90 FEET

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UTILITY PLAN - 2

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

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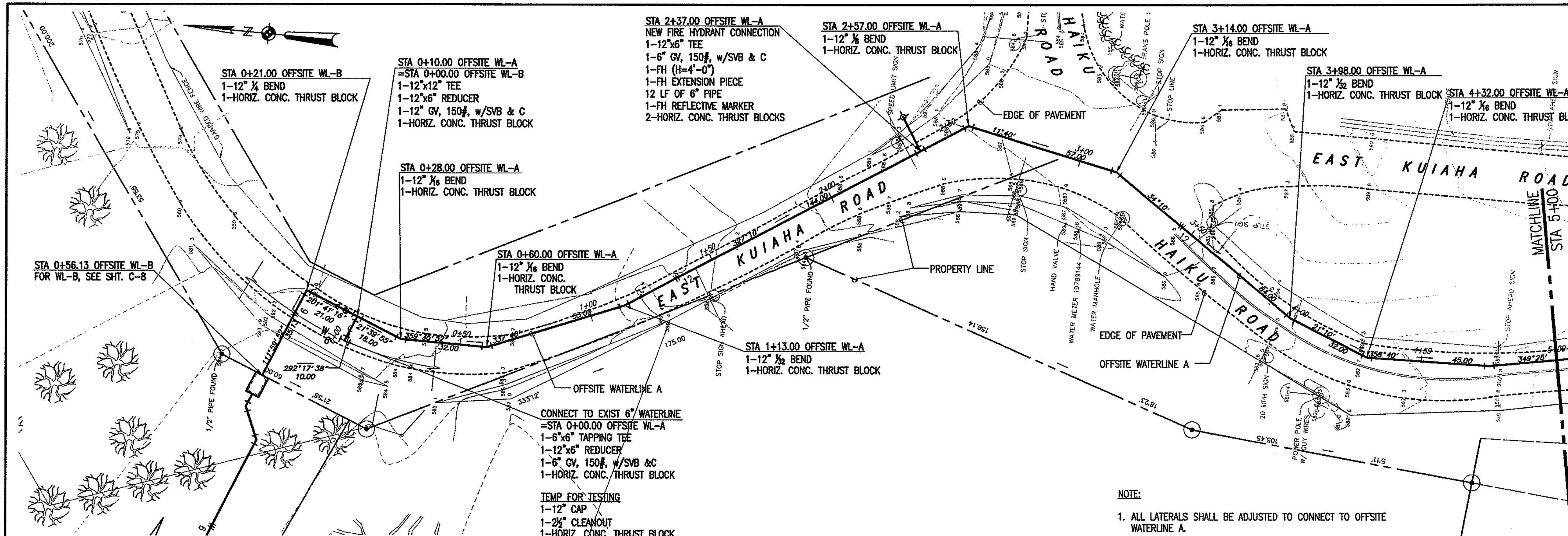
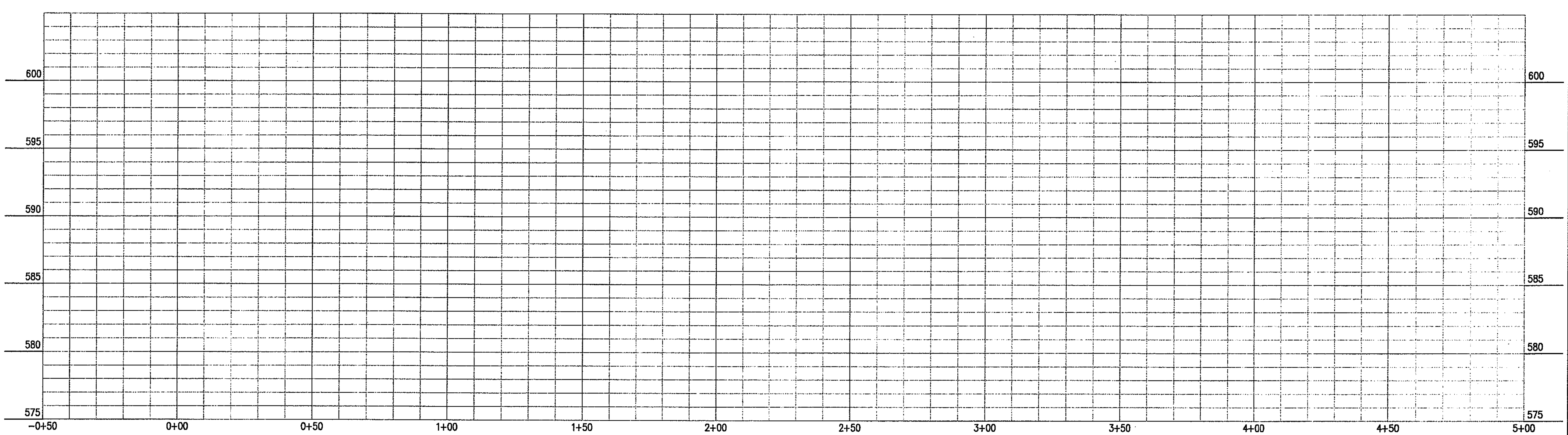


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN – 1

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE – 1

HORIZ: 1"=20'
VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET
1" = 20' SCALE 0 20 40 60 FEET

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HAIKU FIRE STATION
3550 HANA HWY
HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

OFFSITE WATERLINE A
PLAN & PROFILE - 1

DIANE Y. KODAMA
LICENSED PROFESSIONAL ENGINEER
No. 8668-C
HAWAII, U.S.A.

This work was prepared by me or under my supervision and construction of this project will be under my observation. (Observation of construction as defined in Chapter 16-115, Subchapter 1 Definitions of the Hawaii Administrative Rules, "Professional Engineers, Architects, Surveyors, and Landscape Architects.")

signature — expiration date of the license

NOTE: Contractor to check and verify dimensions at job before proceeding with work.

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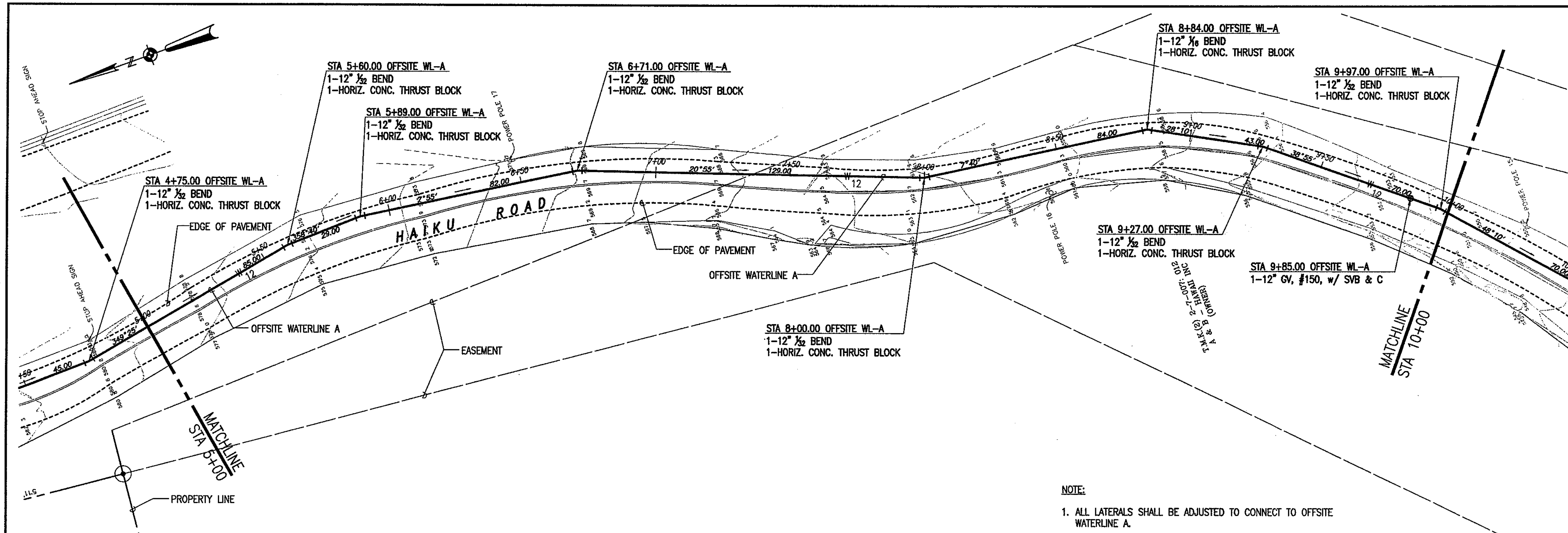
C-9

of Sheets

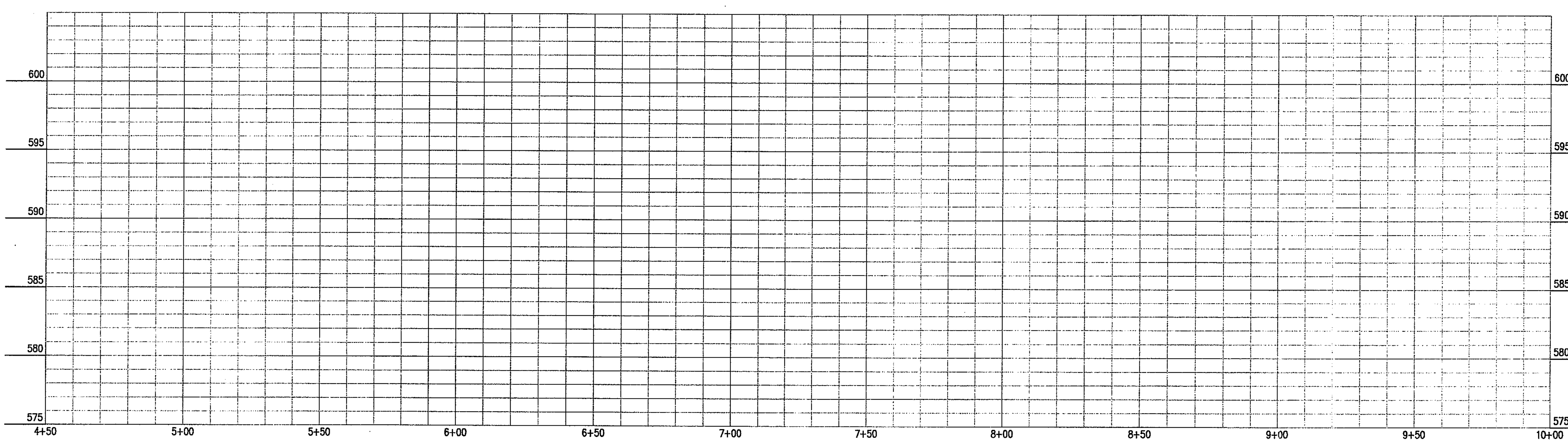


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN – 2

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE – 2

HORIZ: 1"=20'
VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET

1" = 20' SCALE 0 20 40 60 FEET

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HAIKU FIRE STATION
3550 HANA HWY
HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

OFFSITE WATERLINE A PLAN & PROFILE - 2

DIANE Y. KODAMA
LICENSED PROFESSIONAL ENGINEER
No. 8688-C
HAWAII, U.S.A.

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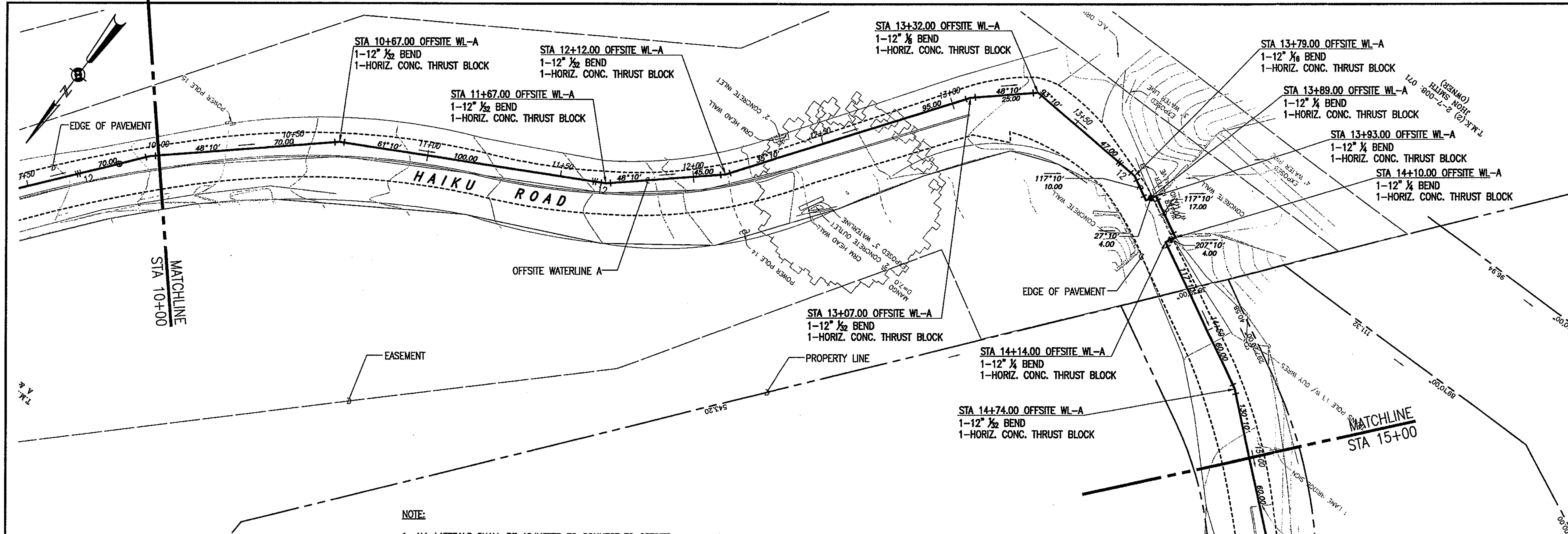
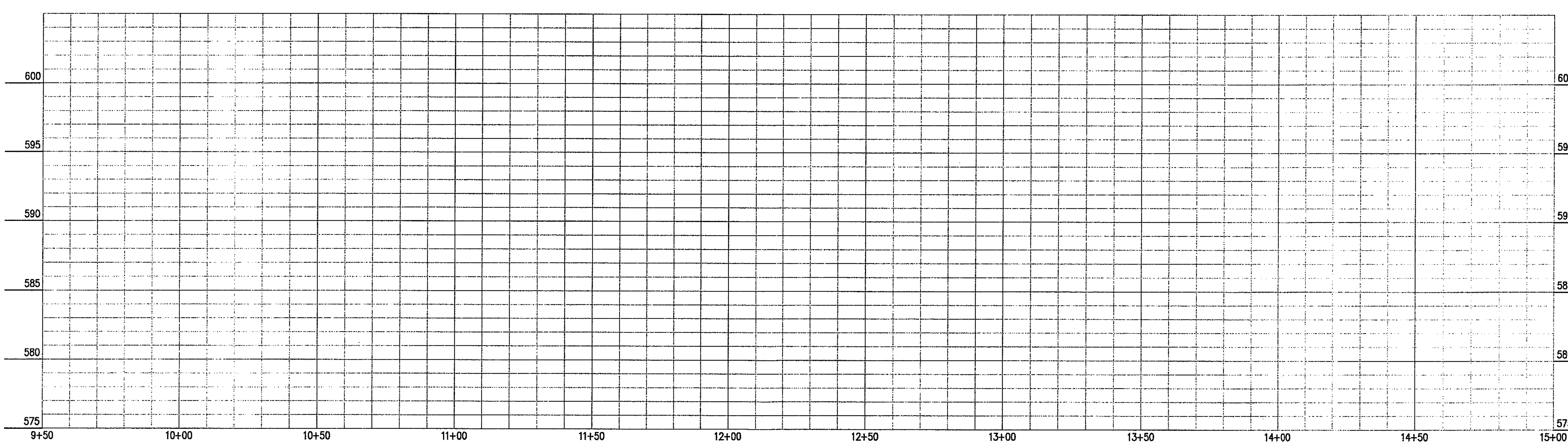


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN – 3

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE – 3

HORIZ: 1"=20'
VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET

1" = 20' SCALE 0 20 40 60 FEET

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HAIKU, MAUI

DESIGN DEVELOPMENT
JANUARY 22, 2010

OFFSITE WATERLINE A PLAN & PROFILE - 3

DIANE Y. KODAMA
LICENSED PROFESSIONAL ENGINEER
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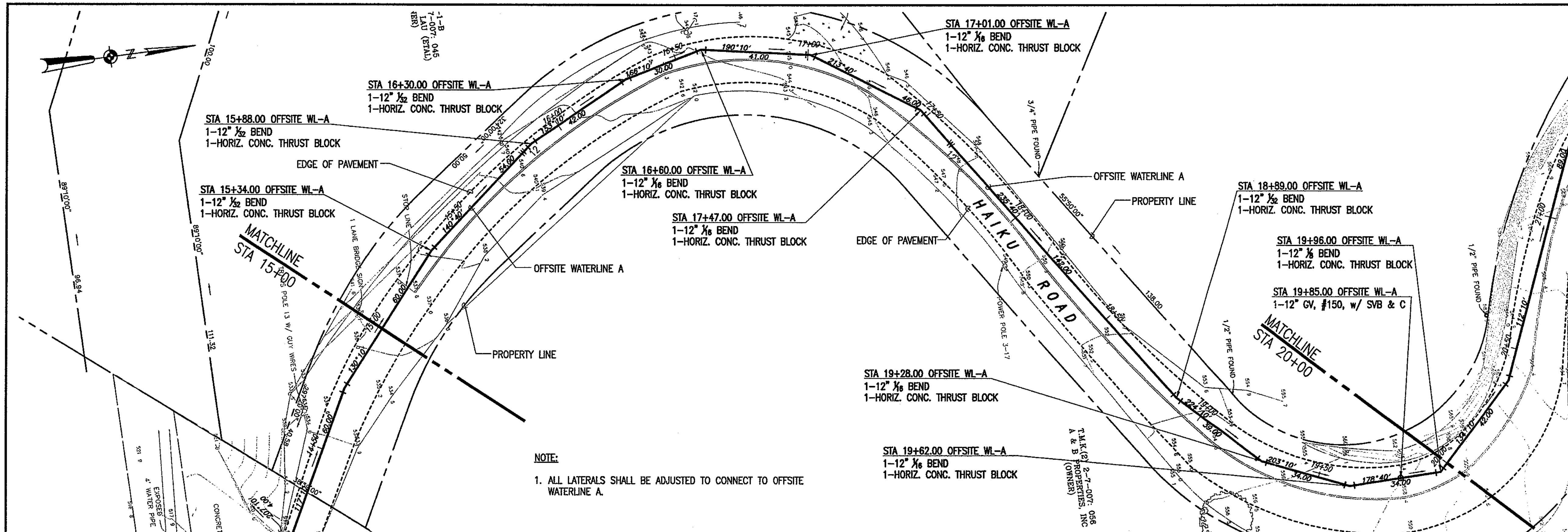
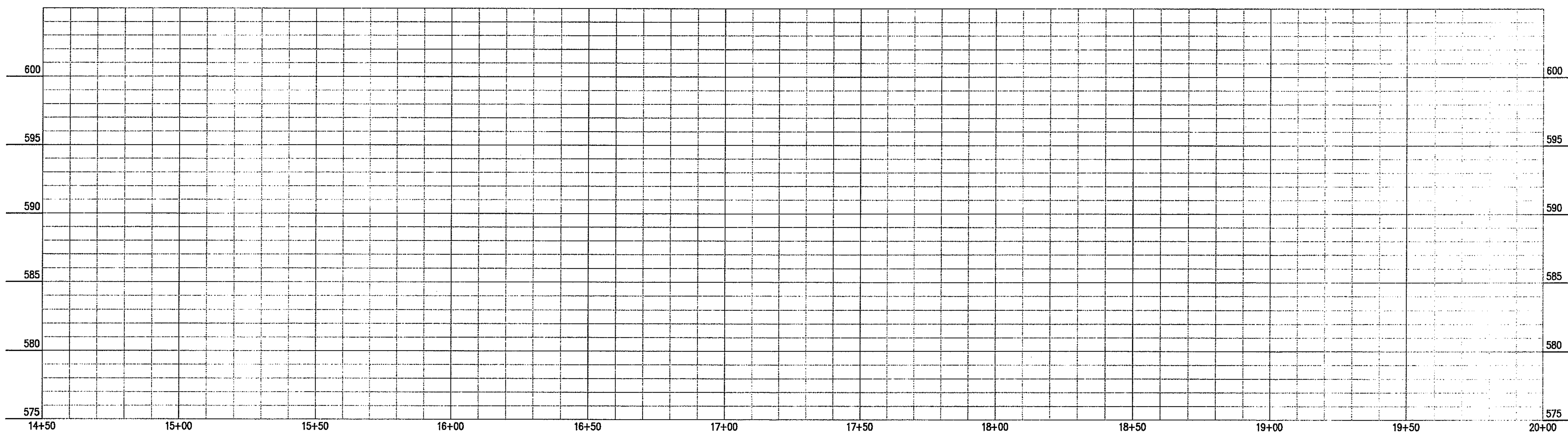


OFFSITE WATERLINE A PLAN - 4

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE - 4

HORIZ: 1"=20'
VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET
1" = 20' SCALE 0 20 40 60 FEET

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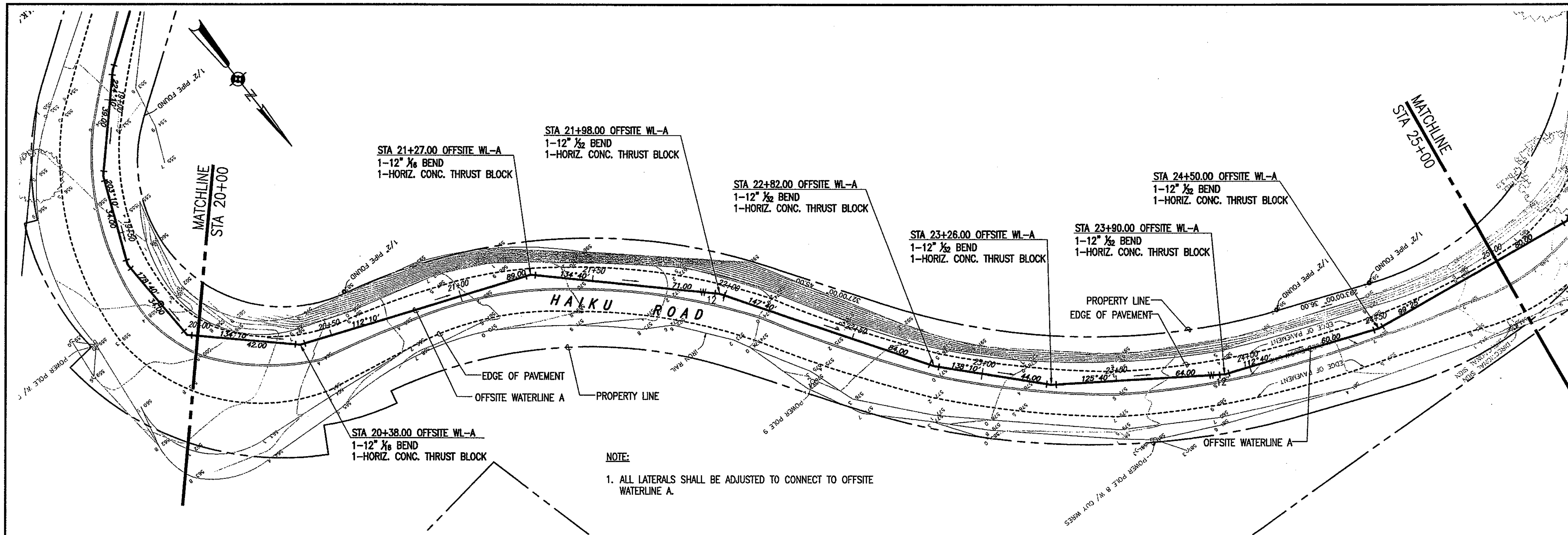
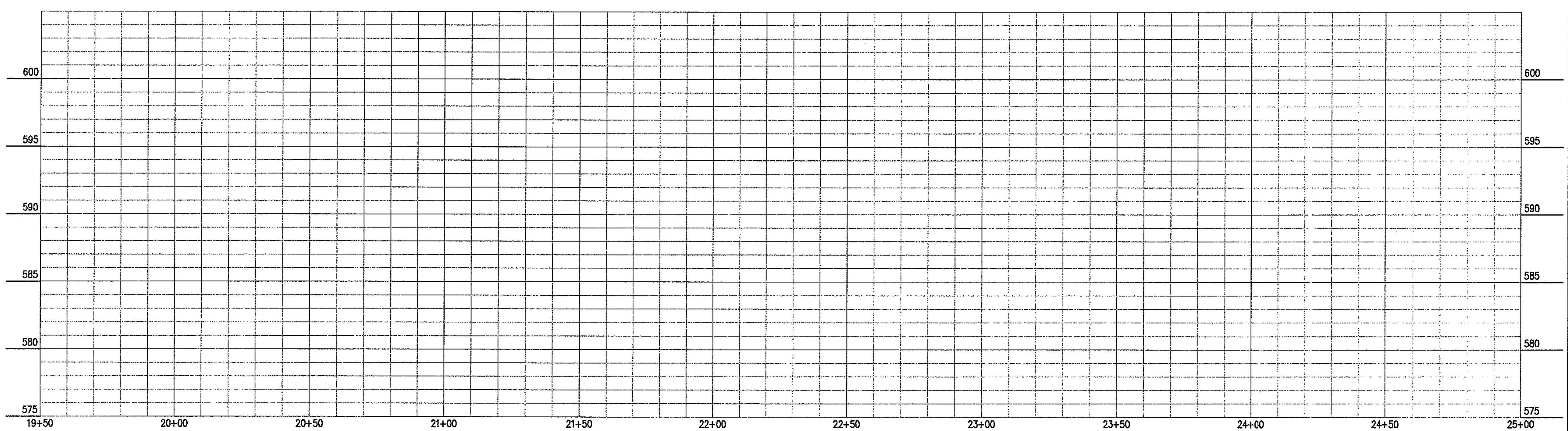


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN – 5

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE – 5

HORIZ: 1"=20'

VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET

1" = 20' SCALE 0 20 40 60 FEET

AHL

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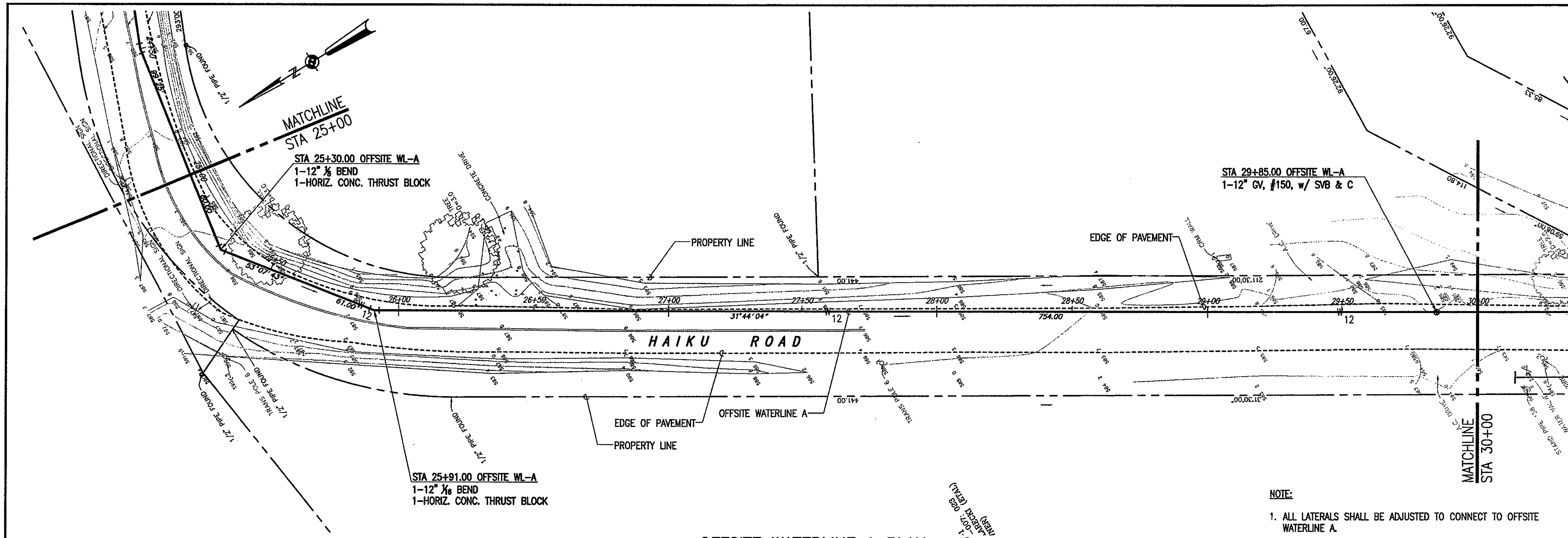
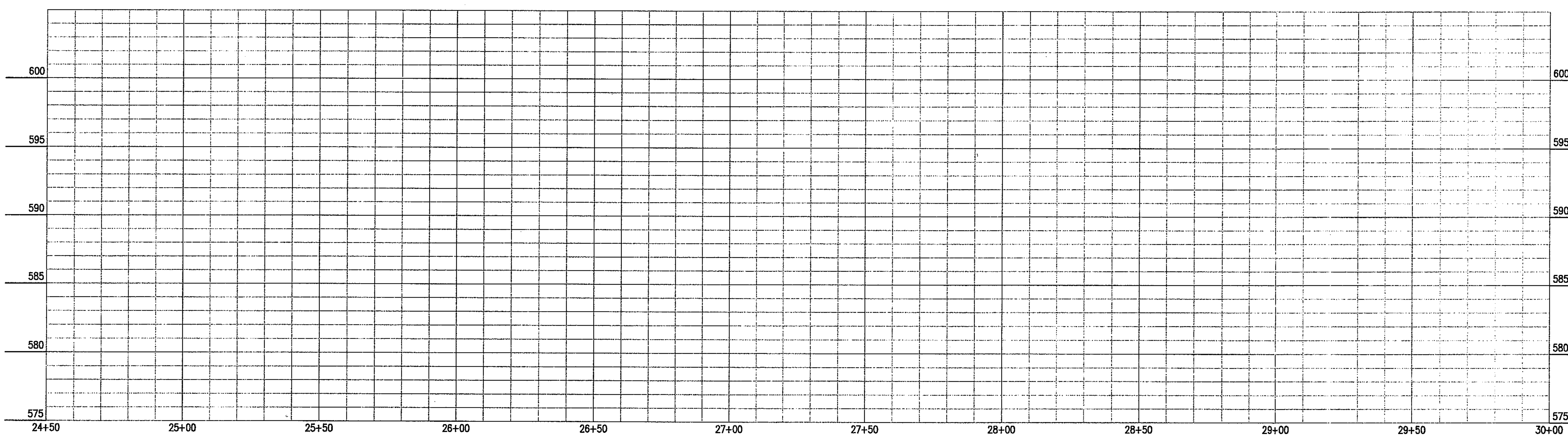


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN – 6

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE – 6

HORIZ: 1"=20'

VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET

1" = 20' SCALE 0 20 40 60 FEET

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OFFSITE WATERLINE A PLAN & PROFILE - 6

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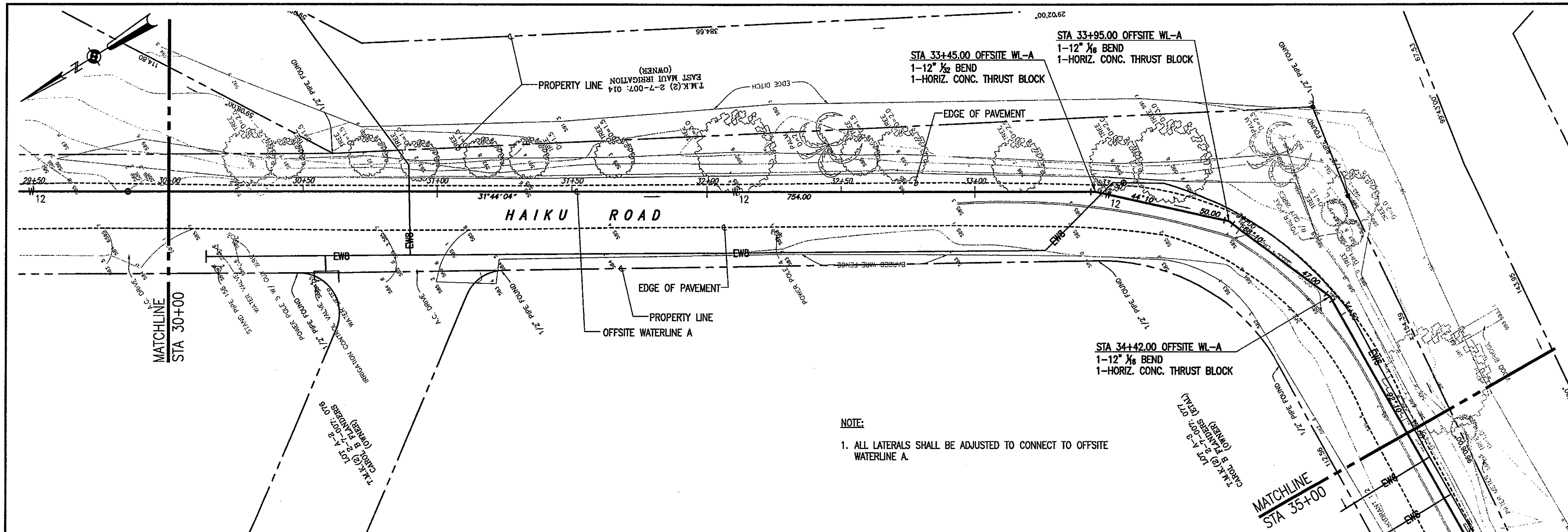
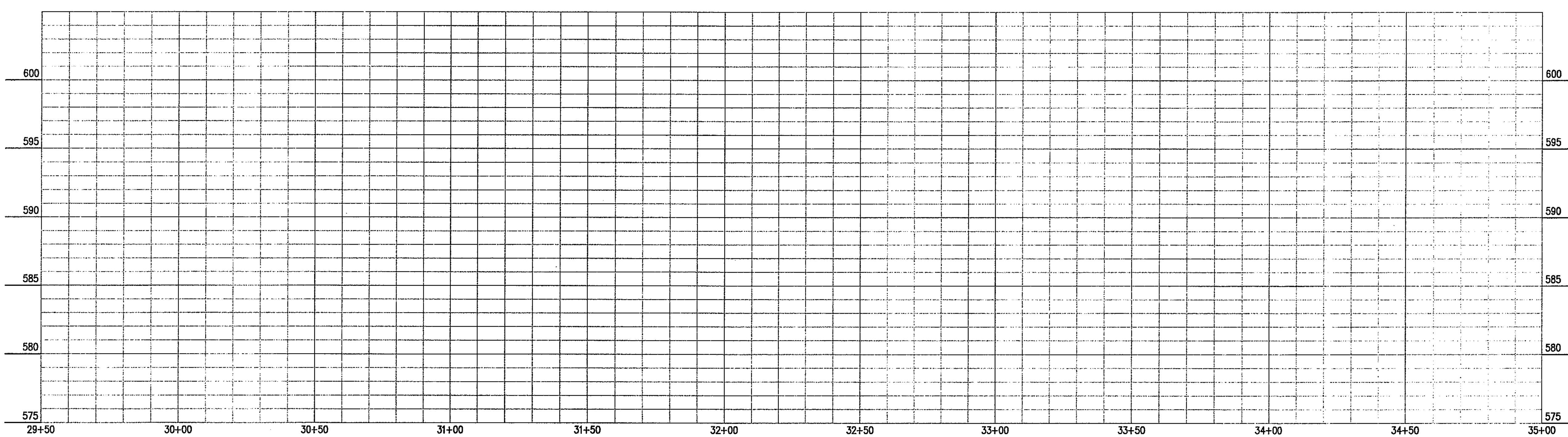


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN – 7

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE – 7

HORIZ: 1"=20'
VERT: 1"=4'

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OFFSITE WATERLINE A PLAN & PROFILE - 7

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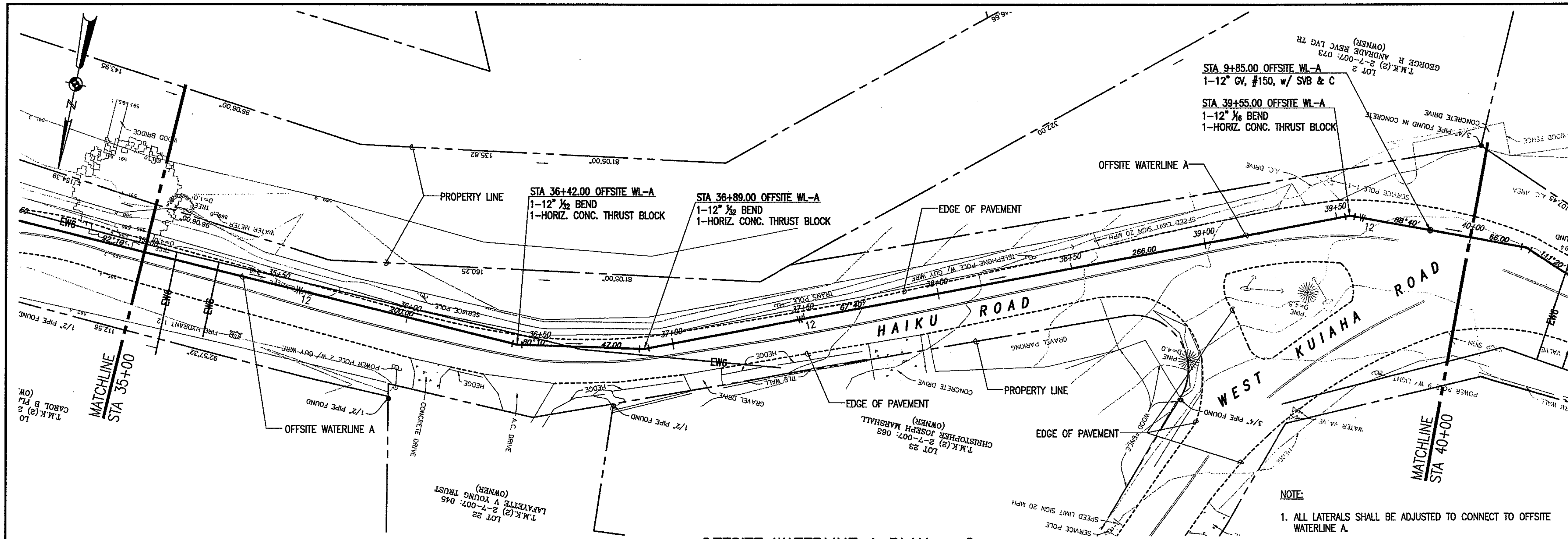
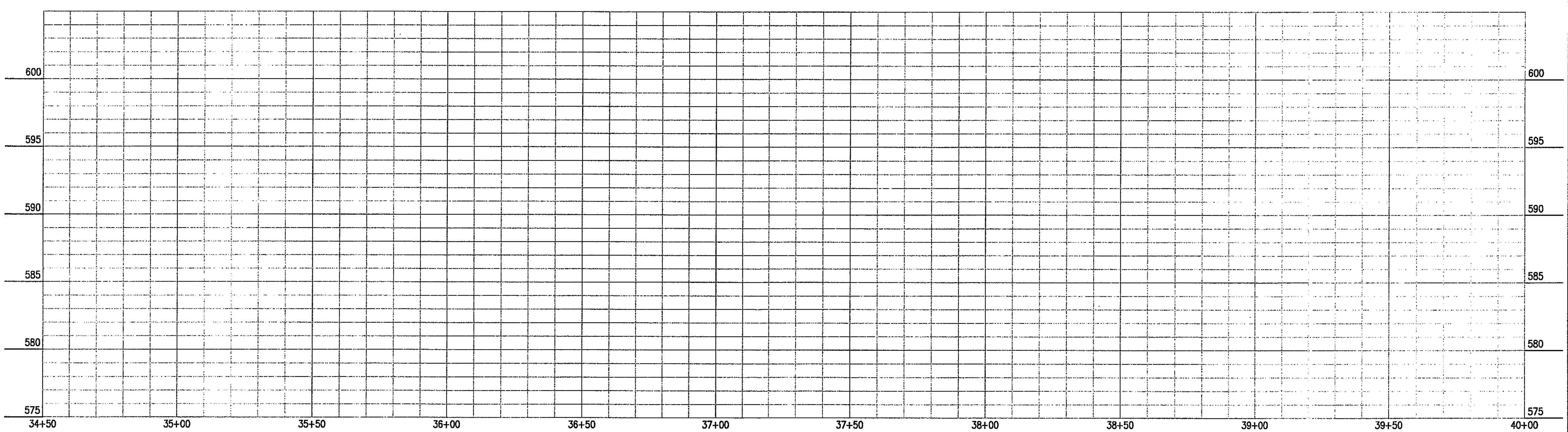


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN - 8

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE - 8

HORIZ: 1"=20'
VERT: 1"=4'

1" = 4' SCALE 0 4 8 12 FEET
1" = 20' SCALE 0 20 40 60 FEET

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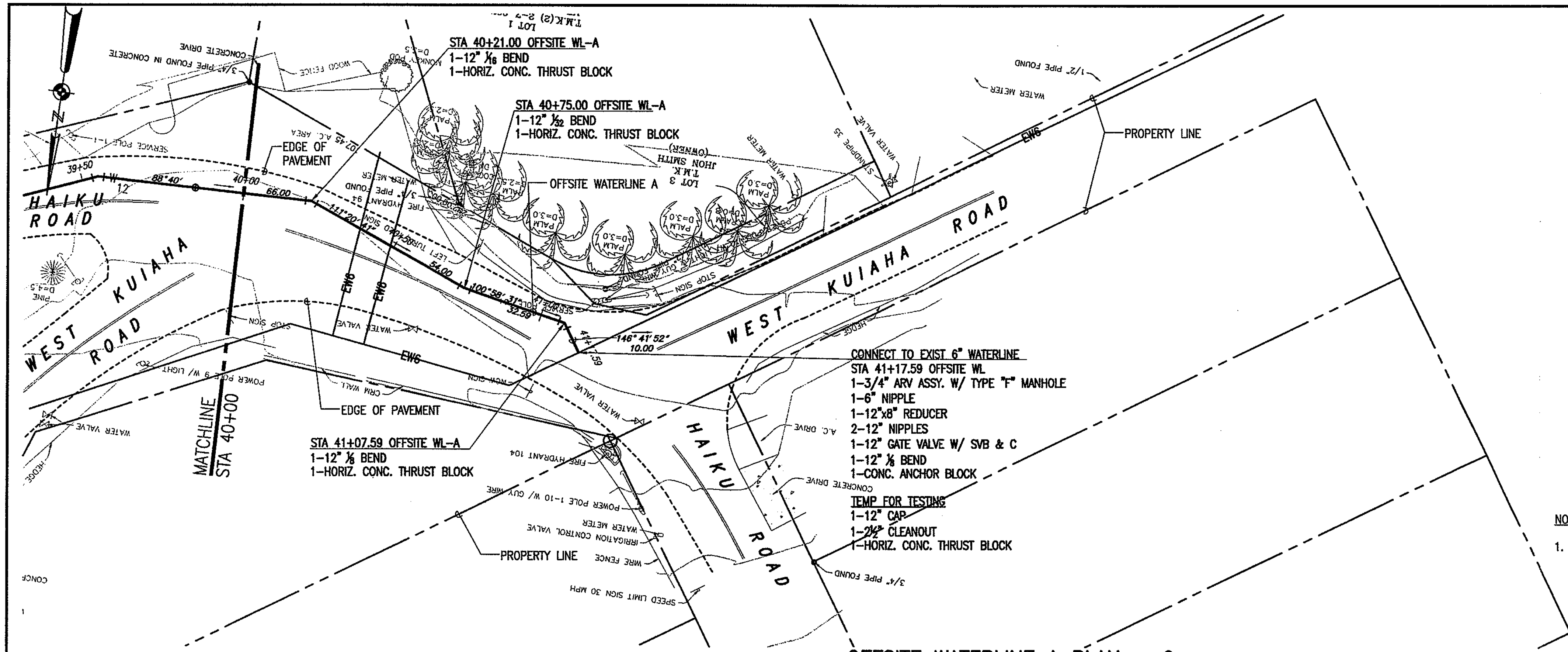
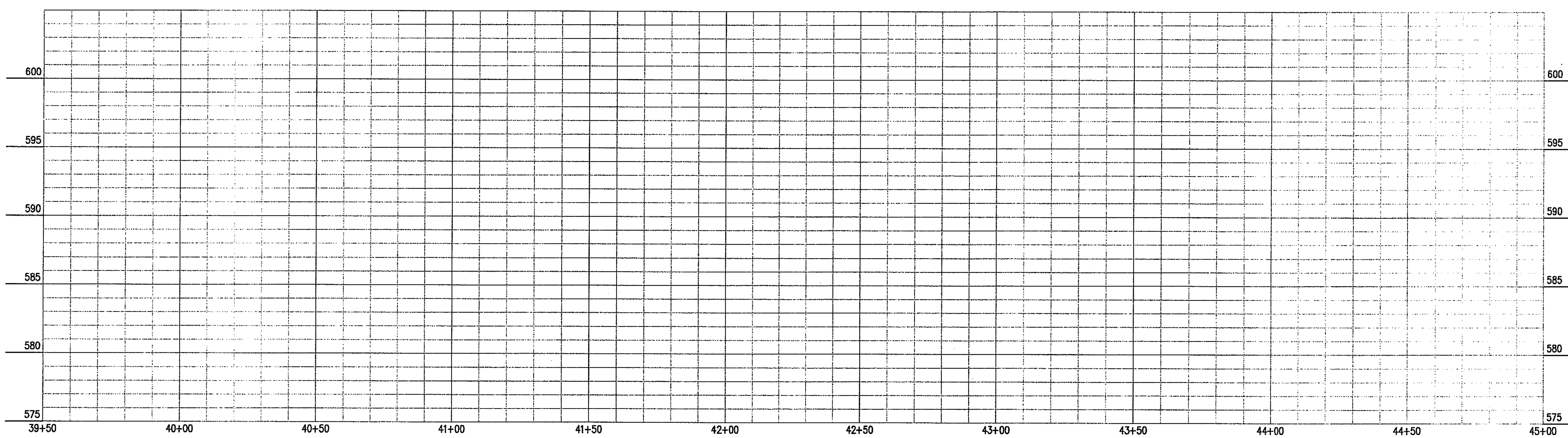


NOTE:

1. ALL LATERALS SHALL BE ADJUSTED TO CONNECT TO OFFSITE WATERLINE A.

OFFSITE WATERLINE A PLAN - 9

SCALE: 1"=20'



OFFSITE WATERLINE A PROFILE - 9

HORIZ: 1"=20'
VERT: 1"=4'

1" = 4' 0 4 8 12 SCALE FEET

1" = 20' 0 20 40 60 SCALE FEET

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OFFSITE WATERLINE A PLAN & PROFILE - 9

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APPENDIX B.

Biological Resources Survey

BIOLOGICAL RESOURCES SURVEY

for the

HAIKU FIRE STATION

EAST KUIAHA, HAMAKUALOA, MAUI

by

ROBERT W. HOBDY
ENVIRONMENTAL CONSULTANT
Kokomo, Maui
September 2009

Prepared for: Munekiyo & Hiraga, Inc.

BIOLOGICAL RESOURCES SURVEY
HAIKU FIRE STATION
EAST KUIAHA, HAMAKUALOA, MAUI

INTRODUCTION

The Haiku Fire Station Project lies on approximately 7 acres of land adjacent to Hana Highway in East Kuiaha, Hamakualoa, Maui TMK (2) 2-7-07:08 (por.). This biological resources study was initiated in response to environmental requirements of the planning process and was conducted in September, 2009.

SITE DESCRIPTION

The project site consists of gently to moderately sloping lands above Hana Highway and just west of East Kuiaha Road. Elevations range from 520 feet and 550 feet above sea level. Annual rainfall averages about 50 inches with the bulk falling during the winter months (Armstrong, 1983). Soils are entirely of the Haiku Series which are deep, well-drained clay soils (Foote et al, 1972). Vegetation consists mainly of a dense growth of large tropical grasses and a scattering of trees. A few structures are situated on the property along with a large concrete slab (see Figures 1-4).

BIOLOGICAL HISTORY

This site was once a lowland, wet native forest consisting of 'ōhi'a (*Metrosideros polymorpha*), hala (*Pandanus tectorius*), kukui (*Aleurites moluccana*) and a variety of shrubs, vines and ferns. Hawaiians were scattered throughout these lowlands with concentrations in the fertile valley bottoms and along the coast.

The project area was used for pineapple farming in the early 1900s and was cleared, plowed and cultivated for this purpose until about 1960. Following this a nursery operation was developed here with a large greenhouse and some buildings. This was discontinued about 10 years ago, and since then the land has been used as pasture or left idle.

SURVEY OBJECTIVES

This report summarizes the findings of flora and fauna survey for the Haiku Fire Station Project which was conducted in September 2009.
The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.

2. Document the status and abundance of each species.

3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.

5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used covering the entire 7 acre parcel including the alternate access route to the southeast corner. Binoculars were used to scan the property and an inventory of all plant species encountered was made.

DESCRIPTION OF THE VEGETATION

The dominant vegetation on the property is a rank growth of large grass species including: Napier grass (*Pennisetum purpureum*), Guinea grass (*Panicum maximum*), molasses grass (*Melinis minutiflora*) and Hilo grass (*Paspalum conjugatum*). There are a few large trees that have grown on the site including African tulip tree (*Spathodea campanulata*), common ironwood (*Casuarina equisetifolia*), albizia (*Falcataria moluccana*) and Java plum (*Syzygium cumini*). A host of herbaceous weeds associated with its former use as a nursery abound.

A total of 104 plant species were recorded during the survey. Just 5 of these were native Hawaiian species: pala'a fern (*Sphenomeris chinensis*), (*Cyperus polystachyos*) no common name, koali awahia (*Ipomoea indica*), popolo (*Solanum americanum*) and ʻuhaloa (*Waltheria indica*). All of these are extremely widespread and common species indigenous in Hawaii and many other Pacific islands.

Two species were Polynesian introductions: ki or ti leaf (*Cordyline fruticosa*) and ʻihi (*Oxalis corniculata*). The remaining 97 species were non-native trees, shrubs, grasses and weeds.

DISCUSSION AND RECOMMENDATIONS

This project area is in a highly altered environmental condition. The site is dominated by aggressive weeds. Five common indigenous native species were found on the property. None of these is a federally Threatened or Endangered species, nor are any of these candidates for such status. There are no special habitats of environmental importance on this property either.

Because of the above conditions on the property it is determined that the proposed development should not have any significant negative impacts on the botanical resources in this part of Maui.

It is recommended, however, that an array of native plants be used in the landscape plans for the proposed facilities to lend a special Hawaiian accent to the project.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of four groups: Ferns, Conifers, Monocots and Dicots. Taxonomy and nomenclature of the Ferns follow Palmer (2003); the Conifers and the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999) and Staples and Herbst (2005)..

For each species, the following information is provided:

1. Scientific name with author citation.

2. Common English or Hawaiian name.

3. Bio-geographical status. The following symbols are used:

   endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.

   indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

   non-native = all those plants brought to the islands intentionally or accidentally after western contact.

4. Abundance of each species within the project area:

   abundant = forming a major part of the vegetation within the project area.

   common = widely scattered throughout the area or locally abundant within a portion of it.

   uncommon = scattered sparsely throughout the area or occurring in a few small patches.

   rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
FERNS			
LINDSAEACEAE (Lindsaea Fern Family)			
Sphenomeris chinensis (L.) Maxon	*pala'ä*	indigenous	rare
NEPHROLEPIDACEAE (Sword Fern Family)			
Nephrolepis brownii (Desv.) Hovenkamp & Miyam.	Asian sword fern	non-native	uncommon
POLYPODIACEAE (Polypody Fern Family)			
Phymatasorus grossus (Langsd. & Fisch.) Brownlie	*laua'e*	non-native	rare
THELYPTERIDACEAE (Marsh Fern Family)			
Christella parasitica (L.) H. Lev.	--------------------	non-native	uncommon
CONIFERS			
ARAUCARIACEAE (Araucaria Family)			
Araucaria columnaris (G. Forst.) J.D. Hooker	Cook pine	non-native	rare
MONOCOTS			
ARACEAE (PalmFamily)			
Syngonium auritum (L.) Schott	five fingers	non-native	rare
ARECACEAE (Aroid Family)			
Dypsis lutescens (H. Wendl.) Beentjie & J. Dransfield	golden-fruited palm	non-native	rare
Roystonea regia (Kunth) O.F. Cook	Cuban royal palm	non-native	rare
ASPARAGACEAE (Asparagus Family)			
Cordyline fruticosa (L.) A. Chev.	ki, ti leaf	Polynesian	rare
Dracaena fragrans (L.) Ker Gawler	fragrant dracaena	non-native	rare
Dracaena marginata Lamarck	money tree	non-native	rare
COMMELINACEAE (Spiderwort Family)			
Commelina diffusa N.L. Burm.	honohono	non-native	rare
CYPERACEAE (Sedge Family)			

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Cyperus involucratus Rottb.	umbrella sedge	non-native	rare
Cyperus polystachyos Rottb.	-------------------	indigenous	rare
Cyperus rotundus L.	nut sedge	non-native	rare
HELICONIACEA (Heliconia Family)			
Heliconia psittacorum L.f.	parrots beak heliconia	non-native	rare
POACEAE (Grass Family)			
Axonopus compressus (Sw.) P. Beauv.	broad-leaved carpetgrass	non-native	rare
Chloris gayana Kunth	Rhodes grass	non-native	rare
Chloris radiata (L.) Sw.	plushgrass	non-native	rare
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	uncommon
Digitaria ciliaris (Retz.) Koeler	Henry's crabgrass	non-native	rare
Digitaria insularis (L.) Mez ex ekman	sourgrass	non-native	rare
Eleusine indica (L.) Gaertn.	wiregrass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	rare
Melinis minutiflora P. Beauv.	molasses grass	non-native	common
Melinis repens (Willd.) Zizka	Natal redtop	non-native	rare
Panicum maximum Jacq.	Guinea grass	non-native	common
Paspalum conjugatum Bergius	Hilo grass	non-native	common
Paspalum fimbriatum Kunth	Panama grass	non-native	rare
Paspalum urvillei Steud.	Vasey grass	non-native	uncommon
Paspalum sp.	-------------------	non-native	rare
Pennisetum purpureum Schumach.	Napier grass	non-native	common
Sporobolus africanus (Poir.) Robyns & Tournay	smutgrass	non-native	rare
Sporobolus diander (Retz.) P. Beauv.	Indian dropseed	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Urochloa mutica (Forssk.) T.Q. Nguyen	California grass	non-native	rare
DICOTS			
ANACARDIACEAE (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry	non-native	uncommon
APIACEAE (Parsley Family)			
Ciclospermum leptophyllum (Pers.) Sprague	fir-leaved celery	non-native	rare
APOCYNACEAE (Dogbane Family)			
Asclepias physocarpa (E.Mey.) Schlecter	baloon plant	non-native	rare
ARALIACEAE (Ginseng Family)			
Schefflera actinophylla (Endl.) Harms	octopus tree	non-native	rare
ASTERACEAE (Sunflower Family)			
Ageratum conyzoides L.	maile hohono	non-native	rare
Bidens pilosa L.	Spanish needle	non-native	uncommon
Calyptocarpus vialis Less.	------------------	non-native	rare
Conyza bonariensis (L.) Cronq.	hairy horseweed	non-native	uncommon
Conyza canadensis (L.) Cronq.	horseweed	non-native	rare
Cyanthillium cinereum (L.) H. Rob.	little ironweed	non-native	rare
Eclipta prostrata (L.) L.	false daisy	non-native	rare
Elephantopus mollis Kunth	elephant's foot	non-native	rare
Emilia fosbergii Nicolson	red pualele	non-native	rare
Emilia sonchifolia (L.) DC	violet pualele	non-native	uncommon
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	uncommon
Sonchus oleraceus (L.)	pualele	non-native	rare
Sphagneticola trilobata (L.) Pruski	wedelia	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Youngia japonica (L.) DC.	Oriental hawksbeard	non-native	rare
BIGNONIACEAE (Bignonia Family)			
Spathodea campanulata P. Beauv	African tulip tree	non-native	uncommon
BORAGINACEAE (Borage Family)			
Heliotropium procumbens Mill.	four-spike heliotrope	non-native	rare
CARICACEAE (Papaya Family)			
Carica papaya L.	papaya	non-native	rare
CASUARINACEAE (She-oak Family)			
Casuarina equisetifolia L.	common ironwood	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea indica (J. Burm.) Merr.	koali awahia	indigenous	rare
Ipomoea triloba L.	little bell	non-native	rare
EUPHORBIACEAE (Spurge Family)			
Chamaesyce hirta (L.) Millsp.	hairy spurge	non-native	rare
Chamaesyce hypericifolia (L.) Millsp.	graceful spurge	non-native	uncommon
Chamaesyce thymifolia (L.) Millsp.	----------------	non-native	uncommon
Phyllanthus debilis Klein ex Willd.	niruri	non-native	rare
Phyllanthus tenellus Roxb.	-----------------	non-native	uncommon
FABACEAE (Pea Family)			
Chamaecrista nictitans (L.) Moench	partridge pea	non-native	uncommon
Crotalaria incana L.	fuzzy rattlepod	non-native	uncommon
Crotalaria pallida Aiton	smooth rattlepod	non-native	uncommon
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	rare
Desmodium incanum DC	ka'imi clover	non-native	common
Desmodium triflorum (L.) DC	three-flowered beggarweed	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Erythrina variegata L.	tiger claw	non-native	rare
Falcataria moluccana (Miq.) Barneby & Grimes	albizia	non-native	rare
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	rare
Indigofera suffruticosa Mill.	'inikö	non-native	rare
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	rare
Macroptilium lathyroides (L.) Urb.	wild bean	non-native	rare
Mimosa pudica L.	hilahila	non-native	uncommon
GENTIANACEAE (Gentian Family)			
Centaurium erythraea Raf.	bitter herb	non-native	rare
LYTHRACEAE (Loosestrife Family)			
Cuphea carthagenensis (Jacq.) Macbr.	tarweed	non-native	rare
MALVACEAE (Mallow Family)			
Hisbiscus x rosa-sinensis	hybrid hibiscus	non-native	rare
Sida acuta N.L. Burm.	-------------------	non-native	rare
Sida rhombifolia L.	Cuban jute	non-native	rare
Sida spinosa L.	prickly sida	non-native	rare
Triumfetta semitriloba Jacq.	Sacramento bur	non-native	rare
Waltheria indica L.	*'uhaloa*	indigenous	rare
MELASTOMATACEAE (Melastoma Family)			
Tibouchina herbacea (DC.) Cogn.	cane tibouchina	non-native	rare
MYRTACEAE (Myrtle Family)			
Eucalyptus robusta Sm.	swamp mahogany	non-native	rare
Psidium guajava L.	common guava	non-native	uncommon
Syzygium cumini (L.) Skeels	Java plum	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Syzygium jambos (L.) Alston	rose apple	non-native	rare
NYCTAGINACEAE (Four-o'clock Family)			
Bougainvillea spectabilis Willd.	bougainvillea	non-native	rare
OXALIDACEAE (Wood Sorrel Family)			
Oxalis corniculata L.	*'ihi*	Polynesian	rare
PASSIFLORACEAE (Passion Flower Family)			
Passiflora edulis Sims	passion fruit	non-native	rare
PLANTAGINACEAE (Plantain Family)			
Plantago lanceolata L.	narrow-leaved plantain	non-native	rare
POLYGALACEAE (Milkwort Family)			
Polygala paniculata L.	milkwort	non-native	uncommon
RUBIACEAE (Coffee Family)			
Pentas lanceolata (Forsskal) Deflers	pentas	non-native	rare
RUTACEAE (Rue Family)			
Citrus reticulata Blanco	tangerine	non-native	rare
SAPINDACEAE (Soapberry Family)			
Litchi sinenensis Sonnerat	litchi	non-native	rare
SOLANACEAE (Nightshade Family)			
Cestrum nocturnum L.	night blooming jasmine	non-native	rare
Solanum americanum Mill.	pöpolo	indigenous	rare
URTICACEAE (Nettle Family)			
Pilea microphylla (L.) Liebm.	artillery plant	non-native	uncommon
VERBENACEAE (Verbena Family)			
Stachytarpheta cayennensis (Rich.) Vahl.	nettle-leaved vervain	non-native	rare
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain	non-native	rare
Verbena littoralis Kunth	ha'u öwī	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A fauna survey was conducted at the same time as the botanical survey. Observations were made using binoculars and listening to vocalizations. Notes were made on species abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat *(Lasturus cinereus semotus)* in the area.

RESULTS

MAMMALS

Just two mammal species were observed on the property during the course of the survey. The extremely dense grass cover made seeing small ground-dwelling mammals difficult, and it made the use of the area by such mammals difficult as well. Taxonomy and nomenclature follow Tomich (1986).

<u>Mongoose</u> (Herpestes auropunctatus) – Two mongooses were seen slipping through the grass on the margins of clearings. These predators hunt for rodents and birds.

<u>Domestic dog</u> (Canis familiaris) – Dogs were heard on nearby properties. These animals no doubt occasionally wander into this property.

Other mammals that no doubt utilize this property include rats (*Rattus spp.*) and mice (*Mus domesticus*) that feed on seeds, fruits and herbaceous vegetation, and feral cats (*Felis catus*) that hunt these rodents as well as birds.

A special effort was made to look for the Hawaiian hoary bat by making an evening survey of the area. When present in an area these bats can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight. No evidence of such activity was observed though visibility was excellent. In addition a bat detection device (Batbox IIID) was employed, set to the frequencies of 27,000 to 28,000 Hertz that these bats are known to utilize. No bats were detected using this device.

BIRDS

Birdlife was particularly sparse on the project area. The deep, dense grass cover is unsuitable for most bird species use of the area. Just three species of birds were observed during two site visits. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

<u>Japanese white-eye</u> (*Zosterops japonicus*) – A few white-eyes were seen and heard twittering in some of the larger trees on the property.

<u>House finch</u> (*Carpodacus mexicanus*) – Two of these finches were seen flying around the lone ironwood tree.

<u>Cattle egret</u> (*Bubulcus ibis*) – One of these egrets was seen flying across the property during the early evening.

There are a variety of other small non-native birds that might occasionally be seen on this property including common myna, zebra dove, spotted dove, house sparrow, northern cardinal and nutmeg mannikin. This property, however, is not suitable for Hawaii's native forest birds which are presently restricted to native forest habitats at higher elevations, or for ground nesting native seabirds such as the Threatened Newells' shearwater (*Puffinus newelli*) and the Endangered Hawaiian petrel (*Pterodroma sandwichensis*) that dig their burrows on high mountain ridges.

INSECTS

While insects in general were not tallied, there were a diversity of insects seen though not in great numbers. Only one native insect Blackburn's Sphinx moth (*Manduca blackburni*) has thus far been put on the Endangered Species list (USFWS, 2009) and this designation requires special focus to ascertain whether any are present. Blackburn's sphinx moth occurs on Maui although it has not been found in this area. Its native host plants are species of 'aiea *(Nothocestrum)*. A non-native alternative host plant is tree tobacco *(Nicotiana glauca)*. None of these host species occur on or near this property and no Blackburn's sphinx moths or their larvae were seen.

DISCUSSION AND RECOMMENDATIONS

The study area is well vegetated but provides habitat that is suitable for very few forms of wildlife. Only a few species of mammals and birds were found during two site visits. None of these species were native and no Threatened or Endangered fauna were seen or would be expected on the property.

The Endangered Hawaiian bat is known from several locations on Maui and is both highly mobile and widespread. None have been recorded in lower Haiku, however, and the project area is most likely not preferred habitat. None were detected during the evening survey.

The federally protected seabirds, Hawaiian petrel and Newell's shearwater, were not detected on the property nor would be expected to utilize it for breeding or resting. These birds, however, would be expected to overfly the area between March and November to reach their burrows high in the mountains, and the young birds fledging during November and December would take their first tentative flights to the ocean over it. These young birds are especially vulnerable. They are often attracted to bright lights during their late evening and early dawn flights, crash and may be killed by vehicles or predators such as dogs, cats or mongoose.

It is recommended that any bright outdoor lights be shielded so that the direct light is not visible from above to reduce this threat to these seabirds.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within two groups: Mammals and Birds. For each species the following information is provided:

1. Common name

2. Scientific name

3. Bio-geographical status. The following symbols are used:

   endemic = native only to Hawaii; not naturally occurring anywhere else in the world.
   indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
   non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.
   migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

   abundant = many flocks or individuals seen throughout the area at all times of day.
   common = a few flocks or well scattered individuals throughout the area.
   uncommon = only one flock or several individuals seen within the project area.
   rare = only one or two seen within the project area.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
MAMMALS			
Mongoose	*Herpestes auropunctatus*	non-native	rare
Domesitic dog	*canis familiaris*	non-native	rare
BIRDS			
Japanese white-eye	*Zosterops japonicus*	non-native	uncommon
House finch	*Carpodacus mexicanus*	non-native	rare
Cattle egret	*Bubulcus ibis*	non-native	rare

Figure 1 Central portion of parcel

Figure 2 Typical view of overgrown grasses

Figure 3 Area of mauka access easement

Figure 4 Cement slab from old nursery with structures

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APPENDIX C.

Archaeological Inventory Survey Report

SCS Project Number 1012-1

AN ARCHAEOLOGICAL INVENTORY SURVEY FOR THE PROPOSED HA`IKŪ FIRE STATION AND WATERLINE CORRIDOR IN PA`UWELA AHUPUA`A, MAKAWAO DISTRICT, ISLAND OF MAUI, HAWAI`I [TMK 2-7-007:008]

Prepared by:
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June 2010

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INTRODUCTION

At the request of Munekiyo & Hiraga, Inc. Scientific Consultant Services (SCS), Inc. has conducted an Archaeological Inventory Survey on a 6.1-acre parcel of land in Pa`uwela, Makawao District (formerly Hamakua-Loa), Maui [TMK: 2-7-007:008] (Figures 1 and 2). The proposed project includes the construction of a new Ha`ikū Fire Station that will include the station house, parking lots, a helipad and access to Hana Highway (Figure 3). In addition, a new waterline is to be installed from the station house to and along the East Kuiaha Road right-of-way that will extend 4200 linear feet (1280 meters) to an existing County waterline at the intersection of West Kuiaha and Ha`ikū Road. Currently, the project area contains a vacant house and outbuildings with large concrete pads and is mostly overgrown with invasive weeds and cane grass.

Inventory Survey work included historic background research and settlement pattern analysis prior to fieldwork, a systematic pedestrian survey of the entire project area, mapping and recording of identified features. Subsurface testing was conducted across the parcel through backhoe trenching and the subsurface stratigraphy was recorded for each trench to assess the presence/absence of subsurface cultural deposits in the project area. No subsurface testing was conducted along the waterline corridor due to traffic and safety concerns. Fieldwork was conducted between September 21-25, 2009 by SCS personal David Perzinski (Project Supervisor) and Brian Armstrong. The survey was conducted under the direct supervision of Michael Dega, Ph.D., Principle Investigator for the project.

The ultimate goals of the project were to identify historic properties on the parcels, effectively record and document the sites and to provide recommendations to the State Historic Preservation Division (SHPD) regarding site significance and mitigation in regards to future land use in the project area.

ENVIRONMENTAL SETTING

PROJECT AREA LOCATION

The project area is a roughly rectangular shaped parcel with its long axis oriented approximately southwest-northeast. Most of the land in the vicinity of the project area has long been planted in sugar cane or pineapple. The west edge of the property is bounded by agricultural land; the east side is bounded by a vacant property that includes a large outbuilding; to the north the project area abuts Hana Highway and to the south by fallow agricultural land. The property is just east and *mauka* of Valley Isle Memorial Cemetery.

Figure 1: USGS Quadrangle Map Showing Project Area.

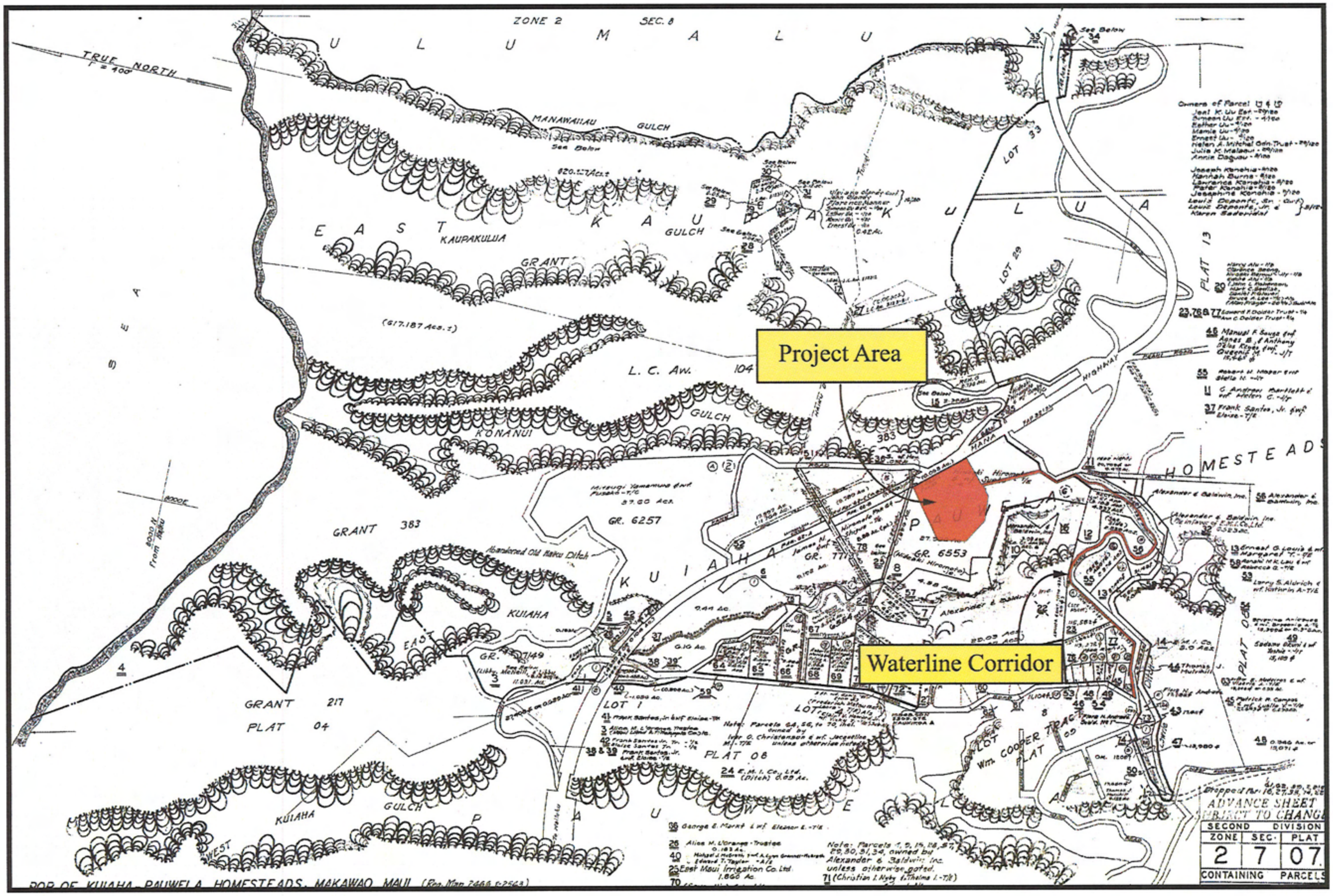


Figure 2: TMK 2-7-07 Showing Project Area

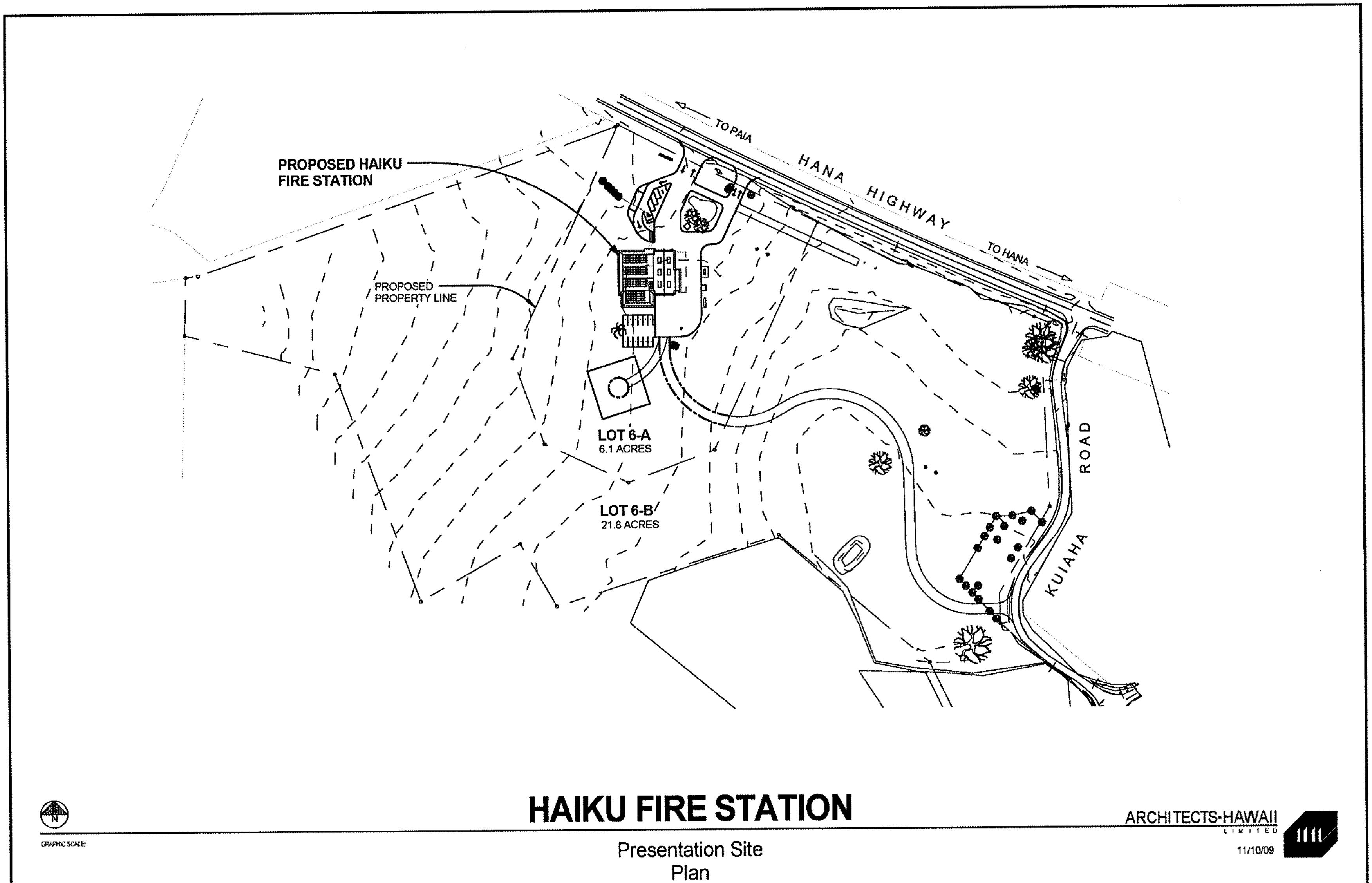


Figure 3: Plan View of Proposed Haiku Fire Station (Courtesy of Munekiyo & Hiraga, Inc.)

VEGETATION AND TOPOGRAPHY

The project area slopes slightly (10–20°) southwest to northeast where grading activities for the pre-existing buildings had not occurred. In the northern portion of the project area along Hana Highway the project area occupied by an abandoned house, outbuildings, concrete pads and former agricultural land.

The project area is heavily vegetated with a mix of koa haole (*Leucaena leucocephala*), java plum (*Syzgium cumini*), tangerine (*Citrus sp.*), banana (*Musa sp.*), African tulip (*Spathodea campanulata*), common guave (*Psidium guajava*), castor bean (*Ricinus communis*), *liliko`i* (*Passiflora edulis*) and thick cane grass. The thick grasses were generally located in the southern portion of the project area.

SOILS

As classified by Foote *et al.* (1972:32, Sheet 112), the soil located in the project area consists of Haiku clay (HbC). Haiku clay is associated with "well-drained soils on uplands on the island of Maui. These soils developed in material weathered from basic igneous rock… Elevations range from nearly sea level to 1,200 feet. The annual rainfall amounts to 50-80 inches" (Foote *et al.* 1972:31-32). HbC soil 7 to 15 percent slope has a representative profile consisting of dark-brown clay 14 inches thick with subsoils consisting of yellowish-red, dark reddish-brown and dark-red clay or silty clay that has subangular and angular blocky structure (*ibid:*32). These soils have moderately rapid permeability, slow to medium runoff and slight to moderate erosion hazard. Lands with Haiku clays are typically used for pineapple, pasture and homesites.

CLIMATE

The project area is located on the northwestern slope of Mount Haleakalā within East Maui. At approximately 550-590 feet above mean sea level (amsl) and approximately 2 km inland. The area is subject to an average annual rainfall of about 150-200 centimeters (Giambelluca *et al.* 1986:12). The wettest months fall between October and April and the rainfall flows northward. When northeast trade winds blow, the area receives a higher level of precipitation than when southerly, drier Kona winds blow.

CULTURAL HISTORICAL CONTEXT

The island of Maui ranks second in size of the eight main islands in the Hawaiian Archipelago. The Island was formed by two volcanoes, Mount Kukui in the west and Haleakalā in the east. The younger of the two volcanoes, Haleakalā, soars 2,727 m (10,023 feet) above sea level and embodies the largest section of the island. Unlike the amphitheater valleys of West Maui, the flanks of Haleakalā are distinguished by gentle slopes. Although it receives more rain than its counterpart in the east, the permeable lavas of the Honomanū and Kula Volcanic Series prevent the formation of rain-fed perennial streams. The few perennial streams found on the windward side of Haleakalā where the project is located, originate from springs located at low elevations. Valleys and gulches were formed by intermittent water run-off.

PAST POLITICAL BOUNDARIES

Traditionally, the division of Maui's lands into districts (*moku*) and sub-districts was performed by a *kahuna* (priest, expert) named Kalaiha`ōhia, during the time of the *ali`i* Kaka`alaneo (Beckwith 1940:383; Fornander places Kaka`alaneo at the end of the 15th century or the beginning of the 16th century [Fornander 1919-20, Vol. 6:248]). Land was considered the property of the king or *ali`i `ai moku* (the *ali`i* who eats the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*), which customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875). The *`ili `āina* or *`ili* were smaller land divisions next to importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located *(Ibid.*; Lucas 1995). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995). The project area is located in the *ahupua`a* of Pa`uwela, which translated means literally "hot soot" (Pukui *et al.*:1974:182). Traditionally, Pa`uwela was considered a part of the Hāmākua Loa District. Presently, Pa`uwela is in the Makawao District.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

The Hāmākua Loa region was associated with the gods Kanaloa and Kane, who caused fresh water to flow from springs and gulches, as they had nothing but *`awa* to drink when they came here (Hill *et al.* 2006). Hāmākua Loa was where the head of the guardian of the god of thunder, Kanehekili, was beheaded by his brother-in-law at Pakanaloe Heiau (Thrum 1908). Although the head had been taken to Lāna`i, the people cut up Kanehekili's body into pieces that were distributed around Maui for all to worship.

Both Hāmākua Poko and Hāmākua Loa, where the *ahupua`a* of Pa`uwela is found, contained small gulches surrounded by gently sloping *kula* lands. Opening to the sea, the wide mouths of the gulches supported *lo`i*, that ascended with the stream bed. Handy and Handy stated that Kuiaha Gulch, near the project area, undoubtedly had a few pond fields within its limits (1972). It was very likely that stream taro were planted in the many streamlets that fed into the main gulches, as well as dry land taro in the *kula* lands and in the lower forest (*ibid*).

The many narrow *ahupua`a* along this coast suggests that the population was considerable, even with only a moderate rain fall. The soil was excellent for sweet potato between the gulches, yams and *`awa* could be grown in the interior, and other crops, including banana, breadfruit, sugar cane, and arrowroot, would have thrived in the region (*Ibid.*). The bays were considered excellent for fishing with the *alaloa*, finished by Kihapi`ilani in the 1500s, connecting them for easy access by the people.

Before the landing of Capt. Cook, there was great competition between the chiefs of Hawai`i Island and the *ali`i nui* of Maui. In the early 1700s, Chief Alapa`i nui a Kauaua of

Hawai`i Island, returned to Maui to make war on Kekaulike, ruling chief of Maui (Kamakau 1961). Upon arrival to Kaupo, he learned that Kekaulike was dying and had appointed Alapa`i's own nephew, Kamehameha nui, as heir. Alapa`i lost all ambition for war and made peace with the new ruler. Although peace was maintained for many years, it was only a matter of time before the rivalry again surfaced between these two Islands. Tensions were renewed with Kahekili (Kamehameha nui's brother) who had become ruler after Kamehameha nui's death, and Kalaniopu`u, an *ali`i* who had previously served under Alapa`i nui, for control of the island chain (Kamakau 1961, Fornander 1969). Kalaniopu`u invaded Hāmākua Loa late in 1778, but was defeated by Kahekili's warriors. Gathering the support of Mahihelelima, chief of the Hāna District, Kalaniopu`u went back to Hāmākua Loa where they attacked once more. The back-and-forth battles continued for sometime (1775-1779), even after the rise of Kamehameha (Kamakau 1961).

> Hearing of Kamehameha's approach Kalanikupule [son of Kahekili] sent an army to Hamakualoa under the warrior Kapa-kahili . . .after his death the fighting ceased and Kamehameha and his chiefs went on the principal encounter at Wailuku [*Ibid.*:148]

WESTERN CONTACT

Early records, such as journals kept by explorers, travelers and missionaries, Hawaiian traditions that survived long enough to be written down, and archaeological investigations have assisted in the understanding of past cultural activities. It was during the fighting between Kalaniopu`u and Kahekili at Hāmākua Loa in 1778, that Capt. Cook and his men first arrived at the other end of the island chain; Ni`ihau and Kaua`i (Fornander 1969). Returning in November of 1778, they had their first look at Maui and Hāmākua Loa region, and indeed, met Kahekili and Kamehameha who ventured out at different times to investigate, ". . .The tower of Lono!" (Kamakau 1961:97).

Descriptions of the north coast of Maui were first recorded in November of 1778 as the Resolution and the Discovery sailed down a portion of the northeast side of the island (Beaglehole 1967: Part I, Vol. III). David Samwell, a surgeon on the Discovery, reported "...the ships lay to all day about 3 miles off shore, trading with the Natives who came off in their canoes in great number..." (Beaglehole Part I, vol. III 1967:1151).

It had been a time of war between Kalaniopu`u, ruler of Hawai`i Island, and Kahekili, chief of Maui and Moloka`i. During this season of the year (*Makahiki*), however, the fighting was temporarily suspended and the great chief of Maui, Kahekili, was free to visit the foreign ships. Samwell recorded his impressions of the King and the windward slopes of the northern coast of Maui. He stated that Kahekili was "a middle aged man ... rather of a mean appearance..." and the land was "...mountainous, the sides of the hills are covered with trees...large open plains on which stand their houses & where they have their plantations of sweet potatoes, taro & c. ..." (*Ibid.*).

THE *MĀHELE*

In the 1840s, a drastic change in the traditional land tenure resulted in a division of island lands and a system of private ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society to that of a market economy (Daws 1968; Kuykendall Vol. I, 1938:145 *et passim*; Kame`eleihiwa 1992). Among other things, the foreigners demanded private ownership of land to insure their investments (Kuykendall Vol. I, 1938:138 *et passim*; Kame`eleihiwa 1992; Kelly 1998, 1983). Once lands were made available and private ownership was instituted, native Hawaiians—including the *maka`āinana* (commoners)—were able to claim the plots they were cultivating and living on, if they had been made aware of the foreign procedures (*kuleana* lands, LCAs). This land division, or Māhele, occurred in 1848. The awarded parcels were called Land Commission Awards (LCA). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property (Chinen 1961). Twenty-eight LCAs were claimed in Pa`uwela Ahupua`a, however, none were awarded within the project area (Waihona `aina Database, 2009). The un-awarded lands of Pa`uwela became government lands and were later sold as Government Grants. The project area was part of Grant 6553.

Sugar cane became a major industry in the 1800s and Pa`uwela offered good land for its cultivation. The Haiku Sugar Company was formed in 1858, and by the 1870s, three more plantations were developed in the region (Dorrance and Morgan 2000). As more and more land was cultivated with sugar, the need for water became significant. In 1876, four plantations formed the Hamakua Ditch Company that obtained the water rights and eventually diverted the stream water by using ditches, tunnels and pipes to irrigate the fields. By 1900, most of Pa`uwela was in sugar and water needs had expanded to the point where several ditches were constructed to deliver water: the Koolau Ditch in 1905, the Lowrie Ditch in 1914, and the Haiku Ditch in 1914 (Haun and Henry 2002). During the 1920s both pineapple and grapes were introduced for cultivation. In the 1930s, some areas of Pa`uwela were used for cattle pasture lands.

During WWII (1944), Pa`uwela lands were used for a training base called "Camp Maui." At least 16,000 Marines trained here for the invasion that was to take place on Saipan and Tinian in the Mariana Islands that were held by the Japanese (Joseph *et al*. 2008). Today, there are residences, and some continuing agriculture, in the region.

PREVIOUS ARCHAEOLOGICAL RESEARCH

The earliest archaeological endeavors on Maui were undertaken by Thrum (1909), Stokes (1918), Emory (1921), and Walker (1931). Their data allows for a deeper understanding of traditional Hawaiian lifestyles. Winslow Walker (1930) was the first to systematically record archaeological sites on Maui. He noted 22 *heiau* in the Hāmākua Loa District (presently a portion of Makawao District) of which 12 were destroyed, five were partially destroyed, and five were still intact. Though no archaeological studies have been conducted within the project area, several studies in the vicinity in the past 20 years aid in predicting the potential for encountering sites within the project area (Figure 4).

A 1990 inventory survey of an 18-acre parcel in Kuiaha-Pauwela Homesteads (approximately 1 mile southwest of the project area) was undertaken by Xamanek Researchers and reported no findings. It was noted that intensive pineapple cultivation had likely disturbed any previous sites and/or deposits and concluded that, "the subject parcel was most likely not utilized by Hawaiians in pre-contact or post contact times for any permanent dwellings or for agricultural purposes" (Fredericksen, 1990:6).

In 1993, Xamanek Researches conducted subsurface testing of an unmarked grave on East Kuiaha, approximately 2 km south of the current project area. Despite the presence of the unmarked grave (SIHP No. 50-50-06-2928; Donham, 1992) and the site area being called a "cemetery", no additional finds were recorded.

In 1998, Cultural Surveys Hawai`i conducted a reconnaissance survey for a new Kaupakulua Bridge approximately 400 m southwest of the project area. Only a concrete bridge was noted with no markings indicating its name or construction date (Hammatt and Chiogioji 1998).

On Maliko Point, an Archaeological Inventory survey was conducted and two sites were identified (Fredericksen and Fredericksen 2001). These consisted of a historic cemetery and a pre-Contact ceremonial and burial site. In the same area but *makai*, another Archaeological Inventory survey was conducted on 43.76 acres at Maliko Point. No cultural remains were identified (Pantaleo 2002).

Colin and Hammatt (1996) conducted an archaeological assessment for a new bridge on Peahi Road. No sites were recorded and the bridge "was not considered significant a historic bridge… because of its lack on integrity and its relatively recent reconstruction in 1941 and again in 1985 (Colin and Hammatt, 1996:i)."

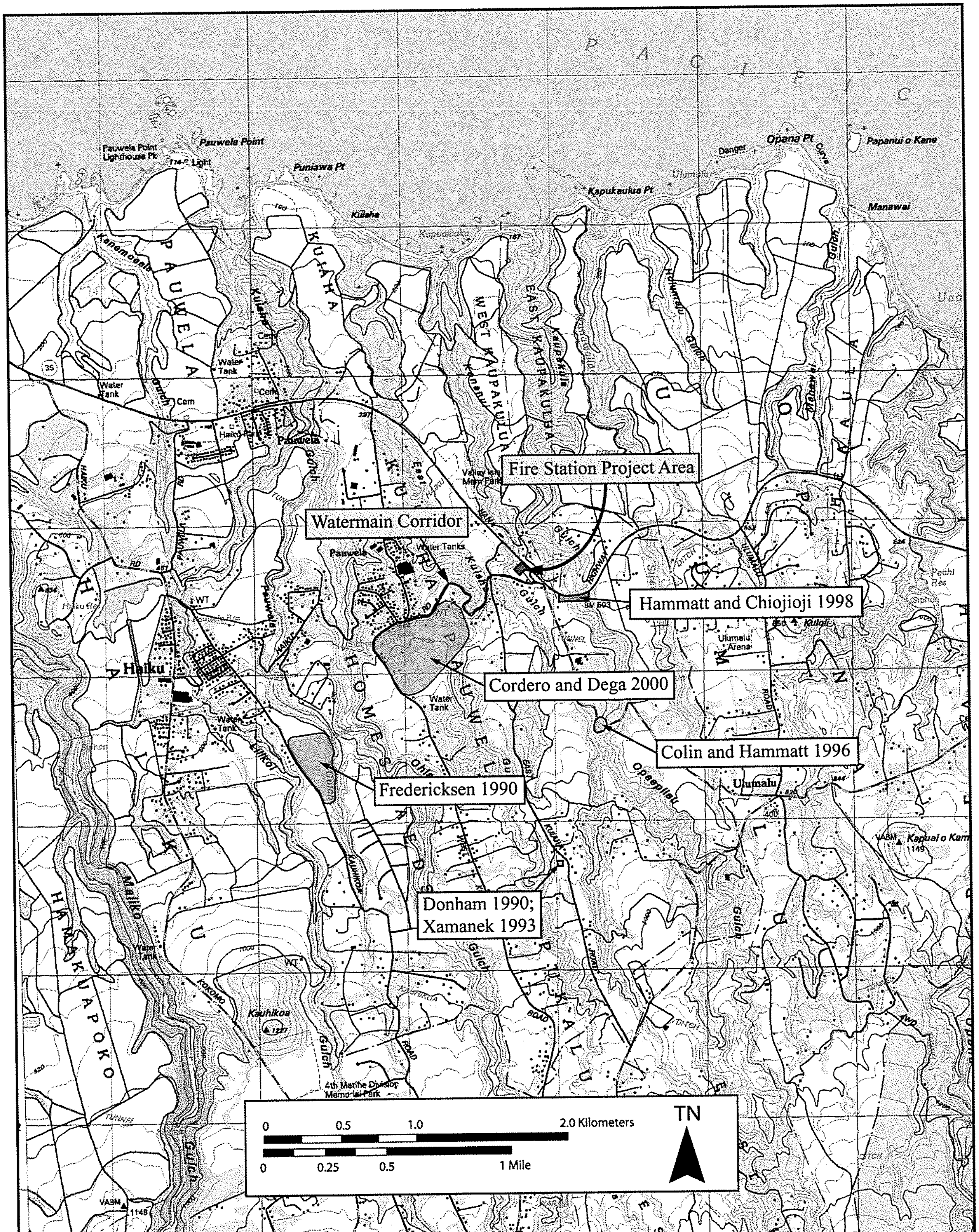


Figure 4: Portion of USGS Map (Haiku Quad) Showing Location of Previous Archaeological Studies

An Archaeological Inventory Survey was conducted for a 64.27 acre parcel north of the project area previously under cultivation with sugar cane. No archaeological remains were identified (Masterson *et al.* 1995).

Scientific Consultant Services surveyed 62-acres in the Kuiaha-Pauwela-Kaupakalua, approximately 1 mile south of the current project area (Cordero and Dega, 2000). Historic pineapple cultivation had utilized over 90% of the project area and only one small retaining wall was identified. A second retaining wall and several small terraces suggested to have been *lo`i* were identified outside the project area within Kuiaha Gulch. The features were believed to have been utilized for small-scale agricultural use as no evidence of habitation was identified. In all, two sites consisting of a retaining wall (SIHP No. -4968) and the remnants of an historic housesite (-5004) were recorded.

An Archaeological Inventory Survey was conducted for the Ha`iku Community Center. Pineapple had previously been cultivated on the parcel and no archaeological remains were identified either above or below the surface (Zachman and Spear 2002).

In 2008, an Archaeological Inventory Survey was conducted in Pa`uwela in which three sites were identified consisting of a pre-Contact stone-walled, earth-filled habitation terrace, a historic boundary line represented by a fence and stone wall and a transportation trail (Joseph *et al.* 2008). The 5-plus acres were located north of the present project area.

PREDICTIVE MODEL

The earliest settlement on Maui Island is believed to have occurred between A.D. 300-600 in windward and coastal areas, with population expanding into drier leeward areas and uplands by A.D. 1000 (Kirch, 1985; Kolb *et al.* 1997 and Sinoto and Pantaleo, 1998). While the coastal settlements flourished, areas considered the middle zones (*i.e.* present project area) contained little archaeological evidence for such expansions (Buffum-Cordero and Dega, 2000).

It is very likely, however, that historic agricultural endeavors such as pineapple cultivation decimated any sites that would have denoted traditional settlement. With the presence of traditional *lo`i* within the gulches around the vicinity of the project area (*i.e.* Kuiaha), it is likely that the plateau areas could have been utilized for temporary habitation or small scale agriculture. LCA's located in the vicinity of the project area suggest that within the gulches taro was cultivated, while potato was grown on the valley sidewalls. Above the gulches, the lands were generally described as pasture land.

Based on previous archaeological research, it is clear that little evidence of traditional Hawaiian settlement on the plateau lands remains. Studies conducted in these areas (i.e. Fredericksen, 1990; Masterson, 1995; and Cordero and Dega, 2000) suggest that surface sites that could have existed prior to the advent of large-scale agriculture were likely destroyed by these activities. Thus, settlement in the plateau lands between the gulches can only be inferred from historic references and the few sites encountered within the gulches.

Historically, the project area was used for large scale pineapple cultivation and pasture and later as a house site that would have likely destroyed any traditional Hawaiian sites or features. Along the waterline corridor the road has been cut up to 15-feet into the slope effectively eliminating any possibility of encountering subsurface deposits. Thus, it is believed that any sites encountered will likely be of an historic nature related to agriculture, animal husbandry or recent habitation within the project area.

METHODS

The inventory survey fieldwork took place from September 21-25, 2009 by David Perzinski, B.A. and Brian Armstrong under the overall direction of Michael Dega, Ph.D. The inventory survey included a 100% pedestrian survey with transects conducted in 5-10 m intervals that were oriented roughly north/south depending on ground cover and visual range. When sites/features were encountered, the location was flagged, noted on a project area map and recorded. The sites were documented with written descriptions, photographs and scale plan view maps. The site boundaries were delineated based on the visible horizontal extent of the features visible on the ground surface.

In addition to the pedestrian survey, 11 backhoe trenches were excavated throughout the subject parcel. Trenches were generally 4 to 8 m in length and excavated to sterile sediments (approximately 1.0-1.4 m below surface). Trenches were excavated throughout the southern portion of the project area due to the extremely uneven terrain in the eastern portion of the project area and presence of several concrete pads and pre-existing structures in the northern portion. Once trenches were completely excavated, the stratigraphic sequence was recorded using Munsell Soil Charts with sediment texture, consistency, plasticity and structure being noted in the descriptions.

Along the waterline corridor, the proposed corridor was inspected by a 100% pedestrian survey. The corridor follows East Kuiaha Road and veers west following Ha`ikū Road to its junction with West Kuiaha Road. The majority of the corridor is along the deeply cut Ha`ikū Road, with the western portion extending through a neighborhood near West Kuiaha Road. No subsurface testing was conducted along waterline corridor due to traffic and safety concerns.

Archival research entailed investigating the historic and archaeological background of the general project area. This examination included a documentary search of previous archaeological research conducted in this region of Maui as well as a review of archival literature relating to Land Commission Awards and local mythology. The review of historical documents was accomplished in order to understand the impact of post-Contact events on the cultural and archaeological landscape of the region

All laboratory work was conducted in the Maui office of SCS and included the drafting of site plan view maps and trench profiles. All documentary materials are currently being curated at the SCS office in Maui.

RESULTS OF FIELDWORK

The archaeological inventory survey included a 100% pedestrian survey and limited subsurface backhoe testing. Surficially, only one historic era site (SIHP No. 50-50-06-6678 and attributed to the former occupants of the vacant house) were recorded. No traditional or early historic sites were observed during the pedestrian inspection. In all, the 11 backhoe trenches were excavated to aid in analysis of the subsurface deposits across the project area, with the majority located within the southern portion of the project area.

The stratigraphic sequences of the 11 trenches were nearly identical (Figures 5 and 6) . The two strata observed were sterile with no cultural layers or materials present. This is likely due to historic land use patterns (pineapple cultivation) and subsequent grading by the landowners. Trenching generally occurred in the southern portion of the project area where thick cane grass and *koa haole* was thriving. In general, the stratigraphic sequence consisted of:

Stratum I: (0-45 cmbs) (dry) 7.5 YR 4/3 (brown) silty clay; slightly hard, medium, granular structure; slightly plastic and sterile; lower boundary is abrupt and wavy

Stratum II: (45-boe) (moist) 5 YR 4/3 (reddish brown) silty clay; slightly hard, medium, subangular structure; slightly plastic and sterile

Along the eastern extent of the proposed waterline corridor, the area appears to have been subjected to grading for the existing East Kuiaha Road. No surface sites or features were observed during the pedestrian survey. Along Ha`ikū Road, the corridor has been deeply cut into the gulch slope, effectively eliminating any possibility of encountering subsurface sites or cultural deposits (Figures 7 and 8). The western extent of the waterline corridor emerges from Kuiaha Gulch and traverses along Ha`ikū Road to its junction with West Kuiaha Road. This portion of the corridor has been graded for the road and existing residential lots.

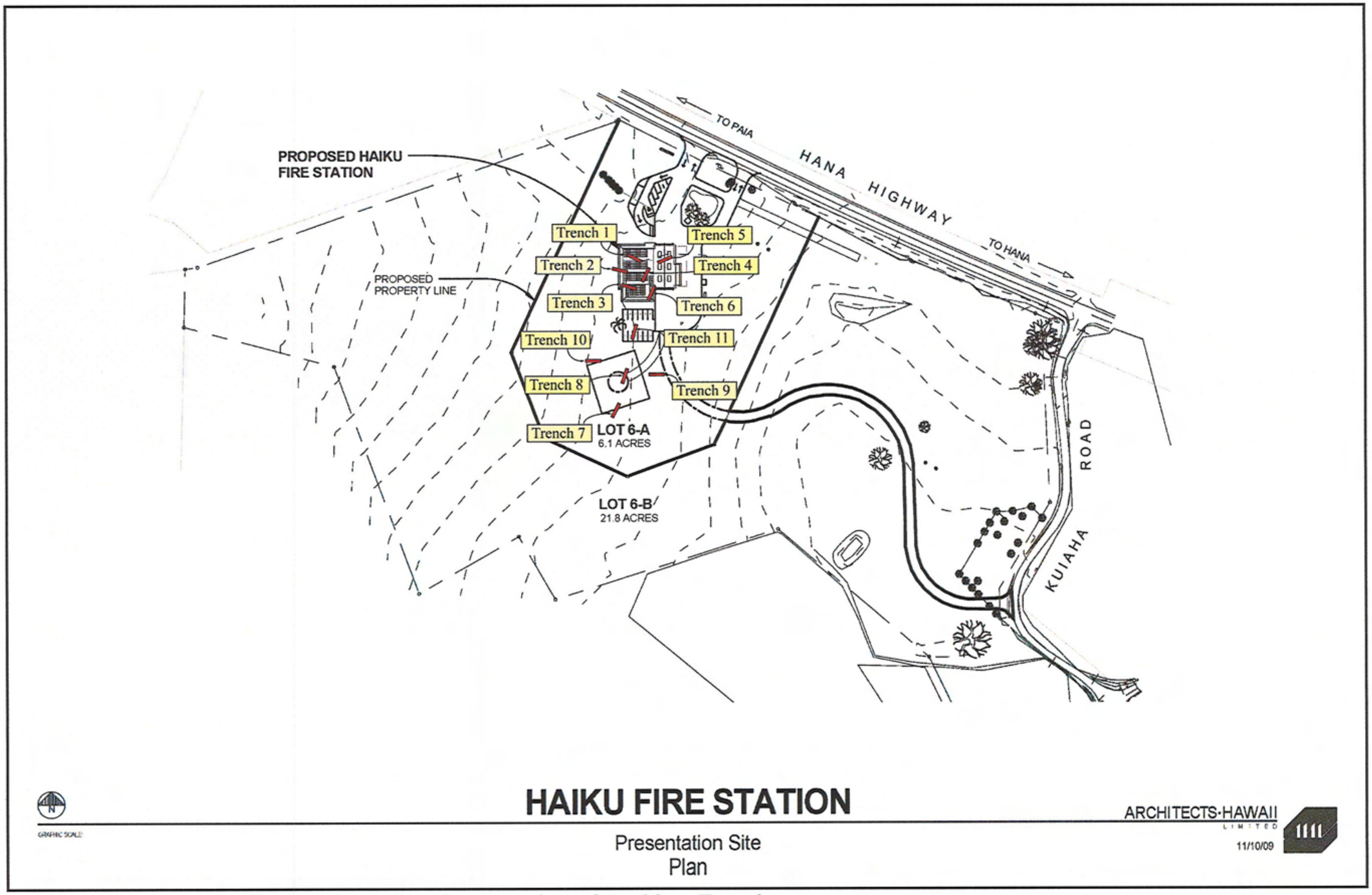
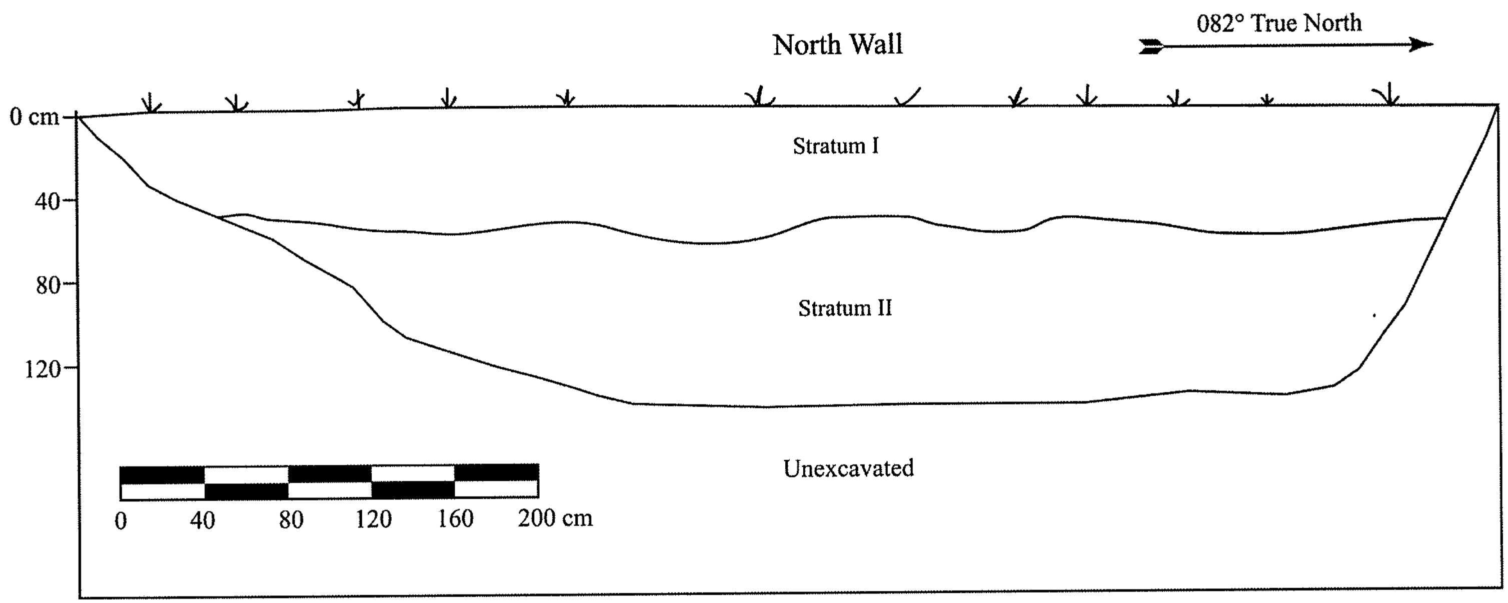


Figure 5: Plan View of Project Area Showing Location of Backhoe Trenches



Stratum I: (dry) 7.5 YR 4/3 (brown) silty clay; slightly hard, medium granular structure; slightly plastic; contains abundant roots and rootlets; lower boundary is abrupt and wavy

Stratum II: (dry) 5 YR 4/3 (reddish brown) silty clay; slightly hard, subangular structure; slightly plastic; contains very few rootlets to no inclusions in places; sterile

Figure 6: Profile of Trench 2 Showing Stratigraphic Sequence

Figure 7: View West of Ha`ikū Road Waterline Corridor Entering Kuiaha Gulch

Figure 8: View West of Ha`ikū Road Waterline Corridor Exiting Kuiaha Gulch

SIHP No. 50-50-06-6678 Condition: Fair/Good

Site Type: Terraces/Retaining Wall

Function: Soil retention/gardening

Feature (#): 2

Age: Historic (ca. 1950's)

Significance: D

Recommendation: No Further Work

SIHP No. 50-50-06-6678 consists of two features and is situated in the northwest portion of the project area adjacent to a vacant cottage and asphalt driveway (Figure 9). The site is currently in fair to good condition and functions as a retaining wall and garden terrace. The features are set amongst thick grasses and vines with a few cultivated plants (banana and potted palms) that appear to have been abandoned. Though the site is constructed of traditional material (dry-stacked basalt), it is believed that the features were associated with the current or possibly a former residence. The age of the site is estimated to be 50-60 years old (ca. 1950's).

Feature A consists of a 21 m long partially faced basalt retaining wall with a maximum height of 94 cm and constructed of small basalt cobbles to large boulders (Figures 10-11). The retaining wall retains an east/west sloping hill that is covered in cane grass. Feature A is dry-stacked 1-5 courses and delineates the eastern side of an asphalt driveway that creates a parking area for an abandoned cottage.

Feature B consists of an 8 meter by 4 meter terraced garden area that is constructed of stacked basalt cobbles 1-4 courses and built on a moderate slope (Figures 10-12). Banana, pineapple and overgrown grasses and vines were observed and it is believed that it was constructed by the former house occupants.

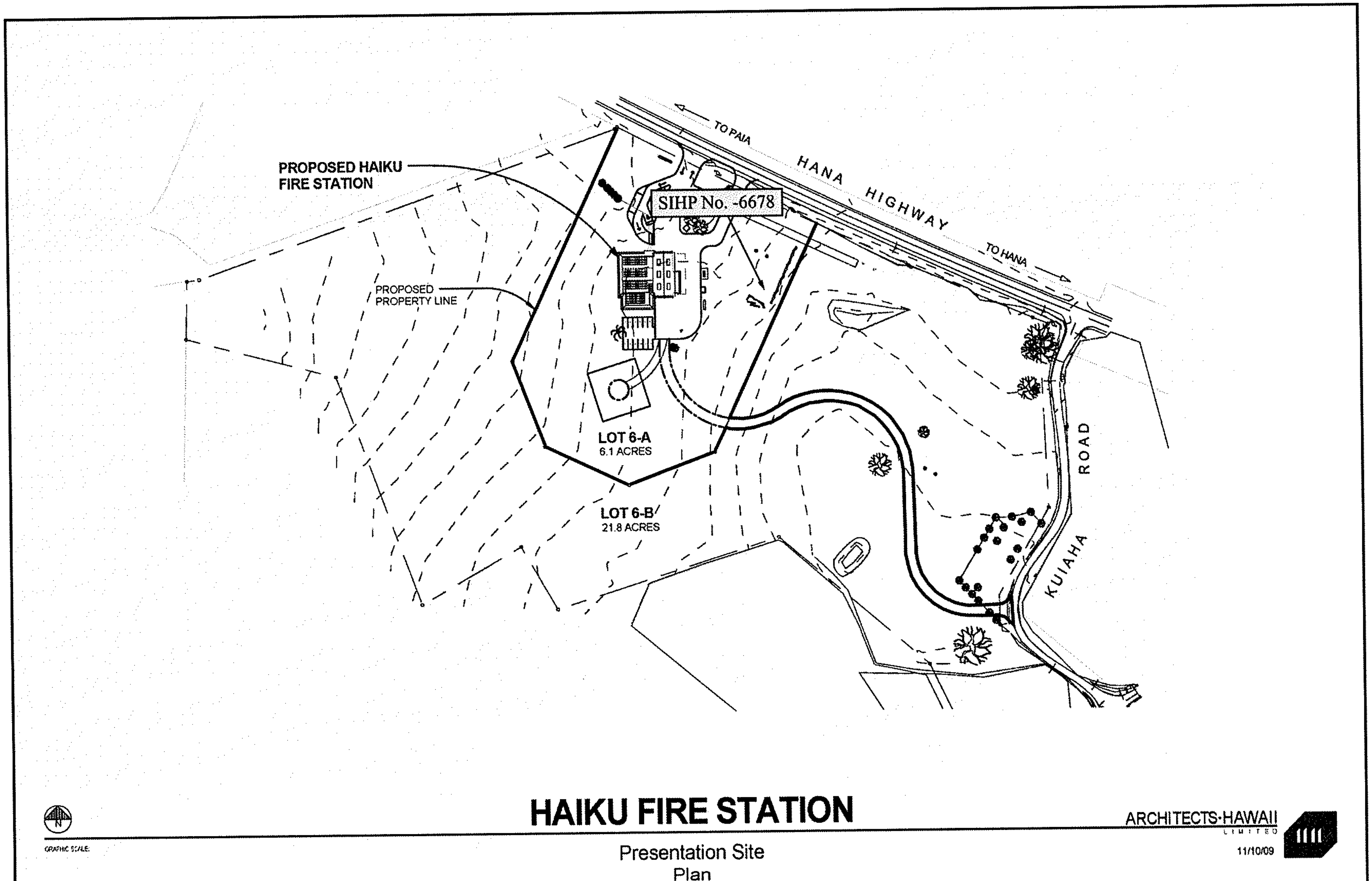


Figure 9: Plan View of Project Area Showing Location of SIHP No. 50-50-06-6678

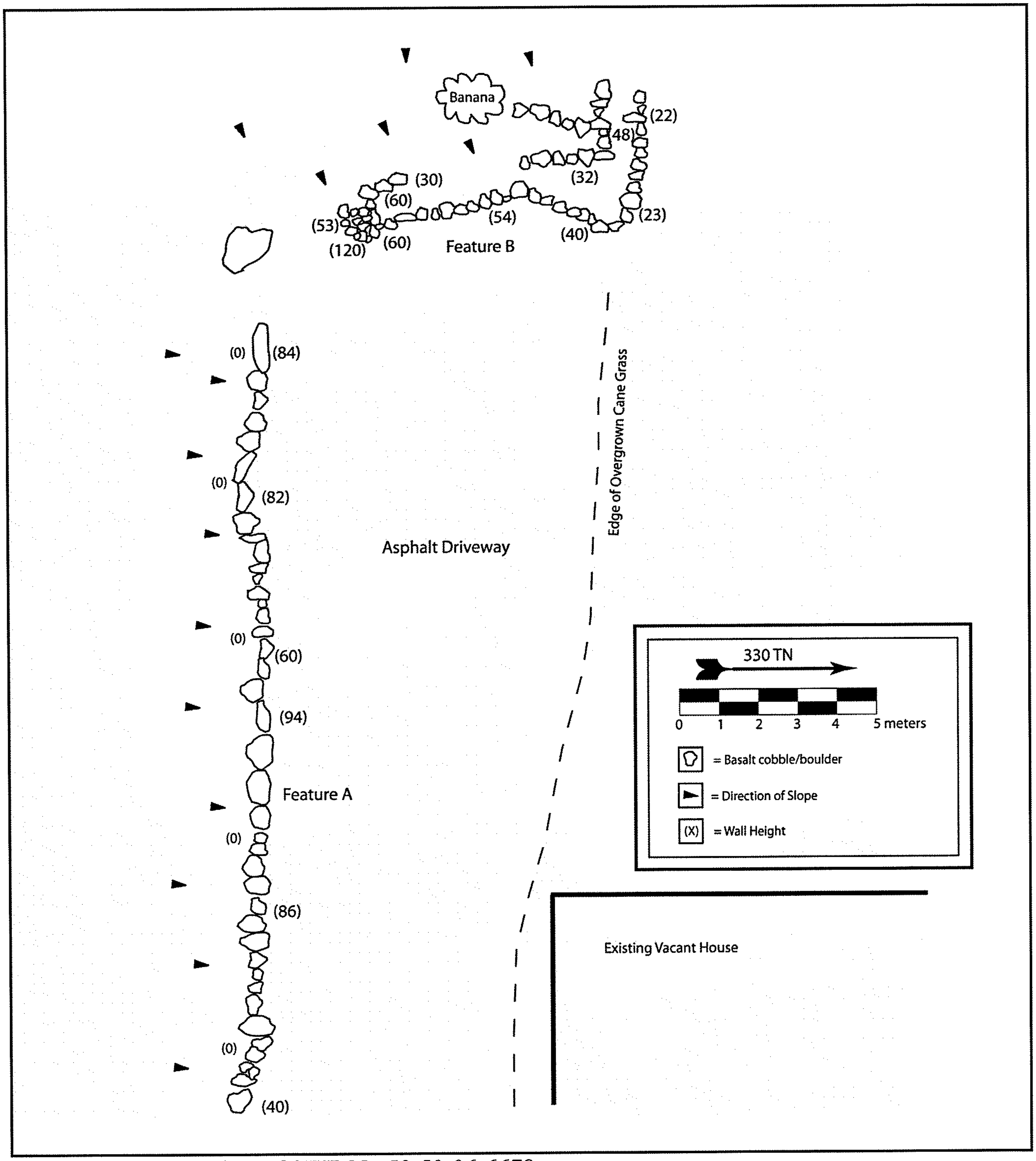


Figure 10: Plan View of SIHP No:50-50-06-6678

Figure 11:View West of SIHP No. -6678 Feature A in Foreground and Feature B in Background

Figure 12: View Northwest of SIHP No. -6678 Feature B

SIGNIFICANCE ASSESSMENTS

One site composed of two features was documented in the project area during Archaeological Inventory Survey at TMK: (2) 2-7-007:008(por.). The site (see below) has been evaluated for significance according to the criteria established for the State and National Register of Historic Places. The five criteria are listed below:

Criterion A:	Site is associated with events that have made a significant contribution to the broad patterns of our history;
Criterion B:	Site is associated with the lives of persons significant to our past;
Criterion C:	Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction;
Criterion D:	Site has yielded or has the potential to yield information important in prehistory or history;
Criterion E:	Site has cultural significance; probable religious structures or burials (State of Hawai`i criteria only).

State Site 50-50-06-6678 is designated under Criterion D as a site that has yielded or has the potential to yield information important in prehistory or history. The site has been thoroughly documented with photographs, scale plan view maps and written descriptions. In addition, one shovel test unit was excavated adjacent to the platform, which yielded no cultural material or layers.

STATE SITE 50-50-06-6678

No further work is recommended for SIHP No. 50-50-06-6678. It is believed that the features have been adequately documented and additional research focused on the site would not contribute to the interpretation of the area, region or Hawaiian prehistory and/or history.

SUMMARY AND RECOMMENDATIONS

Scientific Consultant Services conducted an Archaeological Inventory Survey on a 6.1-acre parcel of land in Pa`uwela, Makawao District, Maui [TMK: 2-7-007:008]. The proposed project includes the construction of a new Ha`ikū Fire Station that will include the station house, parking lots, a helipad and access to Hana Highway. The project was conducted to document and evaluate cultural resources on approximately 6.1 acres of land that currently is the site of two house structures, concrete pads and unmanicured vegetation. In addition, the project has proposed installing a 4,200-foot (1,280 meter) corridor linking the fire station to a watermain at the junction of Ha`ikū Road and West Kuiaha Road. In all, one site (SIHP No. 50-50-06-6678) was documented within the study parcel and consists of an historic era retaining wall and a small terraced garden area.

Previous archaeological investigations and historic documentation in the vicinity of the project area suggests that the area was marginally utilized in pre-Contact times, likely for small scale agriculture, pasture and possibly temporary habitation. In historic times, the area was utilized for large scale agricultural endeavors, primarily for pineapple, and later as a residential house site.

Though it is possible that the project area was utilized in pre-Contact or early historic times, no physical evidence was documented during the inventory survey. Based on field observation and 11 mechanically subsurface test trenches, it appears that the project area, specifically in the vicinity of the proposed Fire Station structures, parking and helipad, has been subjected to extensive mechanical grading for agricultural pursuits and for the former residences. Subsurface observation revealed no evidence of a cultural component (i.e. charcoal, midden, artifacts) that would have indicated pre-Contact or early historic use.

Based on the findings during the archaeological survey, no monitoring is recommended within the 6.1-acre parcel proposed for the new fire station and associated infrastructure. Along the waterline corridor, archaeological monitoring is recommended along portions of Ha`ikū Road that is not within the cut slope. These areas include the stretch crossing Kuiaha Gulch (an approximate 150 meter stretch) and along the western portion of the corridor from the Ha`ikū Road/West Kuiaha Road junction and extending approximately 400 meters towards the gulch. However, should the inadvertent discovery of significant cultural materials and/or burials occur during unmonitored phases of construction, all work in the immediate area of the find must cease and the SHPD be notified to discuss mitigation.

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APPENDIX C-1.

Archaeological Inventory Survey Acceptance Letter from the State Historic Preservation Division

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

November 12, 2010

Michael Dega, Ph.D.
Scientific Consultant Services, Inc.
711 Kapiolani Blvd., Suite 975
Honolulu, Hawaii 96813

LOG NO: 2010.1245
DOC NO: 1011MD25
Archaeology

Dear Dr. Dega:

SUBJECT: Chapter 6E-8 Historic Preservation Review –
Revised Archaeological Inventory Survey of 6.1 Acres with One New Site
Pa'uwela Ahupua'a, Makawao District, Island of Maui
TMK: (2) 2-7-007:008

This letter summarizes our review of the aforementioned revised report (Perzinski and Dega August 2010; *An Archaeological inventory Survey for the Proposed Ha'ikū Fire Station and Waterline Corridor in Pa'uwela Ahupua'a, Makawao District, Island of Maui, Hawaii [TMK 2-7-007:008];SCS Project Number 1012-ISR-2*), which we received on September 9, 2010. We apologize for the delay in our reply. We previously reviewed a draft of this report (Perzinski and Dega June 2010) and requested changes/clarifications (*Log No. 2010.2365, Doc No. 1007MD36*).

This report documents an archaeological inventory survey conducted for the new Ha'ikū fire station, including driveways, a helipad and a waterline extending 1280 meters along Haiku, East Kuiaha and West Kuiaha Roads. One new site was documented, SIHP 50-50-06-6678, rock alignments built by previous residents of the existing vacant house which were used to line the driveway and create a planting area in the 1950s. SIHP 6678 was recommended as significant under criterion "d" and we concur with that recommendation. We also agree that no further work is required at this site.

Archaeological monitoring is recommended for portions of the waterline that are within the Haiku Road corridor, but not along the cut slope. We agree with this recommendation. Please submit an archaeological monitoring plan to SHPD for review and approval pursuant to HAR § 13-279 prior to the start of any ground-altering construction.

Our requested changes have been addressed and this revised report is accepted as final pursuant to HAR §13-276. Upon receipt of this letter please submit one paper copy of your report marked "Final" to our Kapolei office along with a CD containing a searchable pdf version of the final report and a copy of this approval letter, marked to the attention of the "**Kapolei Library**." If you have questions about this letter please contact Morgan Davis at (808) 243-5169 or via email to: morgan.e.davis@hawaii.gov.

Aloha,

Theresa K. Donham
Acting Archaeology Branch Chief
State Historic Preservation Division

APPENDIX D.

Cultural Impact Assessment Report

SCS Project Number 1013-CIA-1

A CULTURAL IMPACT ASSESSMENT FOR THE PROPOSED DEVELOPMENT OF A HA`IK Ū FIRE STATION, PA`UWELA, MAKAWAO DISTRICT ISLAND OF MAUI, HAWAI`I [TMK 2-7-007:008]

Prepared by:
Leann McGerty, B.A.
and
Robert L. Spear, Ph.D.

May 2009

Prepared for:
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i, 96793

SCIENTIFIC CONSULTANT SERVICES Inc.

HAWAII

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

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INTRODUCTION

Scientific Consultant Services (SCS), Inc. has been contracted by Munekiyo & Hiraga, Inc. to conduct a Cultural Impact Assessment (CIA) on a 7-acre land parcel in Pa`uwela, Makawao District, Maui [TMK: 2-7-007:008] (Figures 1 and 2). Based on exhibits supplied by Munekiyo & Hiraga, Inc., the proposed project consists of the construction of the Ha`ikū Fire Station. The exact footprint of the project within the 7 acres has yet to be determined.

The Constitution of the State of Hawai`i clearly states the duty of the State, and its agencies, is to preserve, protect, and prevent interference with the traditional and customary rights of native Hawaiians. Article XII, Section 7 requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778" (2000). In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to native Hawaiian *ahupua`a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights...may extend beyond the *ahupua`a* in which a native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawaii (2000) with House Bill 2895, relating to Environmental Impact Statements, proposes that:

> ...there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights... [H.B. NO. 2895].

Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs and practices, and resources of native Hawaiians, as well as other ethnic groups. Act 50 also requires state agencies, and other developers, to assess the effects of proposed land use, or shore line developments, on the "cultural practices of the community and State" as part of the HRS Chapter 343 environmental review process (2001).

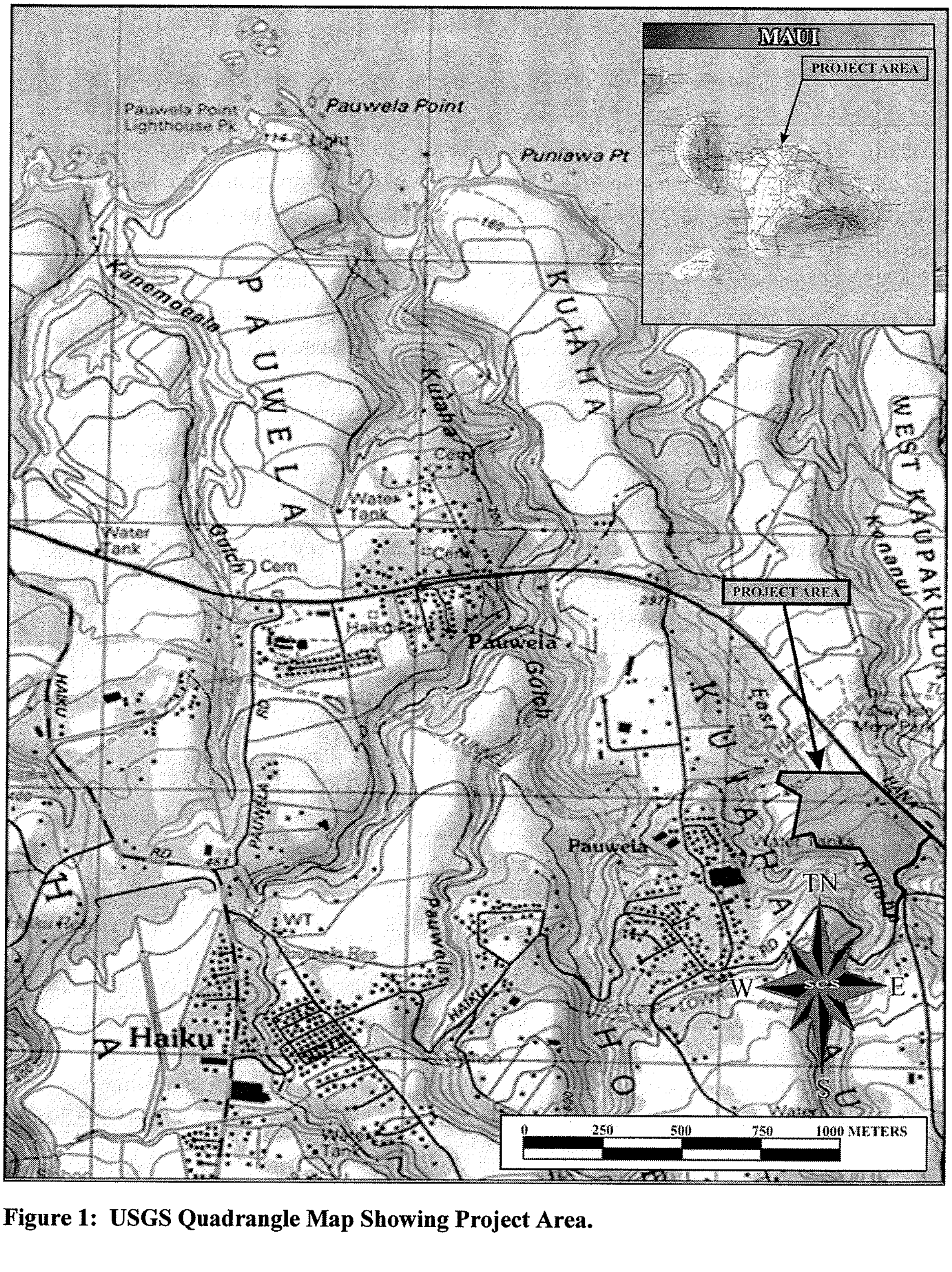

Figure 1: USGS Quadrangle Map Showing Project Area.

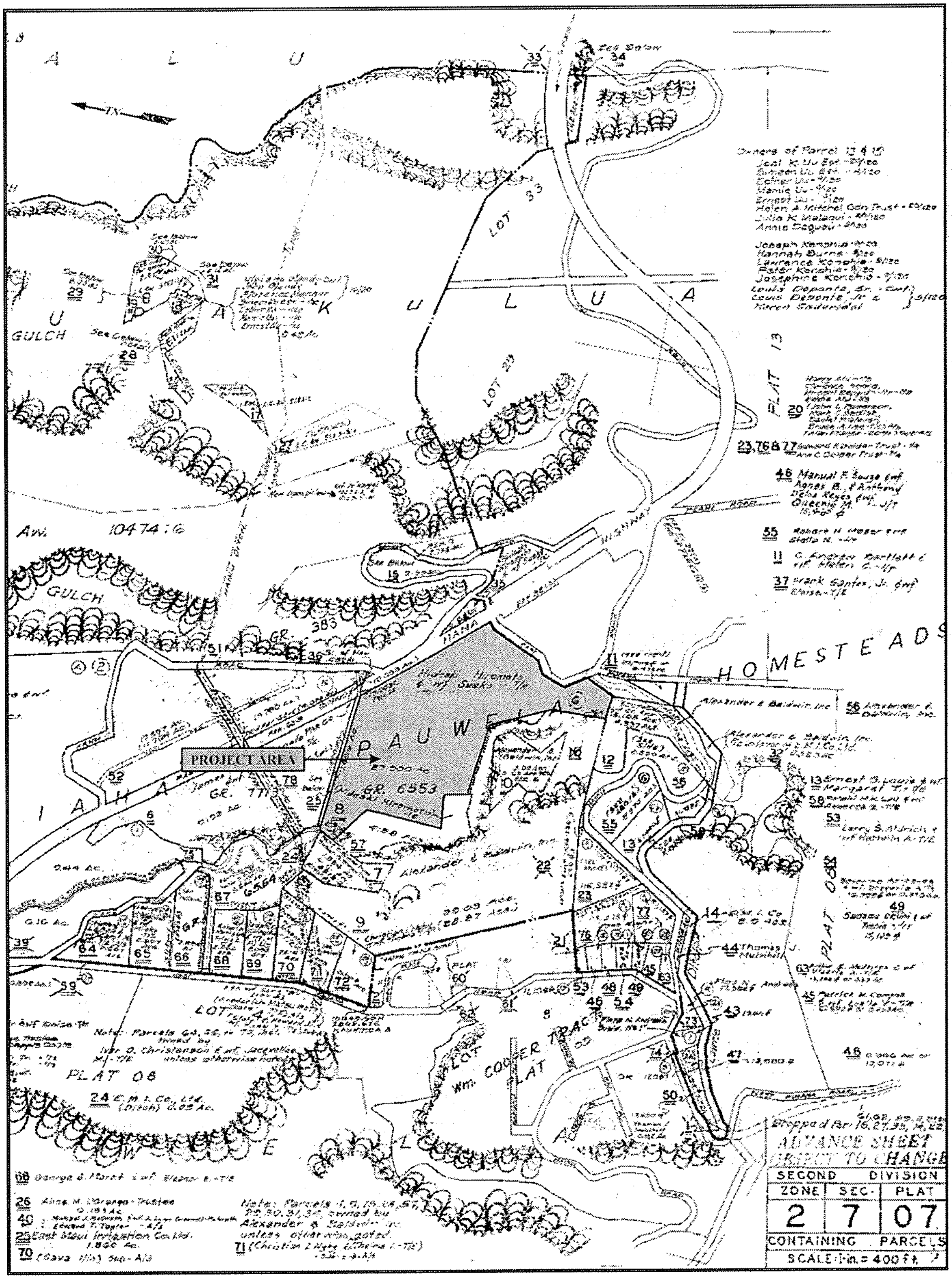

Figure 2: Tax Map Key [TMK] Showing Project Area..

It also re-defined the definition of "significant effect" to include "the sum of effects on the quality of the environment including actions impact on a natural resource, limit the range of beneficial uses of the environment, that are contrary to the State's environmental policies. . . or adversely affect the economic welfare, social welfare or cultural practices of the community and State" (H.B. 2895, Act 50, 2000). Cultural resources can include a broad range of often overlapping categories, including places, behaviors, values, beliefs, objects, records, stories, etc. (H.B. 2895, Act 40, 2000).

Thus, Act 50 requires an assessment of any cultural practices and the possible impacts of a proposed action to be included in the Environmental Assessments and the Environmental Impact Statements, and to be taken into consideration during the planning process. The concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua`a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

The meaning of "traditional" was explained in *National Register Bulletin*:

> Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations', usually orally or through practice. The traditional cultural significance of a historic property, then is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. . . . [Parker and King 1990:1]

METHODOLOGY

This Cultural Impact Assessment was prepared in accordance with the suggested methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Methodology", the OEQC stated that "...information may be obtained through scoping, community meetings, ethnographic interviews and oral histories..." (1997).

The report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. The assessment concerning cultural impacts should make efforts to address the following matters:

(1) a discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints of limitations with might have affected the quality of the information obtained;

(2) a description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken;

(3) ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained;

(4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;

(5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site;

(7) a discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project;

(8) an explanation of confidential information that has been withheld from public disclosure in the assessment;

(9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;

(10) an analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place, and;

(11) the inclusion of bibliography of references, and attached records of interviews, which were allowed to be disclosed.

Based on the inclusion of the above information, assessments of the potential effects on cultural resources in the project area, and recommendations for mitigation of these effects, can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps and land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological project reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws, and guidelines, when knowledgeable individuals are able to identify cultural practices in, or in close proximity to the project area. If they have knowledge of traditional stories, practices and beliefs associated with a project area, or if they know of historical properties within the project area, they are approached for additional consultation and interviews. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share the relevant information. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs (OHA), historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the information available for this study. When telephone interviews occur, a summary of the information is usually sent for correction and approval, or dictated by the informant and then incorporated into the document. If no cultural resource information is forthcoming and no knowledgeable informants are suggested for further inquiry, interviews are not conducted.

Initial letters were sent to organizations whose jurisdiction included knowledge of the area. Consultation was sought from Thelma Shimaoka, Coordinator of the Maui branch of the Office of Hawaiian Affairs; the Central Maui Hawaiian Civic Club; Hinano Rodrigues, Cultural Historian with State Historic Preservation Division; the Maui Planning Department, Cultural Resources Commission; Kamika Kepa`a of the Native Hawaiian Preservation Council, and Nā Kupuna O Maui (Appendix A).

In addition, a Cultural Impact Assessment Notice was published on January 11, 14, 15, 2009 in *The Honolulu Advertiser* and *The Maui News*, on January 11, 14, 15 2009 (Appendix B). These notices requested information of cultural resources or activities in the area of the proposed project, gave the TMK number and where to respond with information. Based on the responses, an assessment of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

When a cultural resource is previously unknown, but identified within a project area, or in a proximity that will be affected by the project, it may be necessary to contact the island Branch OHA office, or other ethnic organizations and individuals who possess the requisite capacity to determine whether any site evaluated meets the criteria for having an important cultural value to the native Hawaiian people as well as those of other ethnic groups.

PROJECT AREA AND VICINITY

The project area is located in Pa`uwela Ahupua`a, Makawao District, and abutting the *mauka* side of the Hāna Highway to the north and East Kuaiha Road to the east. Most of the land in the vicinity of the project area has long been planted in sugar cane or pineapple.

CULTURAL HISTORICAL CONTEXT

The island of Maui ranks second in size of the eight main islands in the Hawaiian Archipelago. The Island was formed by two volcanoes, Mount Kukui in the west and Haleakalā in the east. The younger of the two volcanoes, Haleakalā, soars 2,727 m (10,023 feet) above sea level and embodies the largest section of the island. Unlike the amphitheater valleys of West Maui, the flanks of Haleakalā are distinguished by gentle slopes. Although it receives more rain than its counterpart in the east, the permeable lavas of the Honomanū and Kula Volcanic Series prevent the formation of rain-fed perennial streams. The few perennial streams found on the windward side of Haleakalā where the project is located, originate from springs located at low elevations. Valleys and gulches were formed by intermittent water run-off.

PAST POLITICAL BOUNDARIES

Traditionally, the division of Maui's lands into districts (*moku*) and sub-districts was performed by a *kahuna* (priest, expert) named Kalaiha`ōhia, during the time of the *ali`i* Kaka`alaneo (Beckwith 1940:383; Fornander places Kaka`alaneo at the end of the 15th century or the beginning of the 16th century [Fornander 1919-20, Vol. 6:248]). Land was considered the property of the king or *ali`i `ai moku* (the *ali`i* who eats the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku, ahupua`a, `ili* or *`ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*), which customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875). The *`ili `āina* or *`ili* were smaller land divisions next to importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (*Ibid.*; Lucas 1995). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995). The project area is located in the *ahupua`a* of Pa`uwela, which translated means literally "hot soot" (Pukui *et al.*:1974:182). Traditionally, Pa`uwela was considered a part of the Hāmākua Loa District. Presently, Pa`uwela is in the Makawao District.

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

The Hāmākua Loa region was associated with the gods Kanaloa and Kane, who caused fresh water to flow from springs and gulches, as they had nothing but *`awa* to drink when they came here (Hill *et al.* 2006). Hāmākua Loa was where the head of the guardian of the god of thunder, Kanehekili, was beheaded by his brother-in-law at Pakanaloe Heiau (Thrum 1908). Although the head had been taken to Lāna`i, the people cut up Kanehekili's body into pieces that were distributed around Maui for all to worship.

Both Hāmākua Poko and Hāmākua Loa, where the *ahupua`a* of Pa`uwela is found, contained small gulches surrounded by gently sloping *kula* lands. Opening to the sea, the wide mouths of the gulches supported *lo`i*, that ascended with the stream bed. Handy and Handy stated that Kuiaha Gulch, near the project area, undoubtedly had a few pond fields within its limits (1972). It was very likely that stream taro were planted in the many streamlets that fed into the main gulches, as well as dry land taro in the *kula* lands and in the lower forest (*ibid*). The many narrow *ahupua`a* along this coast suggests that the population was considerable, even with only a moderate rain fall. The soil was excellent for sweet potato between the gulches, yams and *`awa* could be grown in the interior, and other crops, including banana, breadfruit, sugar cane, and arrowroot, would have thrived in the region (*Ibid.*). The bays were considered excellent for fishing with the *alaloa*, finished by Kihapi`ilani in the 1500s, connecting them for easy access by the people.

Before the landing of Capt. Cook, there was great competition between the chiefs of Hawai`i Island and the *ali`i nui* of Maui. In the early 1700s, Chief Alapa`i nui a Kauaua of Hawai`i Island, returned to Maui to make war on Kekaulike, ruling chief of Maui (Kamakau 1961). Upon arrival to Kaupo, he learned that Kekaulike was dying and had appointed Alapa`i's own nephew, Kamehameha nui, as heir. Alapa`i lost all ambition for war and made peace with the new ruler. Although peace was maintained for many years, it was only a matter of time before the rivalry again surfaced between these two Islands. This time with the brother of Kamehameha nui, Kahekili who had become ruler after Kamehameha nui's death, and Kalaniopu`u, an *ali`i* who had previously served under Alapa`i nui, for control of the island chain (Kamakau 1961, Fornander 1969). Kalaniopu`u invaded Hāmākua Loa late in 1778, but was defeated by Kahekili's warriors. Gathering the support of Mahihelelima, chief of the Hāna District, Kalaniopu`u went back to Hāmākua Loa where they attacked once more. The back-and-forth battles continued for sometime (1775-1779), even after the rise of Kamehameha (Kamakau 1961).

> Hearing of Kamehameha's approach Kalanikupule [son of Kahekili] sent an army to Hamakualoa under the warrior Kapa-kahili . . .after his death the fighting ceased and Kamehameha and his chiefs went on the principal encounter at Wailuku [*Ibid.*:148]

WESTERN CONTACT

Early records, such as journals kept by explorers, travelers and missionaries, Hawaiian traditions that survived long enough to be written down, and archaeological investigations have assisted in the understanding of past cultural activities. It was during the fighting between Kalaniopu`u and Kahekili at Hāmākua Loa in 1778, that Capt. Cook and his men first arrived at the other end of the island chain; Ni`ihau and Kaua`i (Fornander 1969). Returning in November of 1778, they had their first look at Maui and Hāmākua Loa region, and indeed, met Kahekili and Kamehameha who ventured out at different times to investigate, ". . .The tower of Lono!" (Kamakau 1961:97).

Descriptions of the north coast of Maui were first recorded in November of 1778 as the Resolution and the Discovery sailed down a portion of the northeast side of the island (Beaglehole 1967: Part I, Vol. III). David Samwell, a surgeon on the Discovery, reported "...the ships lay to all day about 3 miles off shore, trading with the Natives who came off in their canoes in great number..." (Beaglehole Part I, vol. III 1967:1151).

It had been a time of war between Kalaniopu`u, ruler of Hawai`i Island, and Kahekili, chief of Maui and Moloka`i. During this season of the year (*Makahiki*), however, the fighting was temporarily suspended and the great chief of Maui, Kahekili, was free to visit the foreign ships. Samwell recorded his impressions of the King and the windward slopes of the northern coast of Maui. He stated that Kahekili was "a middle aged man ... rather of a mean appearance..." and the land was "...mountainous, the sides of the hills are covered with trees...large open plains on which stand their houses & where they have their plantations of sweet potatoes, taro & c. ..." (*Ibid.*).

THE *MĀHELE*

In the 1840s, a drastic change in the traditional land tenure resulted in a division of island lands and a system of private ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society to that of a market economy (Daws 1968; Kuykendall Vol. I, 1938:145 *et passim*; Kame`eleihiwa 1992). Among other things, the foreigners demanded private ownership of land to insure their investments (Kuykendall Vol. I, 1938:138 *et passim*; Kame`eleihiwa 1992; Kelly 1998, 1983). Once lands were made available and private ownership was instituted, native Hawaiians—including the *maka`āinana* (commoners)—were able to claim the plots they were cultivating and living on, if they had been made aware of the foreign procedures (*kuleana* lands, LCAs). This land division, or Māhele, occurred in 1848. The awarded parcels were called Land Commission Awards (LCA). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property (Chinen 1961). Twenty-eight LCAs were claimed in Pa`uwela Ahupua`a, however, none were awarded within the project area (Waihona `aina Database, 2009). The un-awarded lands of Pa`uwela became government lands and were later sold as Government Grants. The project area was part of Grant 6553.

Sugar cane became a major industry in the 1800s and Pa`uwela offered good land for its cultivation. The Haiku Sugar Company was formed in 1858, and by the 1870s, three more plantations were developed in the region (Dorrance and Morgan 2000). As more and more land was cultivated with sugar, the need for water became significant. In 1876, four plantations formed the Hamakua Ditch Company that obtained the water rights and eventually diverted the stream water by using ditches, tunnels and pipes to irrigate the fields. By 1900, most of

Pa`uwela was in sugar and water needs had expanded to the point where several ditches were constructed to deliver water: the Koolau Ditch in 1905, the Lowrie Ditch in 1914, and the Haiku Ditch in 1914 (Haun and Henry 2002). During the 1920s both pineapple and grapes were introduced for cultivation. In the 1930s, some areas of Pa`uwela were used for cattle pasture lands.

During WWII (1944), Pa`uwela lands were used for a training base called "Camp Maui." At least 16,000 Marines trained here for the invasion that was to take place on Saipan and Tinian in the Mariana Islands that were held by the Japanese (Joseph *et al.* 2008). Today, there are residences, and some continuing agriculture, in the region.

SUMMARY

The "level of effort undertaken" to identify potential effect of a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sometimes the developer might decide to hold meetings in which the public is invited to testify and provide information. As a CIA is not an archaeological study, sending inquiring letters to organizations concerning development of a piece of property that has already been used for previous contemporary activities and is located in an already developed industrial area may be a "good faith effort". If there had been cultural resources and activities in the region, it is likely that they have already been seriously impacted to the point of extinction. However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

In the case of the present parcel, letters of inquiry were sent to organizations whose expertise would include the project area. Consultation was sought from Thelma Shimaoka, Coordinator of the Maui branch of the Office of Hawaiian Affairs; the Central Maui Hawaiian Civic Club; Hinano Rodrigues, Cultural Historian with State Historic Preservation Division; the Maui Planning Department, Cultural Resources Commission; Kamika Kepa`a of the Native Hawaiian Preservation Council, and Nā Kupuna O Maui.

In addition, a Cultural Impact Assessment Notice was published on January 11, 14, 15, 2009 in *The Honolulu Advertiser* and *The Maui News*, on January 11, 14, 15 2009. These notices requested information of cultural resources or activities in the area of the proposed project, gave the TMK number and where to respond with information.

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as I`i, Kamakau, Beckwith, Chinen, Kame`eleihiwa, Fornander, Kuykendall, Kelly, Handy and Handy, Puku`i and Elbert, Thrum, Sterling, and Cordy have contributed, and continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina 2009 Data base.

In addition, archaeological reports specific to the project vicinity were reviewed. Winslow Walker (1930) was the first to systematically record archaeological sites on Maui. He noted 22 *heiau* in the Hāmākua Loa District of which 12 were destroyed, five were partially destroyed, and five were still intact.

An Archaeological Inventory Survey was conducted for a 64.27 acre parcel north of the project area previously under cultivation with sugar cane. No archaeological remains were identified (Masterson *et al.* 1995). In the same area but *makai*, another Archaeological Inventory survey was conducted on 43.76 acres at Maliko Point. No cultural remains were identified (Pantaleo 2002).

On Maliko point a Archaeological Inventory survey was conducted and two sites were identified (Fredericksen and Fredericksen 2001). These consisted of a historic cemetery and a pre-Contact ceremonial and burial site.

An Archaeological Inventory Survey was conducted for the Ha`iku Community Center. Pineapple had previously been cultivated on the parcel and no archaeological remains were identified either above or below the surface (Zachman and Spear 2002).

Several historic burials from around the 1930s were identified in a small parcel west of the present project area (Haun and Henry 2002). These have been preserved by the Maui/Lāna`i Island Burial Council.

Several other surveys conducted between 1998 and 2006 identified agricultural terraces, retaining walls and a steel culvert bridge (Buffum-Cordero and Dega 2000; Hammatt and Chiogioji 1998; and Hill *et al.* 2006).

In 2008, an Archaeological Inventory Survey was conducted in Pa`uwela in which three sites were identified consisting of a pre-Contact stone-walled, earth-filled habitation terrace, a historic boundary line represented by a fence and stone wall and a transportation trail (Joseph *et al.* 2008). The 5-plus acres were located north of the present project area.

Archaeology deals with material remains, and although cultural beliefs are often reflected through some sort of architecture, like *heiau*, or *ko`a,* there are many examples of cultural associations still important to the community with no physical structures to mark their significance. One such place, *Ulukukui O Lanikāula,* located on Moloka`i, is considered an extremely sacred spot. Another might be Kīlauea and Halema`uma`u, home of Pele. These places have become important sites supporting a traditional belief system still held by the many peoples of Hawai`i. They contain no identified archaeological features, however they are highly meaningful "...because of [their] association with cultural practices or beliefs of a living community . . ." (King 2003:3).

CIA INQUIRY RESPONSE

No specific suggestions of further contacts were received from Thelma Shimaoka, Coordinator of the Maui branch of the Office of Hawaiian Affairs; the Central Maui Hawaiian Civic Club; Hinano Rodrigues, Cultural Historian with State Historic Preservation Division; the Maui Planning Department, Cultural Resources Commission; or Nā Kupuna O Maui from the original letters of inquiry sent in January of 2009.

A response was received from Coochie Cayan, the History and Culture Branch Chief, SHPD (January 28, 2009) and OHA, O`ahu Branch (March 17, 200). It was recommended that we initiate consultation with Leslie Kuloloio, Charles Maxwell, and Ke`emoku Kapu and several others that had already been contacted in the letters of initial inquiry. A second batch of inquiry letters were sent on April 8, 2009 (Appendix C). None of these individuals responded with information concerning cultural activities in the area.

Local and statewide newspaper Public Announcements are included in the strategy and pursuit of information concerning cultural resources and activities associated with specific land parcels. A Cultural Impact Assessment Notice was published on January 11, 14, 15, 2009 in the *Honolulu Advertise*r and *The Maui News* also on January 11, 14, 15, 2009. This notice requested information of cultural resources or activities in the project area, or its vicinity, gives the TMK and where to respond with information. There was no response from either notice.

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). To our knowledge, the project area has not been used for traditional cultural purposes within recent times.

CULTURAL ASSESSMEMNT

Based on historical research and the lack of response from the above listed organizations and individuals, it is reasonable to conclude that Hawaiian rights, or those of any ethnic group related to gathering, access, or other customary activities within the project area will not be affected by developmental activities on this parcel. Because there were no cultural activities identified within the project area, there are no adverse effects.

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APPENDIX A: JANUARY CONSULTANT ENQUIRIES

(Enclosures not included)

SCIENTIFIC CONSULTANT SERVICES, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

Central Maui
Hawaiian Civic Club
310 Ka`ahumanu Ave.
Kahului, Maui 96732

January 14, 2009

Dear Members:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha`ikū Fire Station in Ha`ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs…

We are asking you for any information that might contribute to the knowledge of traditional activities, or traditional rights that might be impacted by development of the property. The assessment results are dependent on the response and contributions made by individuals and organizations such as yours. Enclosed are maps showing the proposed project area. Please contact me at our SCS Honolulu office at (808) 597-1182; my cell phone, 225-2355; or home, (808) 637-9539, with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Leann McGerty

Leann McGerty,
Senior Archaeologist
Enclosure (2)

Ph: 808-597-1182 SCS... SERVING ALL YOUR *ARCHAEOLOGICAL* NEEDS Fax: 808-597-1193
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SCIENTIFIC CONSULTANT SERVICES, Inc.

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

January 14, 2009

Kamika Kepa'a
Native Hawaiian Preservation Council
606 Kalo Place
Lahaina, HI 96761

Dear Mr. Kepa'a:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha`ikū Fire Station in Ha`ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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We are asking you for any information that might contribute to the knowledge of traditional activities, or traditional rights that might be impacted by development of the property. The assessment results are dependent on the response and contributions made by individuals and organizations such as yours. Enclosed are maps showing the proposed project area. Please contact me at our SCS Honolulu office at (808) 597-1182; my cell phone, 225-2355; or home, (808) 637-9539, with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Leann McGerty,
Senior Archaeologist
Enclosure (2)

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SCIENTIFIC CONSULTANT SERVICES, Inc.

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

Patty Nishiyama
Nā Kupuna O Maui
320 Kaeo Place
Lahaina, Hawaii 96761

January 14, 2009

Dear Ms. Nishiyama:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha`ikū Fire Station in Ha`ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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SCIENTIFIC CONSULTANT SERVICES, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

January 14, 2009

Hinano Rodrigues, Cultural Historian
DLNR Maui Office
130 Mahalani Street
Wailuku, HI 96791

Dear Hinano:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha`ikū Fire Station in Ha`ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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SCIENTIFIC CONSULTANT SERVICES, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

Thelma Shimaoka
c/o Office of Hawaiian Affairs
140 Hoohana St.
Suite 206
Kahului, HI 96732

January 14, 2009

Dear Ms. Shimaoka:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha`ikū Fire Station in Ha`ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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Sincerely yours,

Leann McGerty

Leann McGerty,
Senior Archaeologist
Enclosure (2)

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SCIENTIFIC CONSULTANT SERVICES, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

January 14, 2009

County of Maui
Department of Planning
Cultural Resources Commission
250 S. High Street
Wailuku, HI 96793

Dear Sir or Madam:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha'ikū Fire Station in Ha'ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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Sincerely yours,

Leann McGerty

Leann McGerty,
Senior Archaeologist
Enclosure (2)

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APPENDIX B: PUBLIC NOTIFICATION

TMK

To: Sharra 597-1193

From: Terri
The Maui News Classified Dept.
Ph: (808) 242-6379 Fax: (808) 242-6389

Please call or fax your corrections/
approval by 4:30 thursday
If I do not hear from you, ad will run
as is. *Thank you!* Cost: $190.80
pd. prmod cr-card.

Scientific Consultant 2x2
Class2009 • 01-11-09 Sunday
(FRS)
1457123 - Page 1 - Composite

CULTURAL IMPACT ASSESSMENT NOTICE

Information requested by SCS
Of cultural resources or on-going
cultural activities on or near this
parcel in Pauwela Homesteads,
Makawao, Maui.
TMK: (2) 2-7-07:8, Gr. 6553.
Please respond within 30 days
to SCS at (808) 597-1182
(MN: Jan. 11, 14, 15, 2009

1013

Proj 1013

IN THE MATTER OF
CULTURAL IMPACT ASSESSMENT NOTICE:

1013

CULTURAL IMPACT ASSESSMENT NOTICE:
Information requested by SCS of cultural resources or ongoing cultural activities on or near this parcel in Pauwela Homesteads, Makawao, Maui TMK: (2) 2-7-07:8, Gr. 6553. Please respond within 30 days to SCS at (808) 597-1182.
(Hon. Adv.: Jan. 11, 14, 15, 2009) (A-620589)

STATE OF HAWAII
City and County of Honolulu

AFFIDAVIT OF PUBLICATION

ss.

Valerie L. Yanagihara being duly sworn deposes and says that she is a clerk, duly authorized to execute this affidavit of THE HONOLULU ADVERTISER, a division of GANNETT PACIFIC CORPORATION, that said newspaper is a newspaper of general circulation in the State of Hawaii, and that the attached notice is a true notice as was published in the aforereferenced newspaper as follows

01/11/2009 The Honolulu Advertiser
01/14/2009 The Honolulu Advertiser
01/15/2009 The Honolulu Advertiser

and that affiant is not a party to or in any way interested in the above entitled matter.

Subscribed and sworn to before me this 15th day of January A.D. 2009

ELSIE A. MARUYAMA NOTARY 88-127 PUBLIC STATE OF HAWAII

Elsie A. Maruyama
Notary Public of the First Judicial Circuit
State of Hawaii
My commission expires March 7, 2012

NOTARY PUBLIC CERTIFICATION

Elsie A. Maruyama First Judicial Circuit

Document Description: Affidavit of Publication

No. of Pages: 1 Date of Doc. 1/15/2009

Elsie A. Maruyama 1/22/2009
Notary Signature Date

ELSIE A. MARUYAMA NOTARY 88-127 PUBLIC STATE OF HAWAII

620589

APPENDIX C: APRIL CONSULTATION INQUIRES

(Enclosures not included)

SCIENTIFIC CONSULTANT SERVICES, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

Mr. Leslie Kuloloio
469 Maalo Street
Kahului, HI 96732

April 8, 2009

Dear Mr. Kuloloio:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha'ikū Fire Station in Ha'ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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Sincerely yours,

Leann McGerty

Leann McGerty,
Senior Archaeologist
Enclosure (2)

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Scientific Consultant Services, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

April 8, 2009 Mr.

Mr. Charles Maxwell
Charles Maxwell
157 Aiea Place
Pukalani, HI 96768

Dear Mr. Maxwell:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha'ikū Fire Station in Ha'ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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Scientific Consultant Services, Inc.
711 Kapiolani Blvd., Suite 975 Honolulu, Hawai'i 96813

Ke`eaumoku and U`i Kapu
Kuleana Kuikahi, LLC.
P.O. Box 11524
Lahaina, Maui 96791

April 8, 2009

Dear Mr. and Mrs. Kapu:

Scientific Consultant Services, Inc. (SCS) has been contracted by Munekiyo & Hiraga, Inc., to conduct a Cultural Impact Assessment (CIA) of a 7 acre parcel in Pauwela, Makawao, Maui (TMK:2-7-007:008). The project proposes the construction of a Ha`ikū Fire Station in Ha`ikū. According to documents supplied by Munekiyo & Hiraga, Inc., SCS has been asked to assess the probability of impacting cultural values and rights within the project area and its vicinity. According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

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Leann McGerty,
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APPENDIX E.

Traffic Impact Analysis Report

Traffic Impact Report

Haiku Fire Station

Prepared for:
Munekiyo & Hiraga, Inc.

Prepared by:
Wilson Okamoto Corporation

June 2010

TRAFFIC IMPACT REPORT

FOR THE PROPOSED

HAIKU FIRE STATION

Prepared for:

Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Prepared by:

Wilson Okamoto Corporation
1907 S. Beretania Street, Suite 400
Honolulu, Hawaii 96826
WOC Ref #7899-01

June 2010

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LIST OF FIGURES

LIST OF APPENDICIES

I. INTRODUCTION

A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed Haiku Fire Station on the island of Maui. The proposed project entails the construction of a new fire station in Haiku adjacent to Hana Highway.

B. Scope of Study

This report presents the findings and conclusions of the traffic study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadway and traffic operations in the vicinity.
3. Analysis of future roadway and traffic conditions without the proposed project.
4. Analysis and development of trip generation characteristics for the proposed project.
5. Superimposing site-generated traffic over future traffic conditions.
6. The identification and analysis of traffic impacts resulting from the proposed project.
7. Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

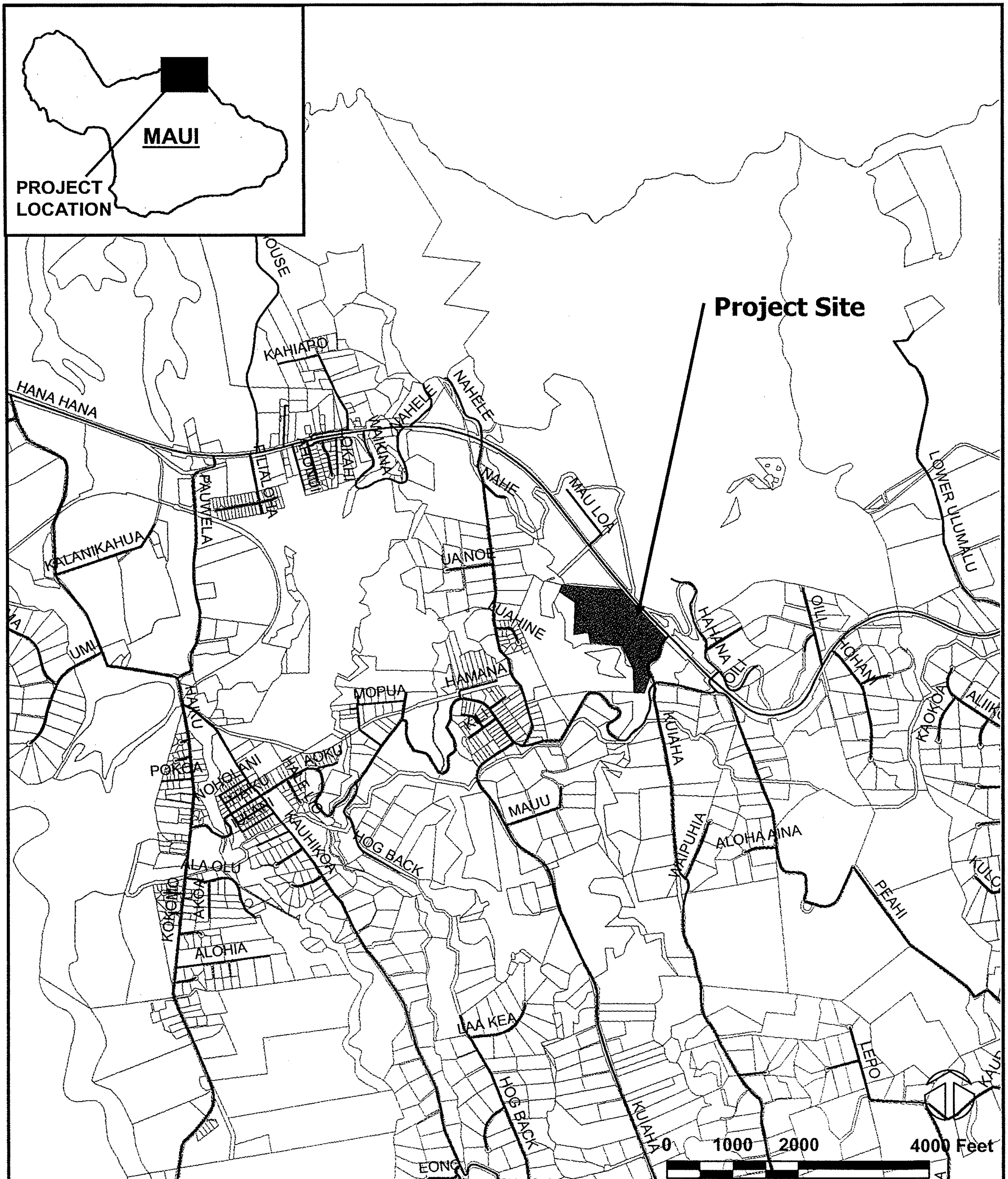
II. PROJECT DESCRIPTION

A. Location

The project site for the new Haiku Fire Station is located adjacent to Hana Highway near East Kuiaha Road in Haiku on the island of Maui (see Figure 1). The proposed site is part of a larger parcel that is further identified as Tax Map Key: 2-7-007: 008 (por.). Access to the new fire station would be provided via a new driveway off Hana Highway.

B. Project Characteristics

The proposed project includes a fire station that will accommodate two fire trucks, utility building, and adjacent at-grade parking areas. The new station will



WILSON OKAMOTO CORPORATION
ENGINEERS • PLANNERS

HAIKU FIRE STATION

LOCATION MAP & VICINITY MAP

FIGURE 1

house office, dining, and living areas, as well as, other miscellaneous support facilities. The new station is expected to be completed by the Year 2012 with access provided via a new driveway off Hana Highway. Figure 2 shows the proposed project site plan.

III. EXISTING TRAFFIC CONDITIONS

A. Area Roadway System

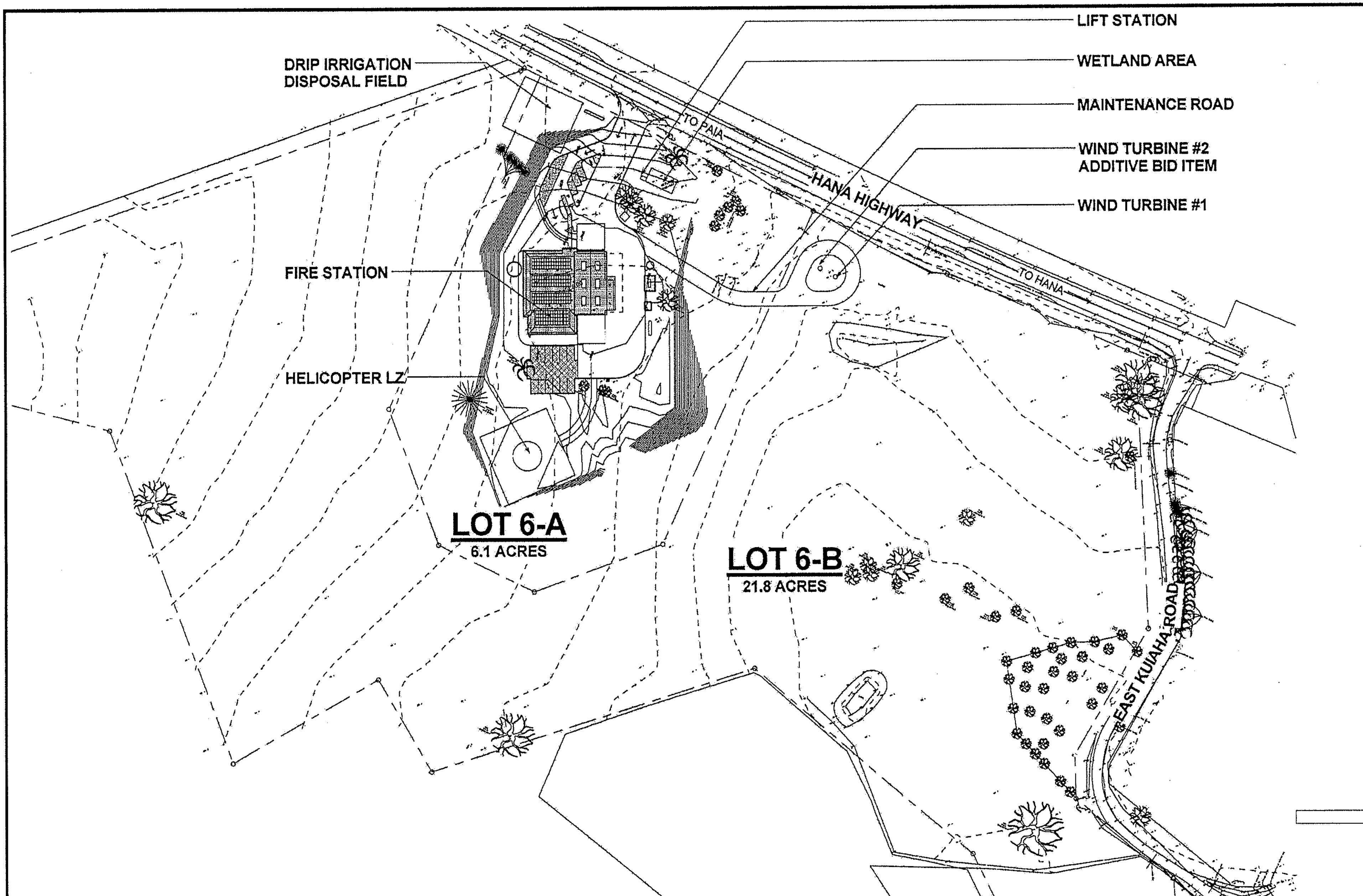
The project site is located adjacent to Hana Highway, a State of Hawaii roadway that serves as the main access road along the northern coast of Maui. In the vicinity of the project site, Hana Highway is a predominantly two-lane, two-way roadway generally oriented in the east-west direction. Southeast of the project site, Hana Highway intersects East Kuiaha Road. At this unsignalized intersection, both approaches of the highway have one lane that serves all traffic movements. East Kuiaha Road is a two-lane, two-way roadway generally oriented in the north-south direction. At the intersection with Hana Highway, the East Kuiaha Road approach has one stop-controlled northbound lane that serves all traffic movements. The southbound approach of the intersection is comprised of a driveway for an adjacent parcel.

B. Traffic Volumes and Conditions

1. General

a. Field Investigation

Field investigations were conducted on April 28, 2008, September 30-October 1, and October 14-15, 2009, and consisted of manual turning movement and 24-hour mechanical traffic count surveys along Hana Highway in the project vicinity. The manual turning movement count surveys were conducted between the morning peak hours of 6:00 AM and 9:00 AM, and the afternoon peak hours of 3:00 PM and 6:00 PM at the intersection of East Kuiaha Road with Hana Highway. Appendix A includes the existing traffic count data.



WILSON OKAMOTO CORPORATION
ENGINEERS - PLANNERS

HAIKU FIRE STATION

PROJECT SITE PLAN

FIGURE 2

b. Capacity Analysis Methodology

The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, and the "Highway Capacity Software", developed by the Federal Highway Administration. The analysis is based on the concept of Level of Service (LOS).

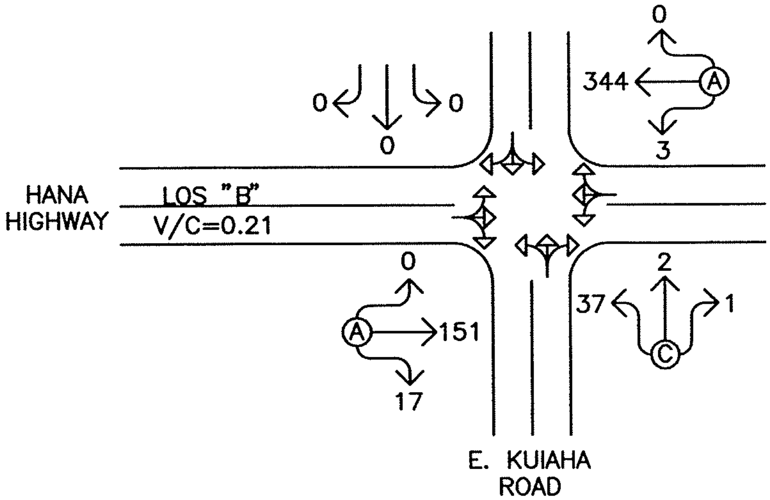
LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix B.

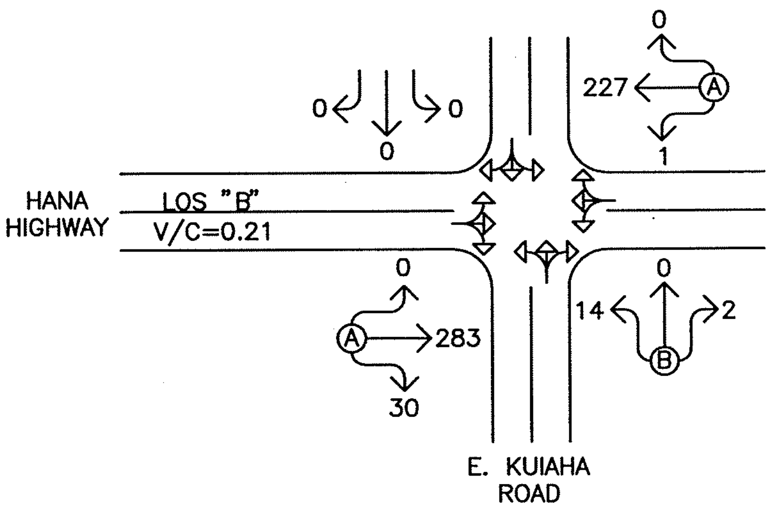
2. Existing Peak Hour Traffic

Figure 3 shows the existing AM and PM peak hour traffic volumes and operating traffic conditions. The AM peak hour of traffic occurs between 7:15 AM and 8:15 AM in the vicinity of the proposed project. In the afternoon, the PM peak hour of traffic generally between the hours of 5:00 PM and 6:00 PM. The analysis is based on these peak hour time periods to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

South of East Kuiaha Road, Hana Highway operates at LOS "B" and a v/c ratio of 0.21 during both peak periods. At the intersection with East Kuiaha Road, the highway carries 168 vehicles eastbound and 347 vehicles westbound during the AM peak hour of traffic. During the PM peak hour, the



AM PEAK PERIOD



PM PEAK PERIOD

LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

Ⓐ LANE GROUP LEVEL OF SERVICE

DATE OF COUNT: April 28, 2008
September 30–October 1, 2009
October 14–15, 2009

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ENGINEERS • PLANNERS

HAIKU FIRE STATION

EXISTING PEAK HOURS OF TRAFFIC

FIGURE 3

overall traffic volume is higher with 313 vehicles traveling eastbound and 228 vehicles traveling westbound. Both approaches of the highway operate at LOS "A" during both peak periods.

The East Kuiaha Road approach of the intersection carries 40 vehicles northbound and operates at LOS "C" during the AM peak hour of traffic. During the PM peak hour of traffic, the traffic volume is less with 16 vehicles traveling northbound. The approach operates at LOS "B" during this time period.

The southbound approach of the intersection is comprised of a driveway for an adjacent parcel. No vehicles were observed on this approach during both peak hours of traffic.

IV. PROJECTED TRAFFIC CONDITIONS

A. Site-Generated Traffic

1. Trip Generation Methodology

The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 8th Edition," 2008. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per employee. Since deliveries to the station are expected to occur during off-peak periods and most of the on-site training, conferences, and workshops are expected to be for the personnel assigned to the station, trips during the peak periods are primarily expected to be comprised of employee-related trips. The Maui Fire Department (MFD) has indicated that there will be 6 employees per shift assigned to the Haiku Fire Station with each employee working 24-hour shifts. The shift change occurs daily between 7:00 AM and 7:30 AM. For the purpose of this report, the total number of site-generated trips was based upon the anticipated number of employees with all employees conservatively assumed to enter and exit the site during the morning peak hour of traffic. Table 1 summarizes the project site trip generation characteristics applied to the AM and PM peak hours of traffic to measure the impact resulting from the proposed Haiku Fire Station.

Table 1: Peak Hour Trip Generation

HAIKU FIRE STATION INDEPENDENT VARIABLE:		# of Employees = 6
		PROJECTED TRIP ENDS
AM PEAK	ENTER	6
	EXIT	6
	TOTAL	12
PM PEAK	ENTER	0
	EXIT	0
	TOTAL	0

2. Trip Distribution

Access to the proposed fire station will be provided via a new driveway off Hana Highway. The directional distribution of site-generated vehicles at the intersection with the highway was based upon the prevailing directional distribution of traffic at the adjacent intersection of the highway with East Kuiaha Road. As such, 85.0% of the entering vehicles were assumed to be traveling eastbound during the AM peak period while 15.0% were assumed to be traveling westbound. Similarly, 2.6% of the exiting vehicles were assumed to be traveling eastbound and 97.4% of the exiting were assumed to be traveling westbound.

B. Through Traffic Forecasting Methodology

The travel forecast is based upon historical traffic count data obtained from the State DOT, Highways Division at survey stations located in the vicinity of the project site. The historical data indicates a stable or declining growth in traffic and, as such, an annual traffic growth rate of approximately 1.0% was conservatively assumed in the project vicinity. As such, using 2009 as the Base Year, a growth rate factor of 1.03 was applied to the existing traffic demands in the project vicinity to achieve the projected Year 2012 traffic demands.

C. Total Traffic Volumes Without Project

The projected Year 2012 AM and PM peak hour traffic volumes and operating conditions in the project vicinity without the proposed Haiku Fire Station are shown on Figure 4, and summarized in Table 2. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.

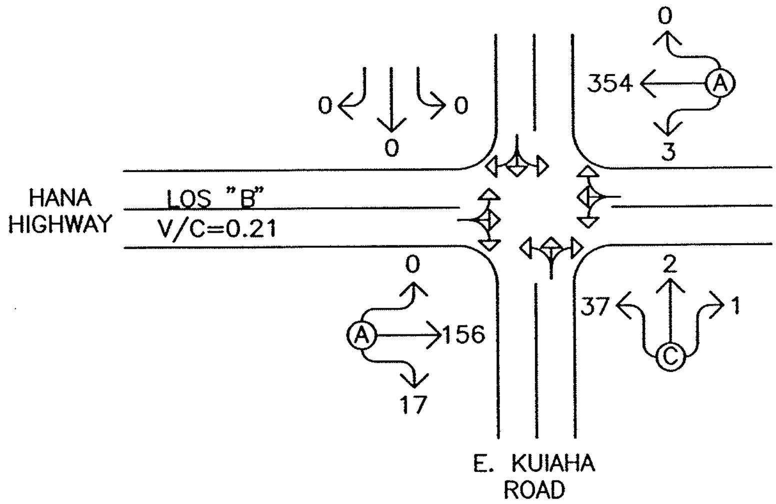
Table 2: Existing and Projected (Without Project) LOS Traffic Operating Conditions

Intersection	Approach	AM		PM	
		Exist	Year 2012 w/out Proj	Exist	Year 2012 w/out Proj
Hana Hwy/ East Kuiaha Rd	Eastbound	A	A	A	A
	Westbound	A	A	A	A
	Northbound	C	C	B	B

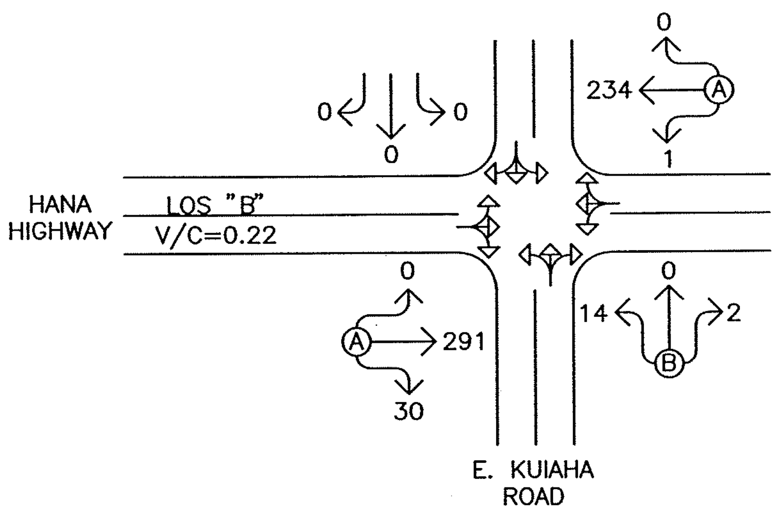
Traffic operations under Year 2012 without project conditions are expected to remain similar to existing conditions during both peak hours of traffic. South of East Kuiaha Road, Hana Highway is expected to continue operating at LOS "B" during both peak periods. Similarly, the approaches of the intersection of Hana Highway with East Kuiaha Road are expected to continue operating at levels of service similar to existing conditions.

D. Total Traffic Volumes With Project

Figure 5 shows the Year 2012 cumulative AM and PM peak hour traffic conditions resulting from the projected external traffic and the proposed Haiku Fire Station. The cumulative volumes consist of site- generated traffic superimposed over Year 2012 projected traffic demands. The traffic impacts resulting from the proposed project are addressed in the following section.



AM PEAK PERIOD



PM PEAK PERIOD

LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

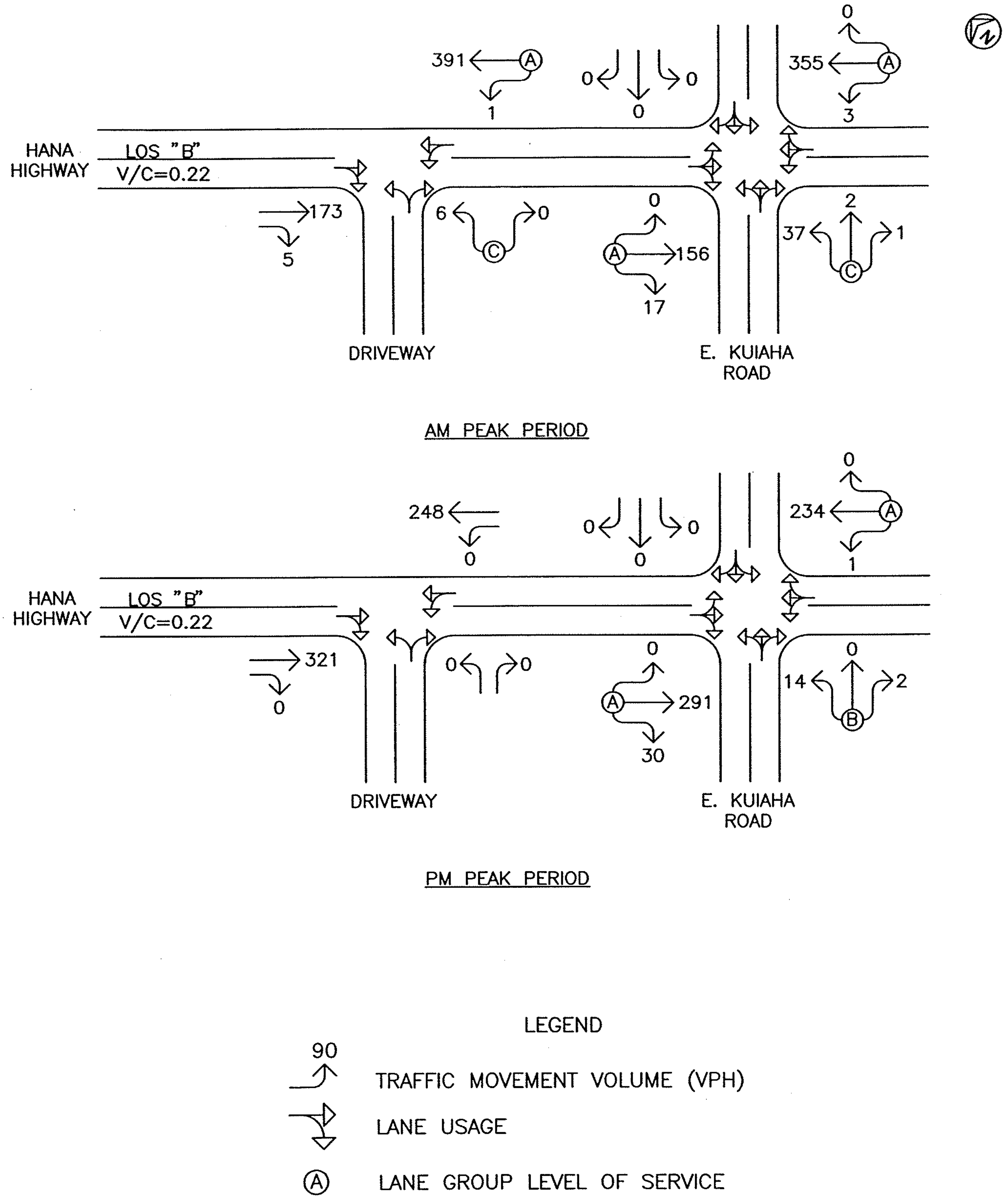
A LANE GROUP LEVEL OF SERVICE

WILSON OKAMOTO CORPORATION
ENGINEERS • PLANNERS

HAIKU FIRE STATION

YEAR 2012 PEAK HOURS OF TRAFFIC WITHOUT PROJECT

FIGURE 4



WILSON OKAMOTO CORPORATION
ENGINEERS · PLANNERS

HAIKU FIRE STATION

YEAR 2012 PEAK HOURS OF TRAFFIC WITH PROJECT

FIGURE 5

V. TRAFFIC IMPACT ANALYSIS

The Year 2012 cumulative AM and PM peak hour traffic conditions with the proposed Haiku Fire Station are summarized in Table 3. The existing and projected Year 2012 (Without Project) operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

Table 3: Existing and Projected (Without and With Project) LOS Traffic Operating Conditions

Intersection	Approach	AM			PM		
		Exist	Year 2012		Exist	Year 2012	
			w/out Proj	w/ Proj		w/out Proj	w/ Proj
Hana Hwy/ East Kuiaha Rd	Eastbound	A	A	A	A	A	A
	Westbound	A	A	A	A	A	A
	Northbound	C	C	C	B	B	B
Hana Hwy/ Fire Station Dwy	Westbound	-	-	A	-	-	-
	Northbound	-	-	C	-	-	-

Traffic operations in the project vicinity are expected to remain similar to existing and Year 2012 without project conditions despite the addition of site-generated vehicles to the surrounding roadway network. South of East Kuiaha Road, Hana Highway is expected to continue operating at LOS "B" during both peak periods. At the intersection of the highway with East Kuiaha Road, the approaches of the intersection are expected to continue operating at LOS "C" or better during the AM peak period and LOS "B" or better during the PM peak period. In addition, the approaches of the intersection of the fire station driveway with Hana Highway are expected to operate at LOS "C" or better during the AM peak period.

VI. RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of this study:

1. Maintain sufficient sight distance for motorists to safely enter and exit all project driveways/roadways.

2. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.

3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.

4. Provide sufficient turning radii at all project driveways/roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

VII. CONCLUSION

The proposed Haiku Fire Station will house support facilities for two fire trucks, as well as, provide office, dining, and living areas for the employees stationed there. With the development of the new fire station, the approaches of the Hana Highway intersections with East Kuiaha Road and the fire station driveway are anticipated to operate at acceptable levels of service during both peak periods. In addition, the total traffic volumes along Hana Highway are expected to increase by approximately 2% or less during both peak periods with the proposed project. These increases in the total traffic volumes are in the range of daily volume fluctuations along the highway and represent a minimal increase in the overall traffic volumes. As such, the proposed Haiku Fire Station is not expected to have a significant impact on the traffic operations in the project vicinity.

APPENDIX A

EXISTING TRAFFIC COUNT DATA

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5676
Counted By:RY
Weather:Clear

File Name : HanaKui AM
Site Code : 00000001
Start Date : 10/1/2009
Page No : 1

Groups Printed- Unshifted

	Private Driveway Southbound				Hana Highway Westbound				E. Kuiaha Road Northbound				Hana Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
06:00 AM	0	0	0	0	0	44	0	44	2	0	0	2	0	7	0	7	53
06:15 AM	0	0	0	0	0	50	0	50	5	0	0	5	0	6	1	7	62
06:30 AM	0	0	0	0	0	55	0	55	5	0	0	5	0	18	0	18	78
06:45 AM	0	0	0	0	0	72	0	72	3	0	0	3	0	19	0	19	94
Total	0	0	0	0	0	221	0	221	15	0	0	15	0	50	1	51	287
07:00 AM	0	0	0	0	0	88	0	88	2	0	0	2	0	13	1	14	104
07:15 AM	0	0	0	0	0	92	0	92	11	2	0	13	0	14	3	17	122
07:30 AM	0	0	0	0	1	124	0	125	12	0	0	12	0	36	3	39	176
07:45 AM	0	0	0	0	1	63	0	64	6	0	1	7	0	53	6	59	130
Total	0	0	0	0	2	367	0	369	31	2	1	34	0	116	13	129	532
08:00 AM	0	0	0	0	1	65	0	66	8	0	0	8	0	48	5	53	127
08:15 AM	0	0	0	0	0	61	0	61	8	0	1	9	0	50	1	51	121
08:30 AM	0	0	0	0	0	52	0	52	3	0	0	3	0	63	1	64	119
08:45 AM	0	0	0	0	0	67	0	67	8	0	0	8	0	57	1	58	133
Total	0	0	0	0	1	245	0	246	27	0	1	28	0	218	8	226	500
Grand Total	0	0	0	0	3	833	0	836	73	2	2	77	0	384	22	406	1319
Apprch %	0	0	0		0.4	99.6	0		94.8	2.6	2.6		0	94.6	5.4		
Total %	0	0	0	0	0.2	63.2	0	63.4	5.5	0.2	0.2	5.8	0	29.1	1.7	30.8	

	Private Driveway Southbound				Hana Highway Westbound				E. Kuiaha Road Northbound				Hana Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	0	0	0	0	92	0	92	11	**2**	0	**13**	0	14	3	17	122
07:30 AM	0	0	0	0	**1**	**124**	0	**125**	**12**	0	0	12	0	36	3	39	**176**
07:45 AM	0	0	0	0	1	63	0	64	6	0	**1**	7	0	**53**	**6**	**59**	130
08:00 AM	0	0	0	0	1	65	0	66	8	0	0	8	0	48	5	53	127
Total Volume	0	0	0	0	3	344	0	347	37	2	1	40	0	151	17	168	555
% App. Total	0	0	0		0.9	99.1	0		92.5	5	2.5		0	89.9	10.1		
PHF	.000	.000	.000	.000	.750	.694	.000	.694	.771	.250	.250	.769	.000	.712	.708	.712	.788

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5676
Counted By:RY
Weather:Clear

File Name : HanaKui PM
Site Code : 00000001
Start Date : 9/30/2009
Page No : 1

Groups Printed- Unshifted

	Private Driveway Southbound				Hana Highway Westbound				E. Kuiaha Road Northbound				Hana Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
03:00 PM	0	0	0	0	2	55	0	57	3	0	0	3	0	42	4	46	106
03:15 PM	0	0	0	0	0	68	0	68	1	0	1	2	0	48	5	53	123
03:30 PM	0	0	0	0	1	52	0	53	3	0	0	3	0	67	2	69	125
03:45 PM	1	0	0	1	0	55	0	55	5	0	0	5	1	57	5	63	124
Total	1	0	0	1	3	230	0	233	12	0	1	13	1	214	16	231	478
04:00 PM	0	0	0	0	1	78	0	79	3	0	0	3	0	56	6	62	144
04:15 PM	0	0	0	0	1	68	0	69	3	0	0	3	1	71	3	75	147
04:30 PM	0	0	0	0	0	46	0	46	1	0	1	2	0	71	6	77	125
04:45 PM	0	0	0	0	0	51	0	51	5	0	0	5	0	67	7	74	130
Total	0	0	0	0	2	243	0	245	12	0	1	13	1	265	22	288	546
05:00 PM	0	0	0	0	1	52	0	53	3	0	1	4	0	76	7	83	140
05:15 PM	0	0	0	0	0	68	0	68	2	0	0	2	0	70	11	81	151
05:30 PM	0	0	0	0	0	51	0	51	6	0	1	7	0	67	7	74	132
05:45 PM	0	0	0	0	0	56	0	56	3	0	0	3	0	70	5	75	134
Total	0	0	0	0	1	227	0	228	14	0	2	16	0	283	30	313	557
Grand Total	1	0	0	1	6	700	0	706	38	0	4	42	2	762	68	832	1581
Apprch %	100	0	0		0.8	99.2	0		90.5	0	9.5		0.2	91.6	8.2		
Total %	0.1	0	0	0.1	0.4	44.3	0	44.7	2.4	0	0.3	2.7	0.1	48.2	4.3	52.6	

	Private Driveway Southbound				Hana Highway Westbound				E. Kuiaha Road Northbound				Hana Highway Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	0	0	0	0	**1**	52	0	53	3	0	**1**	4	0	**76**	7	**83**	140
05:15 PM	0	0	0	0	0	**68**	0	**68**	2	0	0	2	0	70	**11**	81	**151**
05:30 PM	0	0	0	0	0	51	0	51	**6**	0	1	**7**	0	67	7	74	132
05:45 PM	0	0	0	0	0	56	0	56	3	0	0	3	0	70	5	75	134
Total Volume	0	0	0	0	1	227	0	228	14	0	2	16	0	283	30	313	557
% App. Total	0	0	0		0.4	99.6	0		87.5	0	12.5		0	90.4	9.6		
PHF	.000	.000	.000	.000	.250	.835	.000	.838	.583	.000	.500	.571	.000	.931	.682	.943	.922

Wilson Okamoto Corporation
1907 S. Beretania St., Suite 400
Honolulu, HI 96826

Description 1: Haiku Fire Station
Description 2: Hana Highway
Description 3:

Site: 100000000000
Date: 4/28/2009
Tuesday

24 Hour Volume

Begin	WB		EB		Combined	
9:45 AM	86		63		149	
10:00 AM	74	285	86	301	160	586
10:15 AM	70		81		151	
10:30 AM	75		67		142	
10:45 AM	66		67		133	
11:00 AM	67	243	67	280	134	523
11:15 AM	65		89		154	
11:30 AM	55		62		117	
11:45 AM	56		62		118	
12:00 PM	65	224	73	286	138	510
12:15 PM	57		72		129	
12:30 PM	49		62		111	
12:45 PM	53		79		132	
1:00 PM	67	249	82	306	149	555
1:15 PM	45		79		124	
1:30 PM	58		69		127	
1:45 PM	79		76		155	
2:00 PM	63	251	72	307	135	558
2:15 PM	63		86		149	
2:30 PM	48		69		117	
2:45 PM	77		80		157	
3:00 PM	58	278	93	344	151	622
3:15 PM	69		87		156	
3:30 PM	81		76		157	
3:45 PM	70		88		158	
4:00 PM	91	302	109	358	200	660
4:15 PM	66		79		145	
4:30 PM	71		84		155	
4:45 PM	74		86		160	
5:00 PM	67	317	92	365	159	682
5:15 PM	87		88		175	
5:30 PM	84		105		189	
5:45 PM	79		80		159	
6:00 PM	92	319	88	286	180	605
6:15 PM	74		72		146	
6:30 PM	77		68		145	
6:45 PM	76		58		134	
7:00 PM	58	210	43	172	101	382
7:15 PM	58		48		106	
7:30 PM	48		39		87	
7:45 PM	46		42		88	
8:00 PM	49	200	33	111	82	311
8:15 PM	54		30		84	
8:30 PM	44		20		64	
8:45 PM	53		28		81	
9:00 PM	27	124	19	77	46	201
9:15 PM	37		16		53	
9:30 PM	30		19		49	

	Begin	WB		EB		Combined	
	9:45 PM	30		23		53	
	10:00 PM	42	136	17	72	59	208
	10:15 PM	37		21		58	
	10:30 PM	39		29		68	
	10:45 PM	18		5		23	
	11:00 PM	11	41	6	28	17	69
	11:15 PM	12		8		20	
	11:30 PM	13		8		21	
	11:45 PM	5		6		11	
4/29/2009	12:00 AM	3	16	3	11	6	27
	12:15 AM	8		6		14	
	12:30 AM	3		1		4	
	12:45 AM	2		1		3	
	1:00 AM	2	8	1	5	3	13
	1:15 AM	2		2		4	
	1:30 AM	2		1		3	
	1:45 AM	2		1		3	
	2:00 AM	1	6	1	10	2	16
	2:15 AM	1		2		3	
	2:30 AM	4		3		7	
	2:45 AM	0		4		4	
	3:00 AM	1	4	3	9	4	13
	3:15 AM	2		0		2	
	3:30 AM	0		3		3	
	3:45 AM	1		3		4	
	4:00 AM	1	4	4	27	5	31
	4:15 AM	1		4		5	
	4:30 AM	0		9		9	
	4:45 AM	2		10		12	
	5:00 AM	3	17	19	101	22	118
	5:15 AM	3		19		22	
	5:30 AM	3		30		33	
	5:45 AM	8		33		41	
	6:00 AM	7	57	40	268	47	325
	6:15 AM	10		68		78	
	6:30 AM	16		69		85	
	6:45 AM	24		91		115	
	7:00 AM	21	160	96	431	117	591
	7:15 AM	30		121		151	
	7:30 AM	42		129		171	
	7:45 AM	67		85		152	
	8:00 AM	53	98	88	144	141	242
	8:15 AM	45		56		101	

	WB	EB	Combined
24 Hour Volume	3635 (45.5%)	4362 (54.5%)	7997

12:00 AM - 12:00 PM

	WB	EB	Combined
Count	984	1650	2634
	37.4 %	62.6 %	
Peak Hour	9:45 AM	6:45 AM	7:15 AM
Volume	305	437	615
Factor	0.89	0.85	0.90

12:00 PM - 12:00 AM

	WB	EB	Combined
Count	2651	2712	5363
	49.4 %	50.6 %	
Peak Hour	5:15 PM	4:45 PM	5:15 PM
Volume	342	371	703
Factor	0.93	0.88	0.93

Wi... Oka...o Co...ratio..
1907 S. Beretania St., Suite 400
Honolulu, HI 96826

Description 1: Haiku Fire Station
Description 2: Hana Highway
Description 3:

Date: 10/14/2009 Wednesday

Daily Volume

Begin	EB		WB		Combined		Begin	EB		WB		Combined	
12:00 AM	-	-	-	-	-	-	12:00 PM	53	220	66	224	119	444
12:15 AM	-		-		-		12:15 PM	61		54		115	
12:30 AM	-		-		-		12:30 PM	55		52		107	
12:45 AM	-		-		-		12:45 PM	51		52		103	
1:00 AM	-	-	-	-	-	-	1:00 PM	59	249	67	255	126	504
1:15 AM	-		-		-		1:15 PM	61		61		122	
1:30 AM	-		-		-		1:30 PM	67		65		132	
1:45 AM	-		-		-		1:45 PM	62		62		124	
2:00 AM	-	-	-	-	-	-	2:00 PM	59	236	62	260	121	496
2:15 AM	-		-		-		2:15 PM	52		66		118	
2:30 AM	-		-		-		2:30 PM	72		63		135	
2:45 AM	-		-		-		2:45 PM	53		69		122	
3:00 AM	-	-	-	-	-	-	3:00 PM	77	288	110	371	187	659
3:15 AM	-		-		-		3:15 PM	76		91		167	
3:30 AM	-		-		-		3:30 PM	71		65		136	
3:45 AM	-		-		-		3:45 PM	64		105		169	
4:00 AM	-	-	-	-	-	-	4:00 PM	74	324	80	304	154	628
4:15 AM	-		-		-		4:15 PM	101		80		181	
4:30 AM	-		-		-		4:30 PM	81		68		149	
4:45 AM	-		-		-		4:45 PM	68		76		144	
5:00 AM	-	-	-	-	-	-	5:00 PM	67	340	66	261	133	601
5:15 AM	-		-		-		5:15 PM	93		69		162	
5:30 AM	-		-		-		5:30 PM	83		64		147	
5:45 AM	-		-		-		5:45 PM	97		62		159	
6:00 AM	-	-	-	-	-	-	6:00 PM	72	352	51	204	123	556
6:15 AM	-		-		-		6:15 PM	84		57		141	
6:30 AM	-		-		-		6:30 PM	111		61		172	
6:45 AM	-		-		-		6:45 PM	85		35		120	
7:00 AM	-	-	-	-	-	-	7:00 PM	70	227	44	126	114	353
7:15 AM	-		-		-		7:15 PM	62		29		91	
7:30 AM	-		-		-		7:30 PM	53		27		80	
7:45 AM	-		-		-		7:45 PM	42		26		68	
8:00 AM	-	-	-	-	-	-	8:00 PM	49	164	24	73	73	237
8:15 AM	-		-		-		8:15 PM	45		16		61	
8:30 AM	-		-		-		8:30 PM	34		22		56	
8:45 AM	-		-		-		8:45 PM	36		11		47	
9:00 AM	-	-	-	-	-	-	9:00 PM	41	141	17	58	58	199
9:15 AM	-		-		-		9:15 PM	40		13		53	
9:30 AM	-		-		-		9:30 PM	35		14		49	
9:45 AM	-		-		-		9:45 PM	25		14		39	
10:00 AM	-	-	-	-	-	-	10:00 PM	19	84	11	31	30	115
10:15 AM	-		-		-		10:15 PM	24		8		32	
10:30 AM	-		-		-		10:30 PM	23		8		31	
10:45 AM	-		-		-		10:45 PM	18		4		22	
11:00 AM	-	6	-	15	-	21	11:00 PM	17	38	11	16	28	54
11:15 AM	-		-		-		11:15 PM	8		0		8	
11:30 AM	-		-		-		11:30 PM	7		4		11	
11:45 AM	6		15		21		11:45 PM	6		1		7	

	EB	WB	Combined
24 Hour Volume	2669 (54.8%)	2198 (45.2%)	4867

12:00 AM - 12:00 PM

	EB	WB	Combined
Count	6	15	21
	28.6 %	71.4 %	
Peak Hour	-	-	-
Volume	-	-	-
Factor	-	-	-

12:00 PM - 12:00 AM

	EB	WB	Combined
Count	2663	2183	4846
	55.0 %	45.0 %	
Peak Hour	5:45 PM	3:00 PM	3:00 PM
Volume	364	371	659
Factor	0.82	0.84	0.88

Wilson Okamoto Corporation
1907 S. Beretania St., Suite 400
Honolulu, HI 96826

Description 1: Haiku Fire Station
Description 2: Hana Highway
Description 3:

Date: 10/15/2009 Thursday

Daily Volume

Begin	EB		WB		Combined	
12:00 AM	3	9	3	6	6	15
12:15 AM	0		1		1	
12:30 AM	1		0		1	
12:45 AM	5		2		7	
1:00 AM	4	11	0	4	4	15
1:15 AM	1		0		1	
1:30 AM	2		1		3	
1:45 AM	4		3		7	
2:00 AM	4	8	0	3	4	11
2:15 AM	2		0		2	
2:30 AM	1		2		3	
2:45 AM	1		1		2	
3:00 AM	1	4	2	11	3	15
3:15 AM	2		2		4	
3:30 AM	1		5		6	
3:45 AM	0		2		2	
4:00 AM	0	1	3	14	3	15
4:15 AM	1		3		4	
4:30 AM	0		2		2	
4:45 AM	0		6		6	
5:00 AM	4	16	15	92	19	108
5:15 AM	3		22		25	
5:30 AM	6		23		29	
5:45 AM	3		32		35	
6:00 AM	9	48	47	251	56	299
6:15 AM	5		55		60	
6:30 AM	19		76		95	
6:45 AM	15		73		88	
7:00 AM	20	128	80	369	100	497
7:15 AM	29		92		121	
7:30 AM	25		101		126	
7:45 AM	54		96		150	
8:00 AM	66	286	73	320	139	606
8:15 AM	59		86		145	
8:30 AM	77		86		163	
8:45 AM	84		75		159	
9:00 AM	84	304	95	347	179	651
9:15 AM	80		96		176	
9:30 AM	68		74		142	
9:45 AM	72		82		154	
10:00 AM	65	262	67	252	132	514
10:15 AM	65		64		129	
10:30 AM	61		57		118	
10:45 AM	71		64		135	
11:00 AM	66	254	46	268	112	522
11:15 AM	64		73		137	
11:30 AM	67		71		138	
11:45 AM	57		78		135	

Begin	EB		WB		Combined	
12:00 PM	51	134	64	166	115	300
12:15 PM	49		62		111	
12:30 PM	34		40		74	

	EB	WB	Combined
24 Hour Volume	1465 (41.1%)	2103 (58.9%)	3568

	12:00 AM - 12:00 PM			12:00 PM - 12:00 AM		
	EB	WB	Combined	EB	WB	Combined
Count	1331	1937	3268	134	166	300
	40.7 %	59.3 %		44.7 %	55.3 %	
Peak Hour	8:30 AM	7:00 AM	8:30 AM	-	-	-
Volume	325	369	677	-	-	-
Factor	0.97	0.91	0.95	-	-	-

APPENDIX B

LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

Table 1: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Veh)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

"Highway Capacity Manual," Transportation Research Board, 2000.

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR A TWO-LANE HIGHWAY

The primary measures of service quality for Class I two-lane highways are percent time-spent-following and average travel speed. For Class II two-lane highways, service quality is based only on percent time-spent-following. LOS criteria are defined for peak 15-min flow periods and are intended for application to segments of significant length.

Level of Service A describes the highest quality of traffic service, when motorists are able to travel at their desired speed. Without strict enforcement, this highest quality would result in average speeds of 55 mi/h or more on two-lane highways in Class I. The passing frequency required to maintain these speeds has not reached a demanding level, so that passing demand is well below passing capacity, and platoons of three or more vehicles are rare. Drivers are delayed no more than 35 percent of their travel time by slow-moving vehicles. A maximum flow rate of 490 pc/h total in both directions may be achieved with base conditions. On Class II highways, speeds may fall below 55 mi/h, but motorists will not be delayed in platoons for more than 40 percent of their travel time.

Level of Service B characterizes traffic flow with speeds of 50 mi/h or slightly higher on level-terrain Class I highways. The demand for passing to maintain desired speeds becomes significant and approximates the passing capacity at the lower boundary of LOS B. Drivers are delayed in platoons up to 50 percent of the time. Service flow rates of 780 pc/h total in both directions can be achieved under base conditions. Above this flow rate, the number of platoons increases dramatically. On Class II highways, speeds may fall below 50 mi/h, but motorists will not be delayed in platoons for more than 55 percent of their travel time.

Level of Service C describes further increases in flow, resulting in noticeable increases in platoon formation, platoon size, and frequency of passing impediments. The average speed still exceeds 45 mi/h on level-terrain Class I highways, even though unrestricted passing demand exceeds passing capacity. At higher volumes the chaining of platoons and significant reductions in passing capacity occur. Although traffic flow is stable, it is susceptible to congestion due to turning traffic and slow-moving vehicles. Percent time-spent-following may reach 65 percent. A service flow rate of up to 1,190 pc/h total in both directions can be accommodated under base conditions. On Class II highways, speeds may fall below 45 mi/h, but motorists will not be delayed in platoons for more than 70 percent of their travel time.

Level of Service D describes unstable traffic flow. The two opposing traffic streams begin to operate separately at higher volume levels, as passing becomes extremely difficult. Passing demand is high, but passing capacity approaches zero. Mean platoon sizes of 5 to 10 vehicles are common, although speeds of 40 mi/h still can be maintained under base conditions on Class I highways. The proportion of no-passing zones along the roadway section usually has little influence on passing. Turning vehicles and roadside distractions cause major shock waves in the traffic stream. Motorists are delayed in

"Highway Capacity Manual," Transportation Research Board, 2000.

platoons for nearly 80 percent of their travel time. Maximum service flow rates of 1,830 pc/h total in both directions can be maintained under base conditions. On Class II highways, speeds may fall below 40 mi/h, but in no case will motorists be delayed in platoons for more than 85 percent of their travel time.

At **Level of Service E**, traffic flow conditions have a percent time-spent-following greater than 80 percent on Class I highways and greater than 85 percent on Class II. Even under base conditions, speeds may drop below 40 mi/h. Average travel speeds on highways with less than base conditions will be slower, even down to 25 mi/h on sustained upgrades. Passing is virtually impossible at LOS E, and platooning becomes intense, as slower vehicles or other interruptions are encountered.

The highest volume attainable under LOS E defines the capacity of the highway, generally 3,200 pc/h total in both directions. Operating conditions at capacity are unstable and difficult to predict. Traffic operations seldom reach near capacity on rural highways, primarily because of lack of demand.

Level of Service F represents heavily congested flow with traffic demand exceeding capacity. Volumes are lower than capacity and speeds are highly variable.

"Highway Capacity Manual," Transportation Research Board, 2000.

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS
EXISTING PEAK HOUR TRAFFIC ANALYSIS

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 06/10/10
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Hana Hwy
North/South Street: E. Kuiaha
Intersection Orientation: EW   Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	0	151	17	3	344	0
Peak-Hour Factor, PHF	0.71	0.71	0.71	0.69	0.69	0.69
Hourly Flow Rate, HFR	0	212	23	4	498	0
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	37	2	1	0	0	0
Peak Hour Factor, PHF	0.77	0.77	0.77	1.00	1.00	1.00
Hourly Flow Rate, HFR	48	2	1	0	0	0
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	4		51			0	
C(m) (vph)	1066	1332		341				
v/c	0.00	0.00		0.15				
95% queue length	0.00	0.01		0.53				
Control Delay	8.4	7.7		17.4				
LOS	A	A		C				
Approach Delay				17.4				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 6/10/10
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Hana Hwy
North/South Street: E. Kuiaha
Intersection Orientation: EW   Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	0	283	30	1	227	0
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.84	0.84	0.84
Hourly Flow Rate, HFR	0	301	31	1	270	0
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	14	0	2	0	0	0
Peak Hour Factor, PHF	0.57	0.57	0.57	1.00	1.00	1.00
Hourly Flow Rate, HFR	24	0	3	0	0	0
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	1		27			0	
C(m) (vph)	1293	1227		442				
v/c	0.00	0.00		0.06				
95% queue length	0.00	0.00		0.19				
Control Delay	7.8	7.9		13.7				
LOS	A	A		B				
Approach Delay				13.7				
Approach LOS				B				

HCS+: Two-Lane Highways Release 5.4

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst	CL
Agency/Co.	
Date Performed	6/10/10
Analysis Time Period	AM Peak
Highway	Hana Hwy
From/To	South of E. Kuiaha
Jurisdiction	
Analysis Year	Existing
Description	

Input Data

Highway class Class 2

Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	0	%
Grade: Length		mi	Access points/mi	8	/mi
Up/down		%			

Two-way hourly volume, V 549 veh/h
Directional split 69 / 31 %

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.982	
Two-way flow rate,(note-1) vp	668	pc/h
Highest directional split proportion (note-2)	461	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.0	mi/h
Free-flow speed, FFS	58.0	mi/h
Adjustment for no-passing zones, fnp	0.0	mi/h
Average travel speed, ATS	52.8	mi/h

HCS+: Two-Lane Highways Release 5.4

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst	CL
Agency/Co.	
Date Performed	6/10/10
Analysis Time Period	PM Peak
Highway	Hana Hwy
From/To	South of E. Kuiaha
Jurisdiction	
Analysis Year	Existing
Description	

Input Data

Highway class Class 2

Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	0	%
Grade: Length		mi	Access points/mi	8	/mi
Up/down		%			

Two-way hourly volume, V 561 veh/h
Directional split 56 / 44 %

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.982	
Two-way flow rate,(note-1) vp	682	pc/h
Highest directional split proportion (note-2)	382	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.0	mi/h
Free-flow speed, FFS	58.0	mi/h
Adjustment for no-passing zones, fnp	0.0	mi/h
Average travel speed, ATS	52.7	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.990	
Two-way flow rate,(note-1) vp	670	pc/h
Highest directional split proportion (note-2)	375	
Base percent time-spent-following, BPTSF	44.5	%
Adj.for directional distribution and no-passing zones, fd/np	0.0	
Percent time-spent-following, PTSF	44.5	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:

1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.990	
Two-way flow rate,(note-1) vp	655	pc/h
Highest directional split proportion (note-2)	452	
Base percent time-spent-following, BPTSF	43.8	%
Adj.for directional distribution and no-passing zones, fd/np	0.0	
Percent time-spent-following, PTSF	43.8	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:

1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2012 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT PROJECT

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 6/10/10
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2012 w/out project
Project ID:
East/West Street: Hana Hwy
North/South Street: E. Kuiaha
Intersection Orientation: EW   Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach	Eastbound			Westbound		
	Movement	1	2	3	4	5	6
		L	T	R	L	T	R
Volume		0	156	17	3	354	0
Peak-Hour Factor, PHF		0.71	0.71	0.71	0.69	0.69	0.69
Hourly Flow Rate, HFR		0	219	23	4	513	0
Percent Heavy Vehicles		2	--	--	2	--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes		0	1	0	0	1	0
Configuration			LTR			LTR	
Upstream Signal?			No			No	

Minor Street:	Approach	Northbound			Southbound		
	Movement	7	8	9	10	11	12
		L	T	R	L	T	R
Volume		37	2	1	0	0	0
Peak Hour Factor, PHF		0.77	0.77	0.77	1.00	1.00	1.00
Hourly Flow Rate, HFR		48	2	1	0	0	0
Percent Heavy Vehicles		2	2	2	2	2	2
Percent Grade (%)			0			0	
Flared Approach:	Exists?/Storage			No /			No /
Lanes		0	1	0	0	1	0
Configuration			LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	4		51			0	
C(m) (vph)	1052	1324		330				
v/c	0.00	0.00		0.15				
95% queue length	0.00	0.01		0.55				
Control Delay	8.4	7.7		17.9				
LOS	A	A		C				
Approach Delay				17.9				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 6/10/10
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2012 w/out project
Project ID:
East/West Street: Hana Hwy
North/South Street: E. Kuiaha
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	0	291	30	1	234	0
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.84	0.84	0.84
Hourly Flow Rate, HFR	0	309	31	1	278	0
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	14	0	2	0	0	0
Peak Hour Factor, PHF	0.57	0.57	0.57	1.00	1.00	1.00
Hourly Flow Rate, HFR	24	0	3	0	0	0
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	1		27			0	
C(m) (vph)	1285	1219		430				
v/c	0.00	0.00		0.06				
95% queue length	0.00	0.00		0.20				
Control Delay	7.8	8.0		13.9				
LOS	A	A		B				
Approach Delay				13.9				
Approach LOS				B				

HCS+: Two-Lane Highways Release 5.4

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst	CL
Agency/Co.	
Date Performed	6/10/10
Analysis Time Period	AM Peak
Highway	Hana Hwy
From/To	South of E. Kuiaha
Jurisdiction	
Analysis Year	Year 2012 w/out project
Description	

Input Data

Highway class Class 2

Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	0	%
Grade: Length		mi	Access points/mi	8	/mi
Up/down		%			

Two-way hourly volume, V 564 veh/h
Directional split 69 / 31 %

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.982	
Two-way flow rate,(note-1) vp	686	pc/h
Highest directional split proportion (note-2)	473	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.0	mi/h
Free-flow speed, FFS	58.0	mi/h
Adjustment for no-passing zones, fnp	0.0	mi/h
Average travel speed, ATS	52.7	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.990	
Two-way flow rate,(note-1) vp	673	pc/h
Highest directional split proportion (note-2)	464	
Base percent time-spent-following, BPTSF	44.7	%
Adj.for directional distribution and no-passing zones, fd/np	0.0	
Percent time-spent-following, PTSF	44.7	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.21	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:

1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst	CL
Agency/Co.	
Date Performed	6/10/10
Analysis Time Period	PM Peak
Highway	Hana Hwy
From/To	South of E. Kuiaha
Jurisdiction	
Analysis Year	Year 2012 w/out project
Description	

Input Data

Highway class Class 2

Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	2	%
Segment length	0.0	mi	% Recreational vehicles	0	%
Terrain type	Rolling		% No-passing zones	0	%
Grade: Length		mi	Access points/mi	8	/mi
Up/down		%			

Two-way hourly volume, V 569 veh/h
Directional split 56 / 44 %

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.982	
Two-way flow rate,(note-1) vp	692	pc/h
Highest directional split proportion (note-2)	388	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.0	mi/h
Free-flow speed, FFS	58.0	mi/h
Adjustment for no-passing zones, fnp	0.0	mi/h
Average travel speed, ATS	52.6	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.990	
Two-way flow rate,(note-1) vp	679	pc/h
Highest directional split proportion (note-2)	380	
Base percent time-spent-following, BPTSF	44.9	%
Adj.for directional distribution and no-passing zones, fd/np	0.0	
Percent time-spent-following, PTSF	44.9	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.22	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:
1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

APPENDIX E

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2012 PEAK HOUR TRAFFIC
ANALYSIS WITH PROJECT

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 6/10/10
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2012 w/ project
Project ID:
East/West Street: Hana Hwy
North/South Street: E. Kuiaha
Intersection Orientation: EW   Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street:	Approach	Eastbound			Westbound		
	Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume		0	156	17	3	355	0
Peak-Hour Factor, PHF		0.71	0.71	0.71	0.69	0.69	0.69
Hourly Flow Rate, HFR		0	219	23	4	514	0
Percent Heavy Vehicles		2	--	--	2	--	--
Median Type/Storage		Undivided			/		
RT Channelized?							
Lanes		0	1	0	0	1	0
Configuration			LTR			LTR	
Upstream Signal?			No			No	

Minor Street:	Approach	Northbound			Southbound		
	Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume		37	2	1	0	0	0
Peak Hour Factor, PHF		0.77	0.77	0.77	1.00	1.00	1.00
Hourly Flow Rate, HFR		48	2	1	0	0	0
Percent Heavy Vehicles		2	2	2	2	2	2
Percent Grade (%)			0			0	
Flared Approach:	Exists?/Storage			No /			No /
Lanes		0	1	0	0	1	0
Configuration			LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	4		51			0	
C(m) (vph)	1052	1324		330				
v/c	0.00	0.00		0.15				
95% queue length	0.00	0.01		0.55				
Control Delay	8.4	7.7		17.9				
LOS	A	A		C				
Approach Delay				17.9				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 6/10/10
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2012 w/ project
Project ID:
East/West Street: Hana Hwy
North/South Street: E. Kuiaha
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume	0	291	30	1	234	0
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.84	0.84	0.84
Hourly Flow Rate, HFR	0	309	31	1	278	0
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	14	0	2	0	0	0
Peak Hour Factor, PHF	0.57	0.57	0.57	1.00	1.00	1.00
Hourly Flow Rate, HFR	24	0	3	0	0	0
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	1		27			0	
C(m) (vph)	1285	1219		430				
v/c	0.00	0.00		0.06				
95% queue length	0.00	0.00		0.20				
Control Delay	7.8	8.0		13.9				
LOS	A	A		B				
Approach Delay				13.9				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.4

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 6/10/2010
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2012 w/ project
Project ID:
East/West Street: Hana Hwy
North/South Street:
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1 L	2 T	3 R	4 L	5 T	6 R
Volume		173	5	1	391	
Peak-Hour Factor, PHF		0.71	0.71	0.69	0.69	
Hourly Flow Rate, HFR		243	7	1	566	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR	LT		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7 L	8 T	9 R	10 L	11 T	12 R
Volume	6		0			
Peak Hour Factor, PHF	0.77		0.77			
Hourly Flow Rate, HFR	7		0			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0		0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		1		7				
C(m) (vph)		1316		347				
v/c		0.00		0.02				
95% queue length		0.00		0.06				
Control Delay		7.7		15.6				
LOS		A		C				
Approach Delay				15.6				
Approach LOS				C				

HCS+: Two-Lane Highways Release 5.4

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst	CL
Agency/Co.	
Date Performed	6/10/10
Analysis Time Period	AM Peak
Highway	Hana Hwy
From/To	South of E. Kuiaha
Jurisdiction	
Analysis Year	Year 2012 w/ project
Description	

Input Data

Highway class Class 2

Shoulder width	6.0 ft	Peak-hour factor, PHF	0.90	
Lane width	12.0 ft	% Trucks and buses	2	%
Segment length	0.0 mi	% Recreational vehicles	0	%
Terrain type	Rolling	% No-passing zones	0	%
Grade: Length	mi	Access points/mi	8	/mi
Up/down	%			

Two-way hourly volume, V 575 veh/h
Directional split 69 / 31 %

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.982	
Two-way flow rate,(note-1) vp	699	pc/h
Highest directional split proportion (note-2)	482	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.0	mi/h
Free-flow speed, FFS	58.0	mi/h
Adjustment for no-passing zones, fnp	0.0	mi/h
Average travel speed, ATS	52.6	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.990	
Two-way flow rate,(note-1) vp	686	pc/h
Highest directional split proportion (note-2)	473	
Base percent time-spent-following, BPTSF	45.3	%
Adj.for directional distribution and no-passing zones, fd/np	0.0	
Percent time-spent-following, PTSF	45.3	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.22	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:

1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

HCS+: Two-Lane Highways Release 5.4

Phone: Fax:
E-Mail:

Two-Way Two-Lane Highway Segment Analysis

Analyst	CL
Agency/Co.	
Date Performed	6/10/10
Analysis Time Period	PM Peak
Highway	Hana Hwy
From/To	South of E. Kuiaha
Jurisdiction	
Analysis Year	Year 2012 w/ project
Description	

Input Data

Highway class Class 2

Shoulder width	6.0 ft	Peak-hour factor, PHF	0.90	
Lane width	12.0 ft	% Trucks and buses	2	%
Segment length	0.0 mi	% Recreational vehicles	0	%
Terrain type	Rolling	% No-passing zones	0	%
Grade: Length	mi	Access points/mi	8	/mi
Up/down	%			

Two-way hourly volume, V 569 veh/h
Directional split 56 / 44 %

Average Travel Speed

Grade adjustment factor, fG	0.93	
PCE for trucks, ET	1.9	
PCE for RVs, ER	1.1	
Heavy-vehicle adjustment factor,	0.982	
Two-way flow rate,(note-1) vp	692	pc/h
Highest directional split proportion (note-2)	388	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	2.0	mi/h
Free-flow speed, FFS	58.0	mi/h
Adjustment for no-passing zones, fnp	0.0	mi/h
Average travel speed, ATS	52.6	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	0.94	
PCE for trucks, ET	1.5	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	0.990	
Two-way flow rate,(note-1) vp	679	pc/h
Highest directional split proportion (note-2)	380	
Base percent time-spent-following, BPTSF	44.9	%
Adj.for directional distribution and no-passing zones, fd/np	0.0	
Percent time-spent-following, PTSF	44.9	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.22	
Peak 15-min vehicle-miles of travel, VMT15	0	veh-mi
Peak-hour vehicle-miles of travel, VMT60	0	veh-mi
Peak 15-min total travel time, TT15	0.0	veh-h

Notes:

1. If vp >= 3200 pc/h, terminate analysis-the LOS is F.
2. If highest directional split vp >= 1700 pc/h, terminate analysis-the LOS is F.

APPENDIX F.

Preliminary Engineering Report

Haiku Fire Station

Haiku, Maui, Hawai'i

TMK: (2nd Div) 2-7-07:008

Preliminary Engineering Report

November 2010

Prepared for:

Architects Hawaii, Ltd.
1001 Bishop Street
ASB Tower, Suite 200
Honolulu, Hawaii 96813

Prepared by:

AECOM
1001 Bishop Street
ASB Tower, Suite 1600
Honolulu, Hawaii 96813

TABLE OF CONTENTS

SECTION 1

INTRODUCTION

1.1 PURPOSE

The objective of this Preliminary Engineering Report (PER) is to provide a brief description and evaluation of the physical characteristics of the proposed Haiku Fire Station project.

1.2 GENERAL INFORMATION

The project is located in the Makawao district of Maui (see attached Figure 1, Vicinity Map). The Haiku Fire Station, is being developed by the County of Maui, Department of Fire & Public Safety. The proposed improvements include a main building housing sleeping quarters, crew quarters, food preparation, dining, training and exercise facilities, diesel fuel storage, a grassed helicopter landing zone, parking lot, and utilities. The project site has an approximate area of 6.1 acres. The total parcel area is 27.90 acres.

B. Owner: County of Maui
Department of Fire & Public Safety
200 Dairy Road
Kahului, Maui, Hawaiʻi 96733
Contact: Lee Mainaga, Fire Services Officer
Phone: (808) 270-5542
Email: lee.mainaga@co.maui.hi.us

C. Vicinity & Location Map (See Figure 1)

SECTION 2

PHYSICAL ENVIRONMENT

2.1 LOCATION

The Haiku Fire Station project site is located in Haiku at 3550 Hana Highway. Refer to Figure 1 for a location map of the project. The Tax Map Key (TMK) for the project lot is (2)2-2-07:008 (por.).

2.2 TOPOGRAPHY

The project site generally slopes from an elevation of approximately 590 feet above sea level at its highest point to approximately 500 feet at its lowest. The drainage generally flows in a north-westerly direction.

2.3 SOILS

According to the August 1972 publication *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Ref 4) by the United States Department of Agriculture, Soil Conservation Service, the soil at the project site is Haiku clay, with slopes of 7 to 15 percent (soil classification HbC). This series consists of somewhat excessively drained soils on low uplands on the island of Maui. Permeability is moderately rapid. Runoff is slow to medium, and the erosion hazard is slight to moderate.

2.4 DRAINAGE/FLOODING

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) of the project area (Map Number 150003 0225 B, Ref 1), the area is classified as Zone C – an area determined to have minimal flooding.

2.5 RAINFALL

According to the August 1972 publication *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Ref 4) by the United States Department of Agriculture, Soil Conservation Service, the annual rainfall for the project area amounts to 50 to 80 inches.

SECTION 3

UTILITIES

3.1 WATER SYSTEM

The fire station's domestic water will be serviced from a 5/8" water meter located along East Kuiaha Road on the southeast side of the project parcel. The County has acknowledged that a reservation for (3) three 5/8" meters is in place. The proposed domestic water for the new building will connect to the proposed 6-inch waterline off of East Kuiaha Road. Fire hydrants will be provided for the proposed building in accordance with The Department of Water Supply (DWS) standards. All non-potable use will be via a rainwater harvesting system. The existing water demand calculations show that the existing 5/8" meter is inadequate for the site. Since the County has an existing reservation, the existing lot will be subdivided to provide the proposed Haiku Fire Station with a larger meter.

During early consultation with the County DWS, the County required the existing waterline to be replaced by approximately 4200 lf of 12-inch waterline. The County DWS provided a letter dated December 4, 2009 to explain the inadequacy of the current infrastructure. The proposed 12-inch waterline starts from the intersection of Haiku Road and West Kuiaha Road and runs along Haiku Road until the intersection of Haiku Road and East Kuiaha Road near the existing meter to the project site. Fire flow calculations dated October 9, 2009 were done to see what size pipe would be required to provide adequate fire flow to the site from the reservoir. The calculations show that a 8-inch waterline from the reservoir to the site will be inadequate and a larger pipe is required. Currently, the existing line from the reservoir to the site is less than a 6-inch line for the majority of the run.

Where Haiku Road crosses Kuiaha Gulch, the waterline will be aboveground and supported on a beam parallel with the existing bridge. The existing bridge span is approximately 20-feet. The beam will not touch the existing bridge and will have foundation supports on both sides in existing ground. This method of waterline crossing the gulch will eliminate any need for work within the gulch.

Potential Impacts and Mitigation Measures

According to preliminary findings, the fire station will require a minimum 33 gpm which would need a 1-inch meter.

The *Water System Standards* calls for a maximum fire hydrant spacing of 250′ for industrial areas.. Fire flow (FF) requirements for the site include 1,500 gallons per minute (gpm) and a 2-hour duration, see attached calculations dated October 20, 2009 per "Guide for Determination of Required Fire Flow: Insurance Services Office, 1974 edition".

Waterlines will be sized to meet the following requirements:

- Maximum Daily Water Demand + FF with a residual pressure of 20 pounds per square inch (psi) at the critical fire hydrant.
- Peak Hour Water Demand with a minimum residual pressure of 40 psi.
- Carrying capacities of mains shall be determined through the use of the following values:
    - 4″ & 6″—C = 100;
    - 8″ & 12″—C = 110
    - 16″ & 20″—C = 120; and
    - 24″ & larger—C = 130.
- Maximum flow velocities:
    - Distribution mains—without FF—6 feet per second (fps);
    - Distribution mains—with FF @ maximum day domestic flow—10 fps;
    - Transmission mains—without water services or fire flow—20 fps; and
    - Fire lines—13 fps.
- Maximum static or pumping pressure, whichever is greater, shall not exceed 125 psi.

3.2 SEWER SYSTEM

The fire station building's sanitary sewer line will emerge from the north side of the building and connect to a proposed 4" sewer line. The proposed sewer lines will be joined to a new Subsurface Flow (SSF) Constructed Wetland Treatment System located on the east side of the fire station building. The wastewater treatment system consists of a primary settling tank (septic tank), followed by a lined SSF constructed wetland for secondary treatment, and a pump station tank to dose the treated effluent through a subsurface drip irrigation disposal system. Treated effluent will then be reused for landscaping and recycled back into the environment.

3.3 DRAINAGE CONDITIONS

A topographic survey of the project area indicates the existing runoff from the site currently sheet flows along the ground and road surface to the existing gulch on the northwest side of the property. The proposed flow rates from the site's drainage study area are approximately 23.28 cfs for a 10-year, 1-hour storm and 29.01 cfs for a 50-year, 1-hour storm. That represents an increase of 3.91 cfs and 6.25 cfs, respectively, from the existing conditions. The proposed drainage system will include grassed swales, grated inlets, grated channels, manholes, drainlines, headwalls, and detention basin. The increase in runoff as a result of the increase in impervious area from the proposed project will be discharged in the detention basin. The proposed drainage system will manage the increased flow rates with the earthen basin. This permanent best management practice is to reduce the quantity of the runoff exiting the project site an increase the quality of water exiting the site by allowing the pollutants to settle in the basin.

The flow rate onto Hana Highway will be reduced by 5.24 cfs (10-year) and 6.13 cfs (50-year). The flow rate to the northwest property line will be reduced by 3.28 cfs (10-year) and 2.75 cfs (50-year).

With this new development all existing offsite flows will either be reduced or detained, thus there will not be an adverse impact to the existing drainage system downstream, neighboring properties, or roadways.

For more information regarding drainage patterns and properties, refer to the Preliminary Drainage Calculations that accompanies this PER under a separate cover.

REFERENCES

A. *Flood Insurance Rate Map, Maui County, Hawaii*, Map Number 150003 0225 B, Ref Federal Emergency Management Agency, US Department of Homeland Security

B. *Rainfall-Frequency Atlas of the Hawaiian Islands for Areas to 200 Square Miles, Durations to 24 Hours, and Return Periods from 1 to 100 Years*, Technical Paper No. 43, US Department of Commerce, Weather Bureau, 1962.

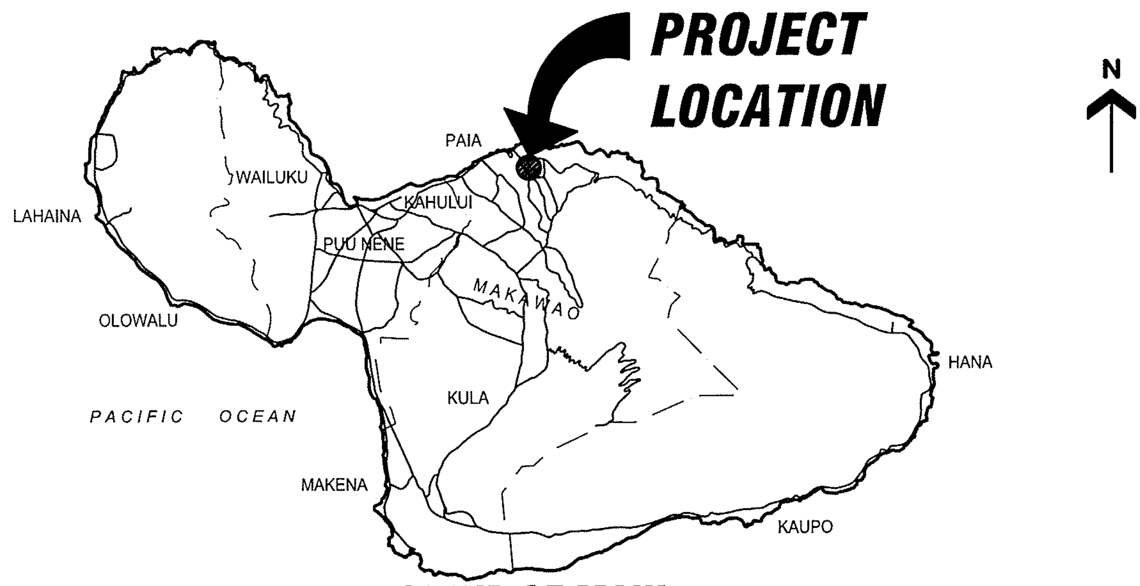
C. *Real Estate Handbook, Zones 1 Thru 6, State of Hawaii, Second Tax Division, Counties of Maui & Kalawao*, First American Real Estate Solutions, Realty Directory, Property Data, 33rd Edition, 1999.

D. *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*, United States Department of Agriculture, Soil Conservation Service, August 1972.

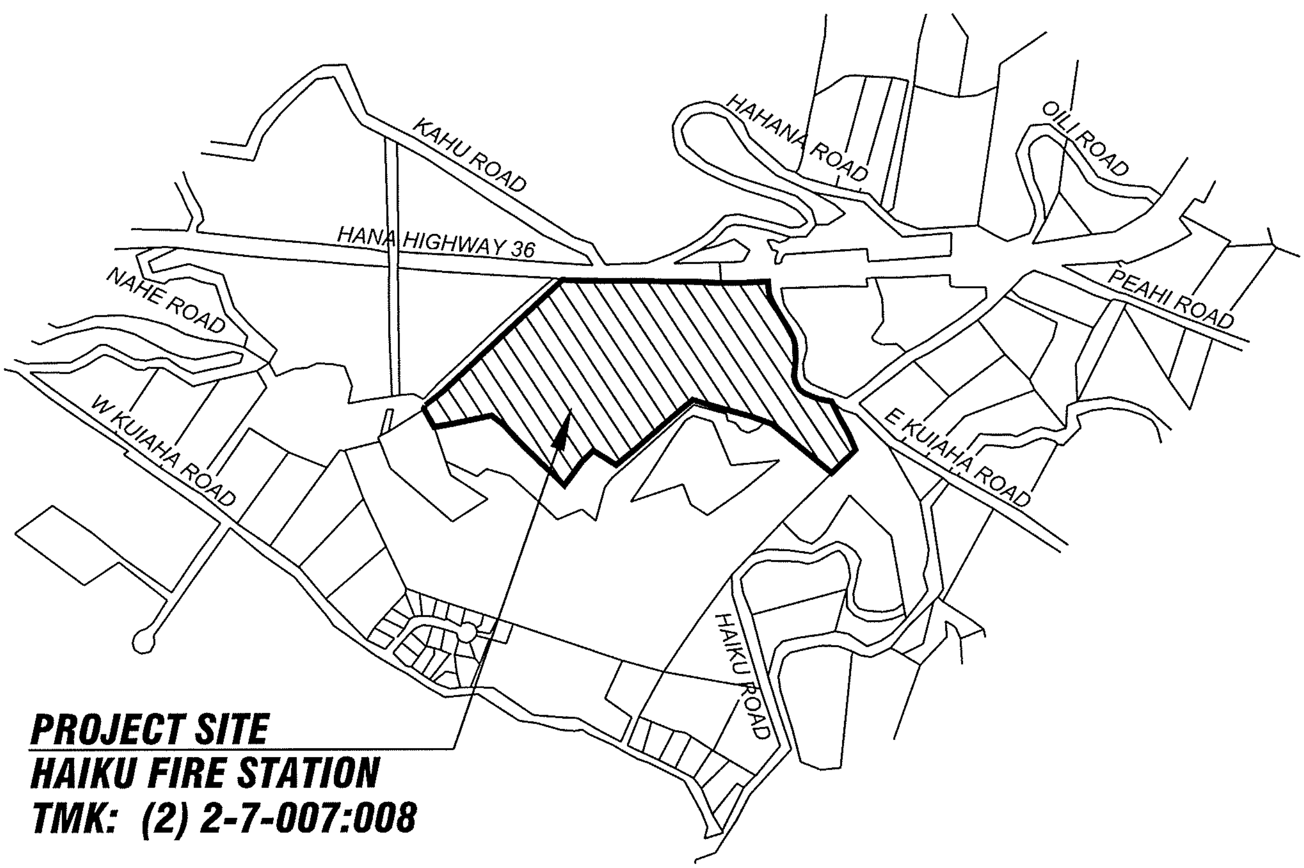
E. *Uniform Plumbing Code*, International Association of Plumbing and Mechanical Officials, 1997.

F. *Water System Standards*, Department of Water Supply, County of Hawai'i, Board of Water Supply, City and County of Honolulu, Department of Water, County of Kaua'i, and Department of Water Supply, County of Maui, State of Hawai'i, 2002.

G. *Title MC-15 Department of Public Works and Water Management,* Subtitle 01 Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui effective November 12, 1995.



ISLAND OF MAUI
VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

PRELIMINARY ENGINEERING REPORT
FIGURE 1
Vicinity and Location Maps
HAIKU FIRE STATION
HAIKU, MAUI, HAWAII
November 2010

APPENDIX

Project Haiku Fire Station
Item Fire Flow Calculation

Computed dk Date 10/9/09
Checked RA Date 10/09/09

Purpose: Calculate the flow onsite for the Haiku Fire Station

References:
1. "Handbook of Hydraulics for the Solution of Hydraulic Engineering Problems." Brater & King, Sixth Edition 1976
2. "*Civil Engineering Reference Manual*" Michael R. Lindeburg, Eighth Edition 2001.
3. "Haiku Fire Station" Preliminary Construction Plans, 2010

Criteria:

Reservoir Elevation = 705'
Residual Baseline = 20 psi
Residual Head = 2.31 x Residual Baseline
= 2.31 x 20 psi
= 46.2'
FH Elevation 530' + (22/12)' = 531.83'
Hazen Williams Discharge Coefficient = 100 (4" - 6" Pipe)
= 110 (8" - 12" Pipe)

Schematic: See Attached

Project Haiku Fire Station | Computed dk | Date 10/9/09
Item Fire Flow Calculation | Checked RA | Date 10/09/09

Calculations:

From Reservoir to Site:

8" Pipe = 2,500 L.F.
6" Pipe = 5,000 L.F.

Equivalent Pipe Length:

$$L_e = L\left(\frac{D_e}{D_1}\right)^{4.8704}\left(\frac{C_e}{C_1}\right)^{1.852}$$

L_e = Equivalent Length of Pipe
L = Length of Pipe
D_e = Equivalent Diameter of Pipe
D = Diameter of Pipe
C_e = Equivalent Coefficient Factor for Pipe
C = Coefficient Factor for Pipe

Equivalent Length of Pipe (6" to 8"):

Example:

$L_{e8} = 3461\ (8 / 16)^{4.8704}\ (110 / 120)^{1.852}$
$L_{e8} = 100.71$ L.F.

L_{e6} = 4121.83 L.F.
L_{e8} = 1536.00 L.F.
L_{e12} = 321.03 L.F.
L_{e16} = 100.71 L.F.

$\sum$ Pipe Lengths = 24,217L.F.

Project Haiku Fire Station
Item Fire Flow Calculation

Computed dk Date 10/9/09
Checked RA Date 10/09/09

Assumptions:

Q = 2000 gpm (pg. 111-4 Water System Standards)
H = 20 psi (pg. 111-4 Water System Standards)

Hazen Williams Equation:

$Q = 0.006756 \cdot C \cdot D^{2.63} \cdot H^{0.54}$
$H_8 = 10449.45 \cdot (Q / (C \cdot D^{2.63}))^{1.852}$
$H_8 = 10449.45 \; (2000 / (110 \cdot 8^{2.63}))^{1.852}$
$H_8 = 89.82$
$H_8 = 89.82 \cdot (62.4/144)$
$H_8 = 38.92$ psi/1000'
$H_8 = 0.03892$ psi/L.F.

Head Loss:

Reservoir Elevation =	705'	
FH Elevation =	531.83'	
Static Pressure =	173.17' = 173.17 · (62.4/144)	
=		75.0 psi
Less Meter Loss (-)		4 psi
=		**71** psi

Friction:

$f_8 = 0.03892$ ($\sum$ Pipe Lengths)
$f_8 = 0.03892$ (7500)
$f_8 = 291.90$ psi

Residual Pressure:

P = 71 psi – 291.90 psi = psi > 20 psi
Therefore, NOT OK

At 20 psi,

$Q = 0.006756 \cdot C \cdot D^{2.63} \cdot H^{0.54}$

Q=889 cfs

Project Haiku Fire Station
Item Fire Flow Calculation

Sheet 4 of 4
Computed dk Date 10/9/09
Checked RA Date 10/09/09

Flow at Fire Hydrant (at 20 psi):

$$Q = 448.895\left(\frac{\left(\frac{D}{12}\right)^{4.8704}(C)^{1.852}h_f}{4.727(L)}\right)^{\frac{1}{1.852}}$$

Q = Available Flow
D = Diameter of Pipe
C = Coefficient of Pipe
h_f = Required Head
= Head at Reservoir – Minimum Residual Head – FH Elevation
= 500' – 46.2' – 251.67'
= 202.13'
L = Equivalent Length of Pipe

$$Q = 448.895\left(\frac{\left(\frac{8}{12}\right)^{4.8704}(110)^{1.852}202.13}{4.727(6080)}\right)^{\frac{1}{1.852}}$$

Q = **1,169.59** gpm < 2000 gpm
Therefore, NOT OK

October 20, 2009

FIRE FLOW CALCULATIONS - NEW HAIKU FIRE STATION:
Haiku, Maui, Hawaii

Guide for Determination of Required Fire Flow: Insurance Services Office, 1974 edition

Occupancy Hazard: Low Hazard
Roof Construction: Metal
Ordinary Construction
Minimum Flow Rate at Base of Riser: Fire Sprinkler Flow = 250 gpm
Maximum Flow Rate: 8000 gpm for non-combustible construction
Minimum Residual Pressure Required: 15 psi
A =13,100 sq. ft.

A. Construction: Combustible, C = 1.0
B. Floor Area: 13,100 sq. ft.
C. Height: 1 story
D. Tables: Fire Flow = 2000 gpm.
E. Increase/Decrease for Occupancy: 15% = 300 gpm (per meeting with Herb Chang on 10/15/09)
   Decrease for Automatic Fire Sprinkler Protection (entire building): -50% = 1000 gpm
   Fire Flow = 2000 gpm – 300 gpm – 1000 = 700 gpm
F. Exposures:

North Exposure:	None
South Exposure:	None
East Exposure:	Trash/Generator Bldg (30' Away) + 20%: 2000 x 0.20 = 400 gpm
West Exposure:	None

G. =700 gpm +400 gpm
   =1100 gpm.

Add flow at base of FS riser: 250 gpm

1350 gpm, round up to 1500 gpm.

Total Fire Flow Required = 1500 gpm.

RANDOLPH H. MURAYAMA
LICENSED PROFESSIONAL ENGINEER
No. 3404-M
HAWAII, U.S.A.

10/20/09

APPENDIX G.

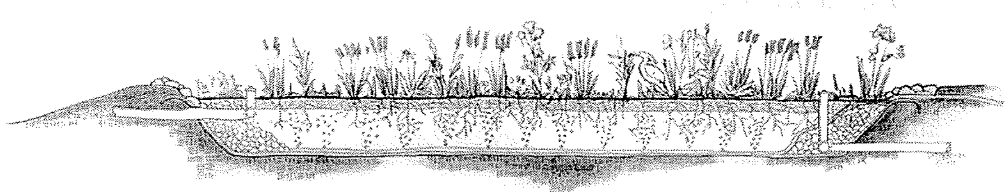
Engineering Design Report for Ecological Wastewater Treatment System

ROTH
ECOLOGICAL
DESIGN INTERNATIONAL, LLC
NATURAL SYSTEMS TECHNOLOGIES

Maui Fire Station, Maui Hawaii

Ecological Wastewater Treatment System and Water Reuse

Engineering Design Report



Prepared by: Lauren C. Roth Venu and David Whitney P.E.

July 19, 2010

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General Project Description

The role of the Ecological Wastewater Treatment System: Creating a Sustainable Community

The Haiku Fire Station (HFS) is located on the island of Maui, Hawaii. One of the prominent goals for this project is the desire to be a model of sustainability and to preserve the islands tropical environment. A low impact development strategy has been implemented with this design. At the forefront of this design is a natural wastewater treatment and reuse system. An Ecological Wastewater Treatment System (EWTS) has been designed to treat all of the wastewater generated onsite by this project, and the purified effluent will be reused as the sole source of irrigation water for a designated landscape on the property. This system encompasses the ideals of an ecologically sensitive project that utilizes the natural environment to aid in everyday needs by providing reliable and efficient wastewater treatment through intentionally arranged ecologically sequenced processes. Plants are an integral part of these systems that provide treatment, an aesthetic enhancement to the surrounding environment, as well as habitat for native wetland flora and fauna. The following Preliminary Design Report details the project design parameters, as well as function and purpose of each component of this ecological wastewater treatment system.

Design Parameters

Wastewater Design Flows

The wastewater design flow for this project is 700 gallons per day which was provided by Architects Hawaii Ltd. The wastewater design flows were derived from Table 1 of the Hawaiian Department of Health's Code, Section 11-62-08. A summary of the project design flows are listed in the Table 1 and Appendix B.

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Table 1: Wastewater Design Flows

1. Welcome Center		
Estimate of maximum of **7** people being housed in the station each night		
Table 1 from 11-62-08 DOH guidelines: (Assuming a boarding school-type of flow)	= 100gpd x 7	= 700gpd
2. Monthly Party		
Estimate of 15 people being housed in the station each night		
Table 1 from 11-62-08 DOH guidelines: (Assuming a restaurant-type flow)	= 10gpd x 15	= 150gpd
	Total:	**= 850gpd**

For design purposes, the average flow per day used was 700 gpd. The peak flow used in the design was 850 gpd.

Wastewater Design Loadings

It is assumed that the nature and strength of wastewater generated at the HFS to be treated by the Ecological Wastewater Treatment System (EWTS) is entirely domestic. The projected design concentrations are listed in Table 2 and are based on the typical composition of untreated medium strength domestic wastewater (Metcalf and Eddy, 1991). The design concentrations of these wastewater constituents throughout the various stages of treatment are listed in Table 3.

Table 2: Wastewater Design Loadings of Raw Wastewater

Raw Wastewater Constituent	Conc.	Mass Loading	
	(mg/L)	(kg/day)	(lb/day)
BOD	340	1.42	3.12
TSS	220	0.92	2.02

Table 3: Design Concentrations of Wastewater Through Treatment System

Wastewater Constituent	Concentration (mg/L)			
	Raw	Septic Tank Effluent	EWTS Effluent	Hawaii R-3 Effluent Requirements
BOD	340	300	<20	< 30
TSS	220	110	<20	< 30

System Description

The proposed system for the HFS is shown in the attached design drawings (Appendix A). This treatment system has been ecologically sequenced to create an efficient, reliable and sustainable technology for treating the HFS station's wastewater. Treated effluent from the Ecological Wastewater System will be disposed of by use of drip irrigation in a garden to the east of the Ecological System.

The four stages of the HFS wastewater treatment system are as follows:

Stage 1: Septic Tanks

Waste from the fire station will flow in a gravity line into a 1,500 gallon (2.1 times one day's flow) septic tank fitted with an effluent filter. The septic tank will provide flow equalization and allow gross suspended solids to settle prior to entering the Ecological Wastewater System. Anaerobic bacteria will begin to degrade the settled solids, and break down organic matter, reducing the influent biochemical oxygen demand (BOD). Up to a 50% reduction in organic loading and water turbidity can be achieved in the septic tanks. For the purpose of this design, the BOD reduction in the septic tanks has been conservatively estimated to be 10%. The septic tank inlets will be baffled, and the outlet will be equipped with a commercial effluent filter. The septic tank effluent filter will filter solids greater than 1/8 inch in diameter from the effluent. It should also be noted that these tanks may produce a modest amount of energy in the form of methane gas; however it is typically not enough to harvest and use.

The total projected wastewater flow was calculated by following Hawaii Administrative Rules, Title 11, and Chapter 62. See Table 1 for a summary of the projected wastewater flows. See Appendix E for the septic tank design calculations.

Stage 2: Ecological Wastewater Treatment System

In general, an Ecological Wastewater Treatment System (EWTS) is a subsurface-flow (SF) constructed wetland designed to pre-treat wastewater prior to disposal. Water flows horizontally across the system. Wastewater enters at one end and is collected at the opposite end. Typically in SF systems, water is maintained at a constant depth below the surface of the porous media, which is usually gravel, and is typically between 18 to 40 inches deep throughout the planted system (Appendix A). Plant species used in conventional SF systems are typically limited to emergent plants and others that can tolerate saturated soil conditions for extended periods of time.

The EWTS was designed to treat this flow. The EWTS is 33 feet long and 15 feet wide (with a surface area of 495 ft^2). The Ecological System is comprised of 3.5 feet of stone media that is covered with 6 inches of compost. See Appendix F for the EWTS design summary. The Ecological System was placed at a location that provides enough head for a gravity fed system. Also, the placement was chosen to be in view of the main highway in a natural depression, but in a location that is easily accessible for maintenance while displaying the beautiful aesthetic of the wetland.

The Ecological System consists of a filter bay constructed below grade in a cell lined with 45-mil EPDM liner. The Ecological System contains sequential segments of varying media type. The Ecological System will be insulated with a 6-inch compost layer to provide odor control, and support the growth of wetland plants to aid in the treatment process. The plant roots establish themselves in the compost layer and retain moisture. As a result the compost does not clog the stone media.

The EWTS is comprised of two media segments, which have been designed to reduce CBOD from 300 mg/L to less than the regulatory limit of 30 mg/L via fixed-growth, microbial oxidation. To be conservative, the EWTS was sized to reduce the CBOD to 20 mg/L. The first segment is 7 feet long and consists of 2 to 4 inch stone. The 4-inch diameter supply pipe will connect to a 4-inch diameter distribution lateral through a tee fitting. The distribution lateral is centered in an infiltration chamber below the mulch of the constructed wetland. The infiltration chamber provides for flow equalization across the width of the Ecological System. It has been designed to handle a cross sectional organic loading rate of 500 g/m^2 per day of BOD, and to reduce the influent concentration of BOD by 50% from 300 mg/L to 150 mg/L. In between the two segments another infiltration chamber that is arranged across the full width of the Ecological System. The placement of this infiltrator is to ensure against preferential flow between the first and second segments, ensuring the appropriate residence time for the wastewater. The second segment includes 26 feet of 3/4 inch diameter stone that has been designed to further reduce the BOD to 20 mg/L. At the base of the second segment a 4-inch diameter collection header contained in an infiltration chamber will be placed at the base of the constructed wetland. The collection header and infiltration chamber extend across the entire width of the constructed Ecological System to allow for outflow equalization.

Rainfall is another design consideration. The site should be graded to divert as much surface runoff away from the EWTS as possible. Additionally the EWTS is surrounded by earthen berms that divert surface runoff away from the treatment system. Therefore additional flow through the Ecological System is limited to the only precipitation that falls directly on the System's footprint. The water level rise in the EWTS has been analyzed for a 50 year design storm rainfall intensity of 2.5 in/hr using Darcy's Law. The results of this analysis show that during this storm event the water level will rise to a maximum of 4.3 inches above the permanent water level that is maintained 2 inches below the bottom of the compost in the stone media. Some ponding may occur during this storm, but the berms have been designed with 12 inches of freeboard above the top of the compost layer, and therefore it will be contained with the footprint of the EWTS. The ponding should subside quickly once the rain event has ceased. See Appendix E for additional rainfall calculations.

The CBOD removal segments of the Ecological Systems are sized on a first-order decay coefficient (*k*) of 0.9/day and an irreducible background $CBOD_5$ concentration of 10

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mg/L (per Kadlec and Knight), with the first-order decay coefficient derived from non-aerated Ecological System studies.

Startup times for the EWTS vary depending on waste strength, frequency and variability in flow and weather. Typical startup time is no longer than three months, although treatment will be noticeable almost immediately. Water quality samples can be drawn from a number of locations. The two most accessible sites are the inlet center cleanout and outlet water level control structure sump. These locations will provide information on the overall performance of the Ecological System. Additionally sampling and monitoring wells can be installed using 2 inch diameter slotted PVC well screen. These are ideal because they are not very noticeable, but are large enough to accommodate most field water quality sampling probes.

EWTS Plants

Plants play a vital role in the performance and function of the EWTS. It is believed that plants enhance biological remediation of organic contaminants found in wastewater by increasing the population density of microorganisms in the growing media. Laboratory studies have shown that the rhizosphere, a region that includes the plant roots and the soil directly surrounding it, can maintain as much as an order of magnitude higher microbial population density than unvegetated soil (Nenduri et al., 2000). This probably results from increased surface area provided by the roots for biofilm growth, which is directly related to microbial activity. A report published by the USEPA (1988), further substantiates this claim by citing the importance of plant exudates; indicating that exudates released from plant roots can alter the enzymes within the resident bacterial population. Bacteria use enzymes to help breakdown compounds into a form that they can consume and digest. The microbial community supported by individual plants is highly variable between plant species, meaning that different plant species may host various bacteria that will have an affinity for treating a variety of different wastes. This is an important consideration to be addressed when designing an advanced biological treatment system that incorporates plants.

Plant species selection in Ecological Wastewater Treatment Systems are typically based on environmental factors such as growing zone, plant hardiness, and ability to tolerate wet growing conditions. Typically local, non-invasive, plant species are given preference over exotic species that are not native to the region. There are several reasons for this. Many states have drafted laws prohibiting the import of invasive, non-native, species. Another incentive is financial. Native plant species have a better chance of survival, which minimizes maintenance and the need to plant additional species each year. Furthermore planting with native plants identifies with the local environment and culture.

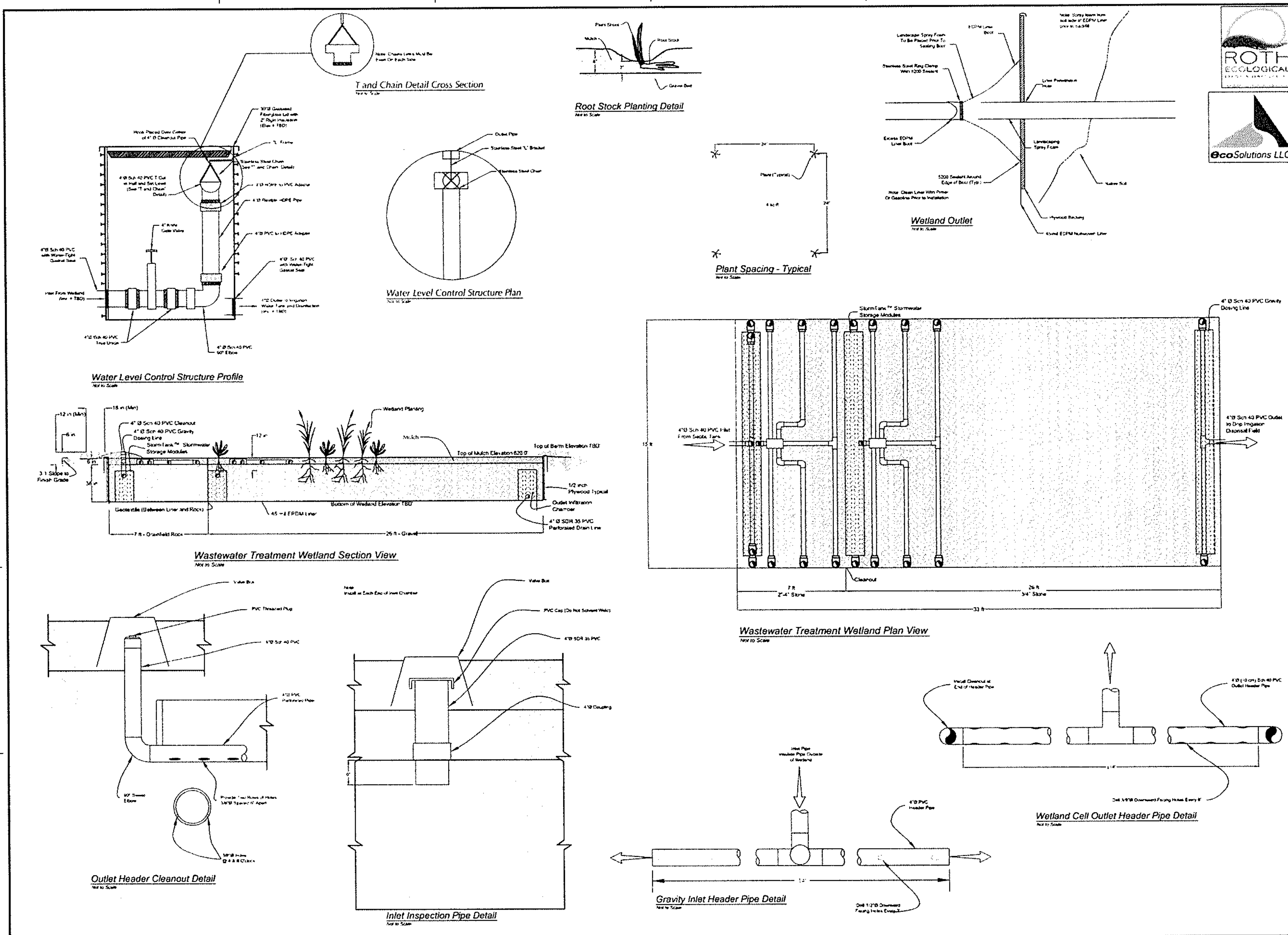
As research on the plant role in treating wastewater develops, new requirements evolve. Other considerations for choosing plant species include root shape, density, and depth. Ideally a wetland plant with deep roots and a great deal of surface area, without clogging the pore space is preferred. Rhizomes are the underground horizontal stems of plants (Zeiger, 1998). The rhizome is a unique feature in wetland plants that allows them to survive in anaerobic mud typically found along the banks of rivers, lakes, and in wetlands.

In the EWTS, a hole is dug into the insulating mulch layer and the rhizome based plants are placed directly on top of the gravel layer (NAWE, 2002). It is believed that they will root better in the gravel than other plants, and penetrate deeper into the wastewater. Deeper roots will result in more surface area for beneficial bacterial growth. Many of these plants thrive in nutrient rich wastewater, and mature vegetative cover is usually expected within two growing seasons. In addition, certain wetland plant species such as heliconias and gingers produce robust and fragrant perennial flowers that contribute to the aesthetics of the system and soften the landscape. A detailed plant list will be provided in the final materials list and construction documentation.

Wastewater Disposal

Treated effluent collected from the EWTS will be reused onsite in accordance with the State of Hawaii Department of Health R-3 reuse regulations. The soils onsite site are poorly drained, clay soils. A maximum emitter discharge rate of 0.5 gal/day has been considered for this design, with a minimum 2.0 emitters per gallon of design flow, for a minimum of 2,200 emitters for this project. Geoflow Wasteflow PC ½ gph drip irrigation tubing will be used at a hydraulic loading rate of 0.3 gal/sq-ft/day. This value is based on Geoflow recommended loading, and results in disposal area of 3,667 sq-ft. However, due to the site topography, planting rates and climate, a larger disposal field of 6,600 sq-ft is recommended with a four zones and emitters spaced 18 inches on center. A planting density of 24 inches on center is recommended (Design By Others).

APPENDIX A – Design Drawing Sheets



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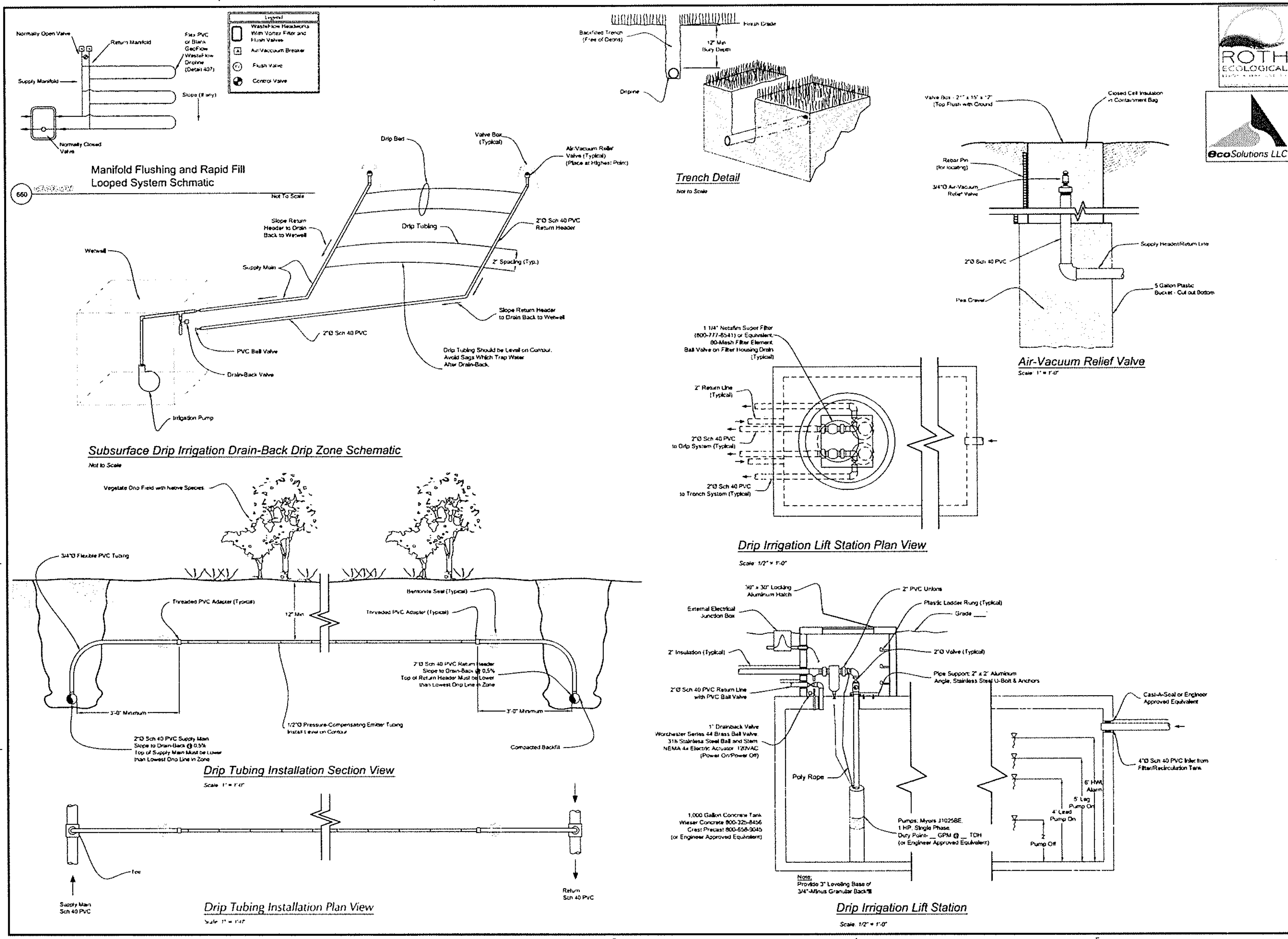
DESIGN DEVELOPMENT
JANUARY 22, 2010

WETLAND DETAILS

SCALE: AS NOTED

PROJECT NO	5898.001
BIM FILE	
DRAWN BY	
DATE	Issue Date
DRAWING NO	

EC-101



ROTH ECOLOGICAL

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HAIKU FIRE STATION

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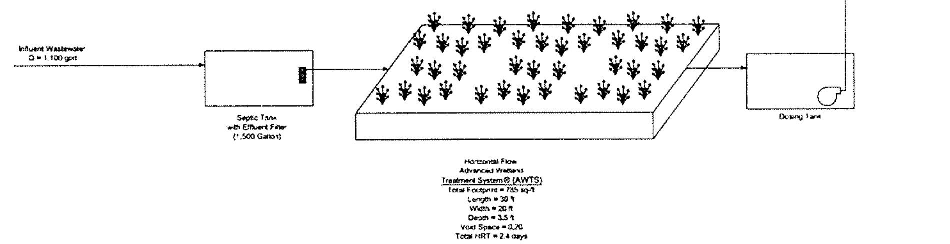
DESIGN DEVELOPMENT
JANUARY 22, 2010

DRIP IRRIGATION DETAILS

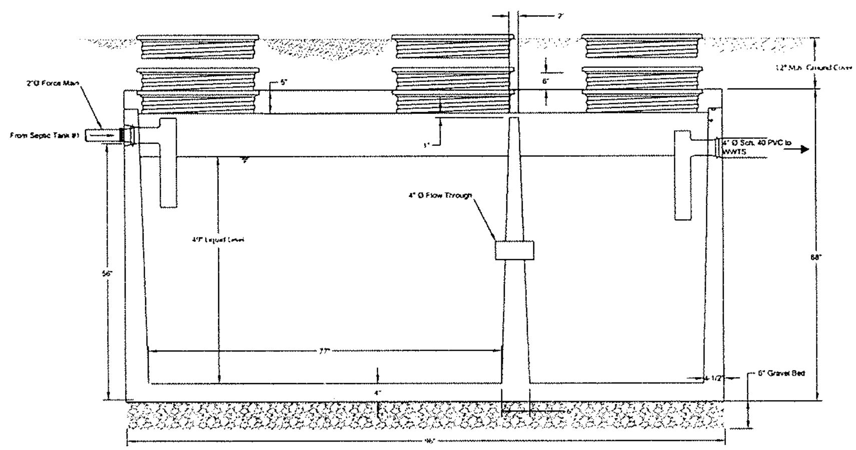
SCALE: AS NOTED

PROJECT NO.	5596.001
BIM FILE	
DRAWN BY	
DATE	Issue Date
DRAWING NO.	

EC-102



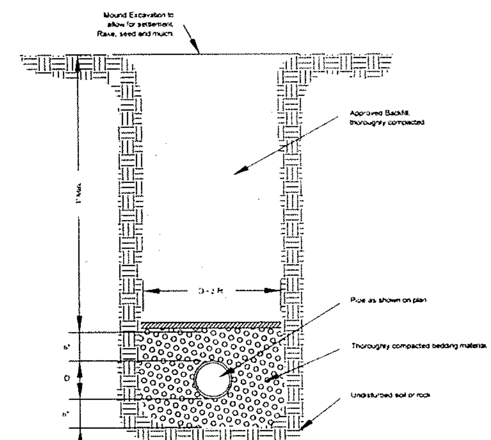
Process Flow Diagram
Not to Scale



1,500 Gallon Double Chamber Septic Tank
Not To Scale

Septic Tank Maintenance Notes:
Per VTDEC EPR Chapter 1Appendix 3A

1) At least once a year, the depth of sludge and scum in the septic tank should be measured. The tank should be pumped if
   a) the sludge is closer than 12" from the outlet
   b) the scum layer is closer than 3" to the outlet
2) Following septic tank cleaning of units over 5,000 gallons, all interior surfaces of the tank should be inspected for leaks and cracks.
3) At least once a year, dosing tanks and distribution boxes should be opened and settled solids removed as necessary and the dosing tank or distribution box checked for level.
4) Toxic or hazardous substances should, in general, not be disposed of in septic systems. These substances may pass through the system in an unaltered state and contaminate the soil or crops at the site of ultimate disposal.



Notes:
1. Typical trench for sewer and drainage pipe.
2. Compaction of backfill and bedding shall be a minimum of 90% (95% under roadway surfaces) of maximum dry density determined in the standard Proctor Test (ASTM D698).
3. Approved backfill shall not contain any stones more than 6" in largest dimension, 2" maximum diameter within 2' of the pipe.
4. Trenches shall be completely dewatered prior to placing of pipe bedding material and kept dewatered during installation of pipe and backfill.
5. The sides of trenches 4' or more in depth entered by personnel shall be sheeted or sloped to the angle of repose as defined by O.S.H.A. Standards.
6. Bedding material for wastewater lines shall consist of crushed stone or gravel with maximum size of 1". Submit a sample to the Engineer for approval.
7. For all road and stream crossing, pipes shall be centered to minimize the number of joints. If rolled casing is used, no joints shall be installed underneath roadways or streams.

Typical Piping Trench Detail
Not To Scale

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MISCELLANEOUS DETAILS

SCALE: AS NOTED

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EC-103

of Sheets

APPENDIX B – Septic Tank Sizing

Equation 1 from HAR Chapter 11-62 was used to determine the size of the septic tank for nonresidential developments exceeding 800 gallons per day (gpd).

$$V = 1000 + (Q - 800) * 1.25 \qquad \text{(Equation 1)}$$

V = Volume of septic tank (gallons)
Q = Wastewater Flow (gpd)

$$V = 1000 + (850 - 800) * 1.25$$
$$V = 1{,}062 \text{ gallons}$$

We recommend a minimum of 48 hours of detention time in the septic tank prior to a WWTS. Therefore, one 1,500 gallon two chamber tank will be used. This should suffice for the average 700 gpd and be able to handle the monthly 850 gpd.

APPENDIX C – Effluent Filter

Project:	Haiku Fire Station
Prepared By:	DHW
Date:	12/15/2009

		Design Flow	Meter Flow	
Filter Area Required	Af =	4.2	NA	sq-ft
Filter Coeff	Cf =	0.002	0.0044	sq-ft/(gpd per yr)
Daily Flow	Q =	700	NA	gpd
Mean Time Between Cl	MTBC =	3	NA	yr

Filter Selected	***FT08-36***	
Actual MTBC	***10.4***	***yrs***

Orenco Filter	Filter Area	Flow Area
FT15-36	50.5	15.2
FT12-36	30.0	9.0
FT08-36	14.6	4.4
FT04-36	5.1	1.5

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Design Aid

Biotube® Effluent Filter Sizing

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Orenco has developed guidelines for calculating the correct sizing of and cleaning frequencies for effluent filters, based on decades of experience as well as monitoring data from thousands of effluent filter installations.*

While these guidelines may not be accurate for every wastewater system, they will be relevant to most situations. (See "Filter Facts," AFL-FT-2, for more information.)

Guidelines were based on the following criteria:

Watertightness

A completely watertight septic tank must be used. If either infiltration or exfiltration is present, there is no way to accurately determine filter sizing.

Hydraulic Retention Time

Residential flows — A septic tank capacity of at least 1000 gallons is used for systems handling flows from a single-family residence of three bedrooms or less. A septic tank capacity of at least 1500 gallons is used for 3-bedroom homes with garbage disposals and for systems handling flows from a single-family residence with more than three bedrooms, up to flows of 600 gpd.

Larger flows — Adequate septic tankage will anaerobically digest organic material, remove settleable and floatable solids, help modulate flow, and consistently discharge effluent that meets "primary treatment" standards.

A septic tank capacity of at least three times the daily design flow is used for systems handling flows greater than those of a single-family home.

After conducting extensive research on septic tankage, Orenco has found that smaller tankage will result in suboptimal effluent quality and more frequent septage pumping. For Orenco's tank sizing recommendations for various applications, see "Primary Tank Sizing," NDA-TNK-1 and "Septic Tank Sizes for Large Flows," NTP-TNK-TRB-2.

Waste Strength

Residential strength wastewater that has been through primary treatment is used. This is equivalent to what Crites and Tchobanoglous describe as "expected effluent wastewater characteristics from a residential septic tank without ... effluent filter" (*Small and Decentralized Wastewater Management Systems*, Table 4-16, p. 183). Here are the parameters:

BOD = 180 mg/L

TSS = 80 mg/L

Oil & Grease = 25 mg/L

Sizing Equations

$A_F = C_f\,(Q)\,(MTBC)$

where:

A_F = Filter area required (ft^2)

C_f = Filter coefficient $\left(\frac{ft^2}{gpd \cdot yr}\right)$

Q = Daily flow in gallons (gpd)

MTBC = Mean time between filter cleaning (years)

The filter coefficient, C_f, is equal to 0.0044 when actual or true daily flow rates are used. A value of 0.002 is applicable if design flow is used. The design flow is defined as a peak flow that allows for a safety margin and is typically about twice the actual flow. All values are based on a filter surface area with approximately 30% or more open or "flow" area.

Actual Flow Equation:

$A_F = 0.0044\,(Q)\,(MTBC)$
(for calculations based on "actual flows")

Design Flow Equation:

$A_F = 0.002\,(Q)\,(MTBC)$
(for calculations based on "design flow" as defined above)

If a kitchen garbage disposal is used, more frequent filter maintenance may be required, due to the additional solids loading. Kitchen garbage disposals contribute an additional 36% (approximately) to the level of solids loading. Increasing the filter area by 36% gives better approximations for sizing and cleaning frequencies when garbage disposals are used.

Sizing filters for systems larger than single family dwellings is more complicated. For systems larger than single family dwellings, utilizing proper tankage and not exceeding residential strength wastewater, filter sizing using the given equations is valid. Systems having less than three times the daily design flow in storage require more conservative filter sizing to prevent the need for frequent cleaning.

**Orenco's effluent filter performance data is so extensive that Dr. George Tchobanoglous, co-author of Small and Decentralized Wastewater Management Systems, used that data to help develop his findings on effluent filters.*

Biotube® Effluent Filter Sizing

Wastewater from restaurants, industrial plants, and other higher waste strength sources needs more detailed analysis of the wastewater characteristics for proper tank and filter sizing and configurations. Multiple filters may be required. Please call to discuss these applications.

Model Nomenclature

Example:

FT 08 54 - 36

- 36: Filter Cartridge Height (inches)
- 54: Nominal Housing Height (inches)
- 08: Nominal Filter Diameter (inches)
- FT: Biotube Effluent Filter Designation

Modulating Orifices and Peak Flows

Effluent filters must also be able to handle situations in which the majority of the daily flow will enter the septic tank over a relatively short period of time. Modulating plates with orifices are often used to limit the flow rate through a tank during peak flow to prevent the flushing out of solids. However, modulating plates and orifices should be used only when the tank has sufficient surge capacity. Simple high liquid level alarms can be added to any Orenco effluent filter.

Filter Surface Area vs. Flow Area

When comparing filters, be sure to note how filter area is being reported. It's important to compare both the Total Filter Surface Area and the Total Flow Area, because *Flow Area is as important as Filter Surface Area.* The surface area of a filter is important, because that's where solids are caught. But the flow area (the area of the "holes" in the filter) is equally important, because that's what prevents the filter from premature clogging.

Selecting A Biotube® Effluent Filter

Filter and Flow Area Chart

Series	Filter Area (ft^2)	Flow Area (ft^2)
FT15-36	50.5	15.2
FT12-36	30.0	9.0
FT08-36	14.6	4.4
FT04-36	5.1	1.5

Design Example:

A 12-unit condominium has a "design flow" of 3600 gallons per day (12 units at 300 gallons per day per unit). If a minimum 3-year cleaning frequency is desired, how much filter area is necessary? Which Biotube Effluent Filter should be selected?

Answer: In this case, the equation for design flow is applicable.

Therefore, $A_F = (0.002)(3600)(3) = 21.6\ ft^2$

Referring to the Filter and Flow Area Chart, an FT1200 Series filter, with a filter area of 30.0 ft^2, is required to satisfy the minimum design criteria.

Using the 30 ft^2 filter area, the design flow equation can be solved for MTBC, giving a cleaning frequency of 4.2 years.

MTBC = 30.0/(3600)(0.002) = 4.2 years.

If the units will include garbage grinders, the filter area is increased by 36% to account for additional solids loading.

Therefore, $A_F = (1.36)(21.6) = 29.4\ ft^2$
And MTBC = 30.0/(3600)(0.002)(1.36) = 3.1 years.

APPENDIX D – WWTS Design Summary

TABLE I

Type of Establishment	Gallons Per Person Per Day (Unless Otherwise Noted)	Wastewater Strength lbs. BOD_5 Per Person Per Day
Airports (per passenger)	5	0.06
Camps:		
Campground with central comfort stations	35	0.10
With flush toilets, no showers	25	0.06
Construction camps (semi-permanent)	50	0.15
Day camps (no meals served)	15	0.12
Resort camps (night and day) with limited plumbing	50	0.12
Luxury camps	100	0.17
Cottages and small dwellings with seasonal occupancy (2 persons per bedroom minimum)	100	0.17
Country clubs (per resident member)	100	0.12
Country clubs (per non-resident member present)	25	0.03
Dwelling (2 person per bedroom minimum)	100	0.17
Factories (gallons per person, per shift, exclusive of industrial wastes)	35	0.10
Hospitals (per bed space)	250+	0.20
Hotels with private baths (2 person per bedroom minimum)	100	0.17
Hotels without private baths	50	0.17
Institutions other than hospitals (per bed space)	125	0.17
Laundries, self-service (gallons per wash, i.e., per customer)	50	0.25
Mobile home parks (per space)	250	0.17
Motels with bath, toilet, and kitchen waste (per bed space)	50	0.15
Motels (bed space)	60	0.12
Picnic parks (toilet wastes only) (per picnicker)	5	0.06
Picnic parks with bathhouses, showers, and flush toilets	10	0.10
Restaurants (toilets and kitchen wastes per patron)	10	0.06
Restaurants (kitchen wastes per meal served)	3	0.03
Restaurants additional for bars and cocktail lounges	2	0.02
Schools:		
Boarding	100	0.17
Day, without gyms, cafeteria, or showers	15	0.04
Day, with gyms, cafeteria, and showers	25	0.08
Day, with cafeteria, but without gyms or showers	20	0.06
Service stations (per vehicle served)	10	0.06
Swimming pools and bathhouses	10	0.06
Theaters:		
Movie (per auditorium seat)	5	0.03
Drive-in (per car space)	5	0.03
Travel trailer parks without individual water and sewer hook-ups (per space)	50	0.12
Travel trailer parks with individual water and sewer hook-ups (per space)	100	0.17
Workers:		
Construction (at semi-permanent camps)	50	0.15
Day, at schools and offices (per shift)	15	0.06

§§11-62-09 to 11-62-20 (Reserved)

Calculation 1: Wetland Sizing

$$\ln\left(\frac{C_o - C^*}{C_i - C^*}\right) = k_v t \varepsilon$$

$$t = \frac{hA}{Q}$$

$$A = \frac{Q \times \ln\left(\frac{C_o - C^*}{C_i - C^*}\right)}{h \varepsilon K_v}$$

	Zone 1 (BOD)
Co = influent concentration	300
Ci = effluent concentration	20
C* = irreducible fraction	10
ε = pore volume	0.2
kv = rate constant, day^{-1}	0.9
h = wetland depth,m	1.07
Q = flow, m^3/day	2.6
Area,ft^2	**500**

Calculation 2: Width of Wetland (BOD Cross Sectional Loading)

$$A_c = \frac{L_{BOD}}{X_{loading}}$$

$$w = \frac{L_{BOD}}{X_{loading} \times h}$$

L_{BOD} = BOD loading, lb/day (g/day)	1.98
$X_{loading}$ = design cross sectional loading g/m2/day	500
h = wetland depth, m	1.07
w = wetland width,ft (Min.)	**6**
w' = actual wetland with, ft (m)	**15**

Calculation 3: Total Coliform Reduction (Kadlec and Knight, 1996, eq. 17-3, pg 541)

$$C = C_0 * \exp\left(-\frac{k_1}{q}\right)$$

C_0 = initial coliform concentration, #/100 mL	1.00E+06
C = effluent coliform concentration, #/100 mL	156
k_1 = first-order, areal rate constant, m/d	0.50
q = hydraulic loading rate, m/d	0.06
w' = actual wetland with, ft (m)	**15**

Calculation 4: Total Suspended Solids Reduction (Reed, et. al., 1999, eq. 6.40, pg 233)

$$C_e = C_0[0.1139 + 0.00213(HLR)]$$

C_0 = influent TSS, mg/L	110
C_e = effluent TSS, mg/L	14
HLR = hydraulic loading rate, cm/d	5.71

Calculation 5: Length of Zone 1 Inlet (Sized to reduce BOD by 50%)

$$\ln\left(\frac{C_o - C^*}{C_i - C^*}\right) = k_v t \varepsilon$$

$$t = \frac{\ln\left(\frac{C_o}{C_i}\right)}{k_v \varepsilon} = \frac{hA}{Q} = \frac{hwl}{Q}$$

$$l = \frac{\ln\left(\frac{C_o}{C_i}\right)Q}{hwk_v \varepsilon}$$

Co = influent concentration	300
Ci = effluent concentration (50% of influent)	150
Q = flow, m^3/day	2.6
h = wetland depth,m	1.07
w = wetland width, m	4.57
kv = rate constant, day^{-1}	0.9
ε = pore volume	0.2
Length of Inlet Zone,ft	**6.9**

Prepared By: DHW
Project: 08-141 MFD
Date: December 15, 2009

APPENDIX E – WWTS Rainfall Analysis

Rainstorm Event =	2.5	in/hr (50 YR Storm)	
AWTS Dimensions:			
Length, L =	33	Ft	
Width, W =	15	Ft	
Depth of Stone, D =	3.5	Ft	
Cross Sectional Area, A_c =	52.5	Ft^2	(Perpendicular to flow)
Hydraulic Conductivity Range, K =	10,000 to 1,000,000	gpd/sq-ft	(Reed, et al, 1995)
Design Hydraulic Conductivity, K =	50,000	gpd/sq-ft	
	2,083.3	gphr/sq-ft	

Description	Flow (gal/hr)	Hydraulic Gradient, i	Δ H Across Wetland (inches)	Comment
Design Flow, gpd	700.0	0.0%	0.1	Contained within stone
Peak Flow, gpd	1,750.0	0.1%	0.3	Contained within stone
Storm Flow, gphr	778.9	0.7%	2.8	Contained within berms
Peak and Storm Flow, gphr	851.8	0.8%	3.1	Contained within berms

1. Assumes 2 inch gap between outlet invert, and top of stone.
2. Assumes 6 inches of compost and 12 inches of freeboard to top of berms.

Using Darcy's Law:
$Q = KiA_c$;
Rearrange to solve for i,
$i = Q / KA_c$

$A_c = W \times D = 15\ Ft \times 3.5\ Ft = 52.5\ Ft^2$ (perpendicular to flow)

$K = 50{,}000\ gpd/Ft^2 \times 1\ day/24\ hr = 2{,}083.3\ gal/hr\text{-}Ft^2$

Peak Flow = 2.5 x Design Flow = 2.5 x 700 gpd = 1,750 gpd

Storm Flow = Design Storm x L x W = (2.5 in/hr x 1 Ft/12 in) x 33 Ft x 15 Ft
= 103.13 Ft^3/hr x 7.4805 gal/Ft^3
= 771.4 gal/hr

Peak and Storm Flow = Peak Flow + Storm Flow
= 1,750 gpd x 1 day/24 hr + 771.4 gal/hr
= 844 gal/hr

Sample i and Δ H Calculation:
i = 844 gal/hr / (2,083.3 gal/hr-Ft^2 x 52.5 Ft^2) = 0.0077 x 100% = 0.8%
Δ H = 0.8% x 33 Ft x 12 in/Ft = 3.2 in

APPENDIX F – WWTS Plants (By REDI)

	Scientific name	Common name	Hawaiian name	Source
*	Cyperus javanicus	Javanese flatsedge	Ahu'awa	Indigenous
	Zingiber zerumbet	Shampoo ginger	Opuhi	Polynesian
*	Bacopa monnieri	Water hyssop	Ae'ae	Indigenous
	Dianella sandwicensis	n/a	Uki Uki	Indigenous
	Zingiber sp.	Ginger (unidentifid sp.)	Awapuhi	Polynesian
*	Schoenoplectus lacustris ssp. validus	Great bulrush	Aka'akai	Indigenous
*	Cyperus laeviigatus	Smooth flatsedge	Makaloa	Indigenous
	Colocasia esculenta	Taro	Kalo	Polynesian
	Marsilea villosa	Water clover	Ihi'ihilauakea	Endemic
	Ludwigia octovalvis	Primrose willow	Pukamole	Polynesian
	Cyperus polystachyos	Manyspike flatsedge	Kiolohia	Indigenous
	Sporobolus virginicus	Seashore drop seed	Aki aki	Indigenous
	Canna indica	Canna	Li'ipoe	Introduced
	Heliconia sp.	Hibiscus sp.	Koki'o	Introduced
	Sesuvium portulacastrum	Seaside purslane	Akulikuli	Indigenous
	Cordyline terminalis	Ti	Ki	Polynesian

* Preferred Plants

Experimental Plants (Native bog plants)			
Dubautia pauciflorula	Wahiawa bog dubautia	Na`ena`e	Indigenous
Labordia lydgatei	Wahiawa mountain labordia	Kâmakahala	Indigenous
Viola helenae	Bog violet	n/a	Indigenous
Hesperomannia lydgatei .	Thistle	n/a	Indigenous
Dicranopteris linearis	Mat fern	Uluhe	Indigenous
Lobelia kauensis	Lava lobelia	Pu'e	Indigenous
Drosera anglica	Carnivorus sundews	Mikinalo	Indigenous
Rhynchospura spicaeformis	Spiked beaksedge	Kuolohia	Indigenous
Oreobolus furcatus	Hawai'i island sedge	n/a	Endemic

Fence Plants			
Alyxia oliviformis	Maile	Maile	Indigenous

APPENDIX G – Drip Irrigation Design Summary

GEOFLOW SUBSURFACE DRIP — Field Flow

Job Description:	*Maui Fire Station*
Contact:	*Lauren Roth, Roth Ecological Design International*
Prepared by:	*David H. Whitney, P.E., EcoSolutions LLC*
Date:	*15-Dec-09*

Please fill in the shaded areas and drop down menus:
This spreadsheet serves as a guide, and is not a complete hydraulic design.

Worksheet 1- Field Flow

Total field

Total Quantity of effluent to be disposed per day	1,100	gallons / day	note
Hydraulic loading rate	0.3	gallons / sq.ft. / day	note
Minimum Dispersal Field Area	3,667	square ft.	note
Total Dispersal Field Area	6,600	square ft.	note

Flow per zone

Number of Zones	4	zone(s)	note
Dispersal area per zone	1,650	square ft.	note
Choose line spacing between WASTEFLOW lines	2	ft.	note
Choose emitter spacing between WASTEFLOW emitters	1.5	ft.	note
Total linear ft per zone (minimum required)	825	ft. per zone	note
Total number of emitters per zone	550	emitters per zone	note
Select Wasteflow dripline (16mm)	Wasteflow PC - 1/2gph	dripline	note
Pressure at the beginning of the dripfield	20	psi	note
Feet of Head at the beginning of the dripfield	46.2	ft.	note
What is the flow rate per emitter in gph?	0.53	gph	note
Dose flow per zone	**4.86**	**gpm**	note

If required, choose flush velocity	0.5	ft/sec	note
How many lines of WASTEFLOW per zone?	12	lines	note
Fill in the *actual* length of longest dripline lateral	69	ft.	note
Flush flow required at the end of each dripline	0.37	gpm	note
Total Flow required to achieve flushing velocity	4.44	gpm	note
Total Flow per zone- worst case scenario	**9.30**	**gpm**	note

Select Filters and zone valves

Select Filter Type	BioDisc Filter		note
Recommended Filter (item no.)	BioDisc-150	1.5" Disc Filter 0-30gpm	note
Select Zone Valve Type	Electric Solenoid		note
Recommended Zone Valve (item no.)	SVLVB-100	1-in. Solenoid valve	note

Dosing

Number of doses per day / zone:	12	doses	
Timer ON. Pump run time per dose/zone:	4.43	mins:secs	
Timer OFF. Pump off time between doses	1:55	hrs:mins	
Per Zone - Pump run time per day/zone:	0:56	hrs:mins	
All Zones - Number of doses per day / all zones	48	doses / day	
Allow time for field to pressurize	0:00:30	hrs:mins:secs	0.500
Filter flush timer	0:00:20	hrs:mins:secs	0.333
Drain timer	0:05:00	hrs:mins:secs	5.000
Field flush timer	0:01:00	hrs:mins:secs	1.000
Field flush counter	3	cycles	note
Time required to complete all functions per day	9:14	hrs:mins	
Dose volume per zone	23	gallons per dose	note

Allow time in the day for controller to have pressurization and drainage time.

GEOFLOW SUBSURFACE DRIP — **Pump Size**

Job Description:	Maui Fire Station
Contact:	Lauren Roth, Roth Ecological Design
Prepared by:	David H. Whitney, P.E., EcoSolutions
Date:	12/15/2009

Pressure losses may be grossly overstated, particularly if designing with WASTEFLOW Classic
The letters on the diagram(right) match the letters in section 2 below.

Worksheet - Pump Sizing

Section 1 - Summary from Worksheet 1

Flow required to dose field	4.86 gpm
Flow required to flush field	4.44 gpm
Flow required to dose & flush field	9.30 gpm
Filter	BioDisc-150
No. of Zones	4 zones
Zone valve	SVLVB-100
Dripline	Wasteflow PC - 1/2gph
Dripline longest lateral	68.75 ft.

Section 2

Section 2	Ft of head	Pressure
A. Flush line - Losses through return line		
Size of flush line in inches	.75 inch	
Length of return line	200 ft.	
Equivalent length of fittings	5 ft.	
Elevation change. (if downhill enter 0)	**0** ft.	
Pressure loss in 100 ft of pipe	7.16 ft.	3.10 psi
Total pressure loss from end of dripline to return tank	*14.7 ft.*	6.36 psi
B. Dripline - Losses through Wasteflow dripline		
Length of longest dripline lateral	**69** ft.	
Minimum dosing pressure required at end of dripline	23.10 ft.	10.00 psi
Loss through dripline during flushing	2.31 ft.	1.00 psi
Total minimum required dripline pressure	*25.41 ft.*	1.00 *psi*
A+B. Minimum Pressure required at beginning of dripfield		
CALCULATED pressure required at beginning of dripfield	*40.09 ft.*	17.36 *psi*
SPECIFIED pressure at beginning of dripfield (from workhst 1)	**46.2 ft.**	20.00 *psi*
Great! SPECIFIED Pressure is greater than CALCULATED Pressure requirement. Go to next step		
C. Drip components - Losses through headworks		
Filter	4.6 ft.	2.00 psi
Zone valve pressure loss (not in diagram)	0.69 ft.	0.30 psi
Flow meter pressure loss (not in diagram)	ft.	- psi
Other pressure losses	ft.	- psi
Total loss through drip components	**5.31 ft.**	2.30 psi
D. Supply line - Minimum Pressure head required to get from pump tank to top of dripfield		
Size of supply line in inches	2 inch	
Length of supply line	0 ft.	
Equivalent length of fittings	5 ft.	
Height from pump to tank outlet	5 ft.	
Elevation change. (if downhill enter 0)	20 ft.	
Pressure loss/gain in 100 ft. of pipe	0.24 ft.	0.10 psi
Total gain or loss from pump to field	***25.0 ft.***	10.83 psi
Total dynamic head	**76.5 ft.**	33.13 *psi*
Pump capacity *	**9.3 gpm**	
Pump Model Number		
Voltz / Hp / phase		

* Note: Pump capacity flow assumes flow in dripline does not change during a dose cycle. With Wasteflow C
For more accurate flows please see Geoflow's **Flushing worksheet.**

If you need assistance designing for this additional flow, please

a. See Geoflow flushing worksheet or

b. Contact Geoflow at 800-828-3388.

SITE EVALUATION/PERCOLATION TEST

Date/Time: July 9, 2009

Test performed by: Hirata & Associates, Inc.

Owner: County of Maui, Department of Fire and Public Safety

Tax Map Key: 2nd Div. 2-7-007: 008

Test Number: P1

Elevation: 526± ft.
Depth to Groundwater Table: NA ft. below grade
Depth to Bedrock (if observed): NA ft. below grade
Diameter of Hole: 4 in.
Depth to Hole Bottom: 5 ft. below grade

Depth (inches)	**Soil Profile** (Color, texture, other)
0 - 60	Dark brown clayey silt

PERCOLATION READINGS

Time 12 inches of water to seep away: ~30 min.
Time 12 inches of water to seep away: ~30 min.

___ For percolation tests in sandy soils, record time intervals and water drops every 10 minutes for at least 1 hour.

√ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals and water drops at least every 10 minutes for 1 hour; or if the time for the first 6 inches to seep away is greater than 30 minutes, record time intervals and water drops at least every 30 minutes for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

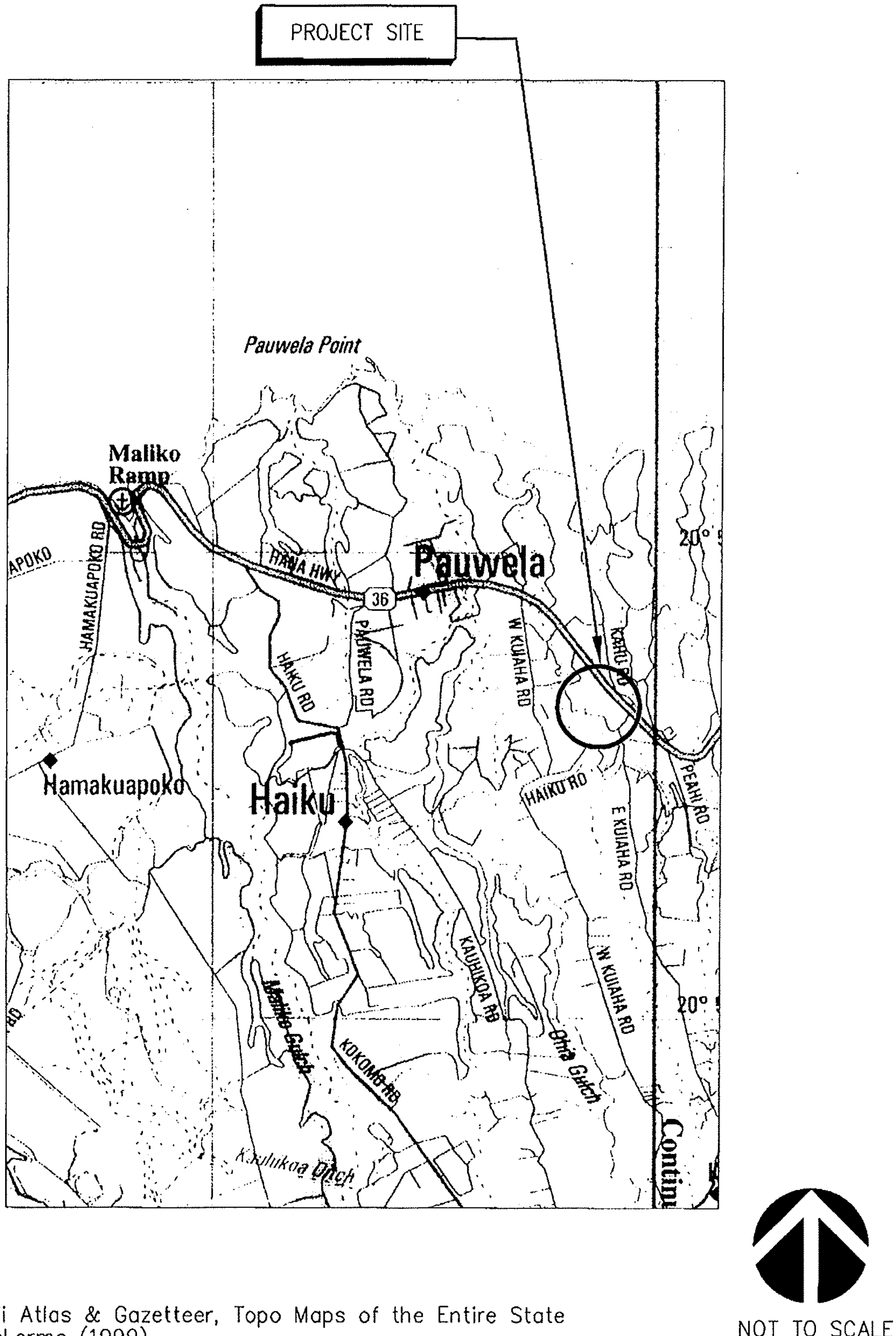
Time interval	Drop in inches	Time interval	Drop in inches
30 min.	1/8		
30 min.	1/16		
30 min.	1/16		

Percolation Rate (time/final water level drop): 480 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

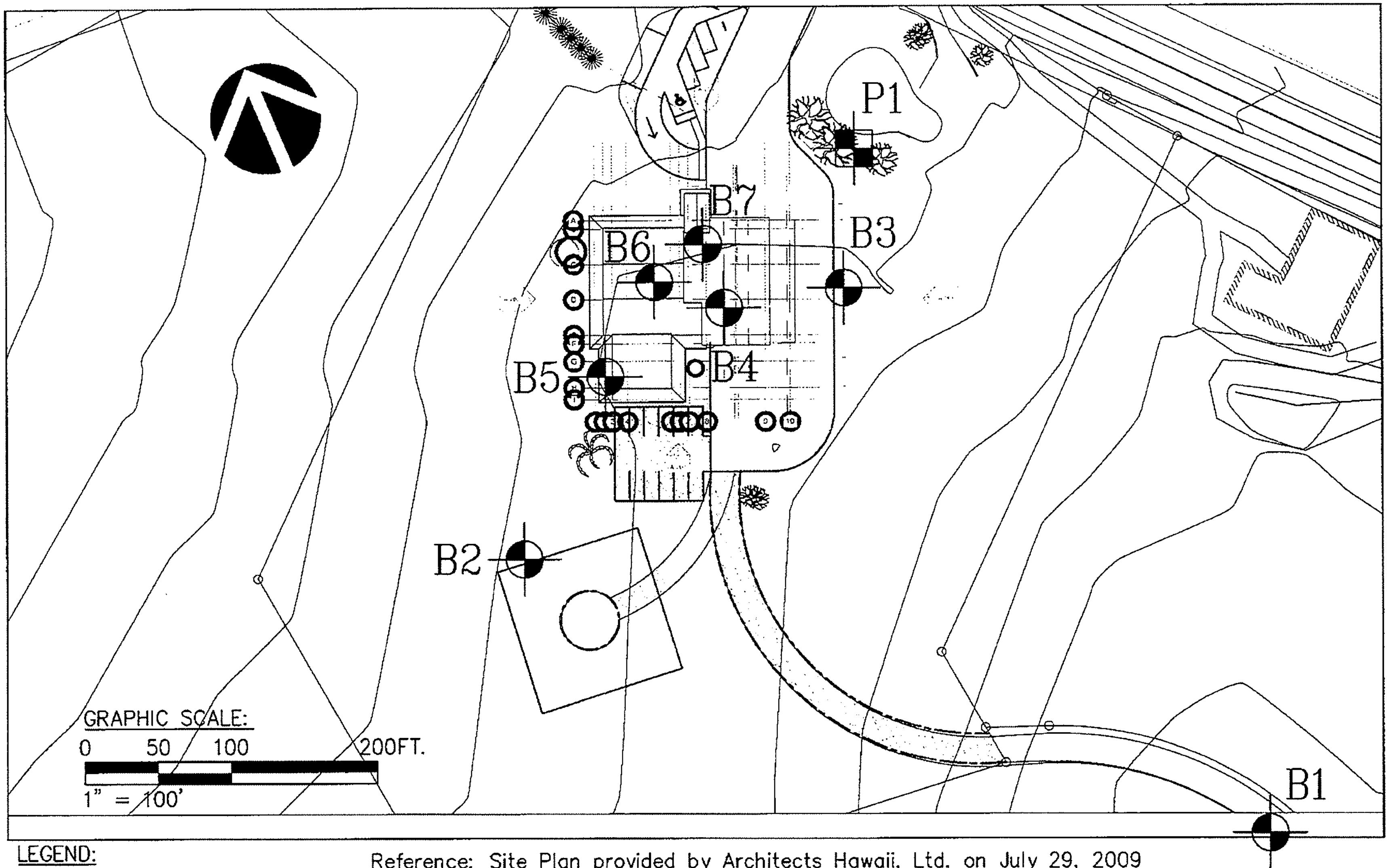
Engineer's Signature/Stamp

JENNIFER G.K. HIRATA
LICENSED PROFESSIONAL ENGINEER
No. 12097
HAWAII, U.S.A.



Reference: Hawaii Atlas & Gazetteer, Topo Maps of the Entire State by DeLorme (1999)

W.O. 08-4693	Haiku Fire Station Annex
Hirata & Associates, Inc.	LOCATION MAP Plate A2.1



LEGEND:

- Approximate location of borings
- Approximate location of percolation test

Reference: Site Plan provided by Architects Hawaii, Ltd. on July 29, 2009

W.O. 08-4693	Haiku Fire Station Annex
Hirata & Associates, Inc.	BORING LOCATION PLAN

Plate A2.2

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of the material is LARGER than No. 200 sieve size.)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines.)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines.)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size.)	CLEAN SANDS (Little or no fines.)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines.)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of the material is SMALLER than No. 200 sieve size.)	SILTS AND CLAYS (Liquid limit LESS than 50.)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50.)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.
				FRESH TO MODERATELY WEATHERED BASALT
				VOLCANIC TUFF / HIGHLY TO COMPLETELY WEATHERED BASALT
				CORAL

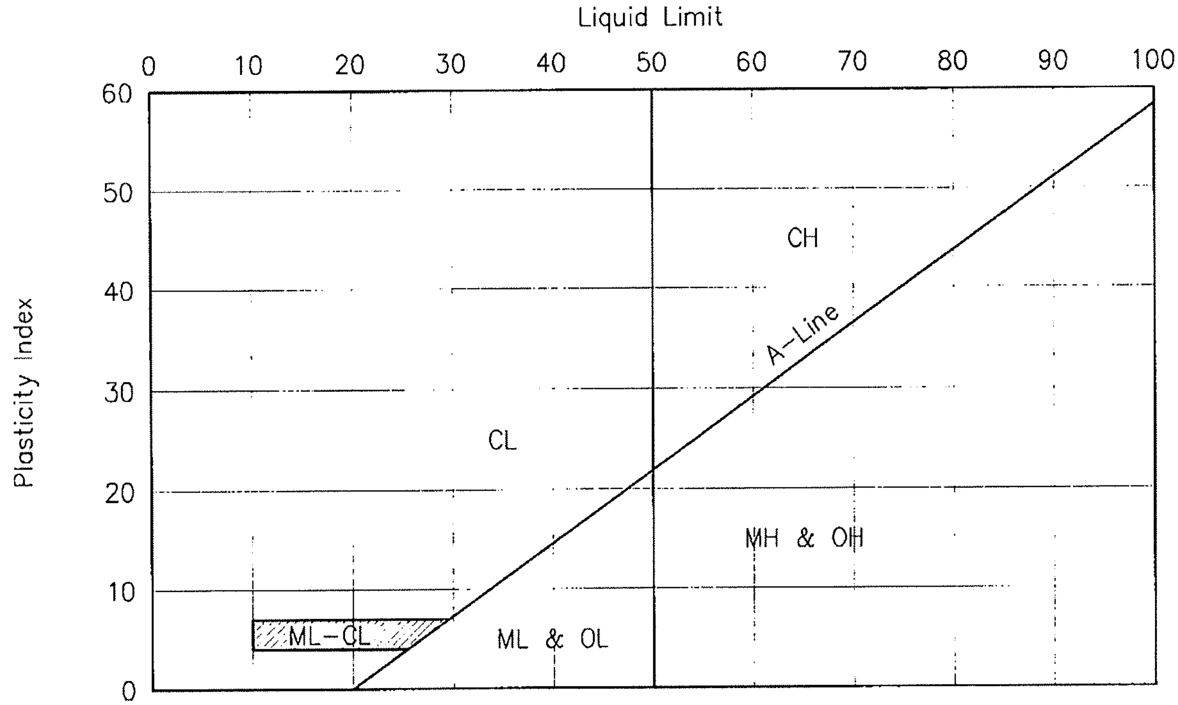
SAMPLE DEFINITION

2" O.D. Standard Split Spoon Sampler	Shelby Tube	RQD Rock Quality Designation
3" O.D. Split Tube Sampler	NX / 4" Coring	Water Level

W.O. 08-4693	Haiku Fire Station Annex
Hirata & Associates, Inc.	BORING LOG LEGEND

Plate A3.1

PLASTICITY CHART



GRADATION CHART

COMPONENT DEFINITIONS BY GRADATION	
COMPONENT	SIZE RANGE
Boulders	Above 12 in.
Cobbles	3 in. to 12 in.
Gravel	3 in. to No. 4 (4.76 mm)
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 (4.76 mm)
Sand	No. 4 (4.76 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.76 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and clay	Smaller than No. 200 (0.074 mm)

W.O. 08-4693	Haiku Fire Station Annex
Hirata & Associates, Inc.	UNIFIED SOIL CLASSIFICATION SYSTEM Plate A3.2

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B1 DRIVING WT. 140 lb. START DATE 7/8/09

SURFACE ELEV. 580±* DROP 30 in. END DATE 7/8/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) – Dark brown, moist, stiff, with plastic debris. (Fill)
			25	77	41	
						Clayey SILT (MH) – Mottled brown, moist, stiff. (Completely Weathered Basalt)
			35	62	53	
5			22	58	65	
			33	64	52	
10						
						End boring at 10.5 feet.
15						
20						
25						Neither groundwater nor seepage encountered.
						* Elevations based on Site Plan provided by Architects Hawaii, Ltd. on July 29, 2009.
30						

Plate A4.1

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B2 DRIVING WT. 140 lb. START DATE 7/8/09

SURFACE ELEV. 521± DROP 30 in. END DATE 7/8/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) – Dark brown, moist, stiff, with plastic debris. (Fill)
		☐	50	80	38	
		☐	34	84	35	
5						Clayey SILT (MH) – Mottled brown, moist, stiff. (Completely Weathered Basalt)
		☐	21	69	49	
10						End boring at 9.5 feet.
15						
20						
25						Neither groundwater nor seepage encountered.
30						

Plate A4.2

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B3 DRIVING WT. 140 lb. START DATE 7/8/09
SURFACE ELEV. 531± DROP 30 in. END DATE 7/8/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) – Mottled brown, moist, medium stiff. (Completely Weathered Basalt) Covered by 4 inches of concrete over 3 inches inches of coralline sand.
		☐	18	84	27	
		☐	7	72	37	Firm from 3 to 6 feet.
5		☐	9	76	38	
10		☐	20	91	28	
▽						Seepage water encountered at 13 feet below grade at 11:00 am on 7/08/09.
15		☐	34	99	24	
20		☐	22	82	40	
						End boring at 20.5 feet.
25						Neither groundwater nor seepage encountered.
30						

Plate A4.3

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B4 DRIVING WT. 140 lb. START DATE 7/9/09
SURFACE ELEV. 530± DROP 30 in. END DATE 7/9/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) – Dark brown, moist, medium stiff. (Fill)
			17	69	40	Clayey SILT (MH) – Mottled brown, moist, medium stiff. (Completely Weathered Basalt)
5			13	74	35	
			19	96	26	
10						
			28	92	28	Stiff from 13 feet.
15						
			28	97	22	
20						End boring at 19.5 feet.
25						Neither groundwater nor seepage encountered.
30						

Plate A4.4

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B5 DRIVING WT. 140 lb. START DATE 7/8/09
SURFACE ELEV. 530± DROP 30 in. END DATE 7/8/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Clayey SILT (MH) – Dark brown, moist, medium stiff to stiff. (Fill)
		☐	21	86	30	
		☐	29	94	27	
5		☐	28	91	25	Clayey SILT (MH) – Mottled brown, moist, stiff. (Completely Weathered Basalt)
10		☐	30	75	36	
15		☐	11	73	31	Medium stiff at 14 feet.
20		☐	21	70	31	
						End boring at 20.5 feet.
25						Neither groundwater nor seepage encountered.
30						

Plate A4.5

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B6 DRIVING WT. 140 lb. START DATE 7/9/09

SURFACE ELEV. 530± DROP 30 in. END DATE 7/9/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty SAND (SM) – Tannish brown, moist, medium dense. (Fill)
			22	82	30	Clayey SILT (MH) – Dark brown, moist, medium stiff to stiff. (Fill)
			17	80	35	
5						
			38	88	35	
10						Clayey SILT (MH) – Mottled brown, moist, medium stiff. (Completely Weathered Basalt)
			16	80	39	
15						Seepage water encountered at 14.5 feet below grade at 11:00 am on 7/09/09.
			21	86	29	
20						End boring at 19.5 feet.
25						
30						

Plate A4.6

HIRATA & ASSOCIATES, INC.

BORING LOG

W.O. 08-4693

BORING NO. B7 DRIVING WT. 140 lb. START DATE 7/9/09
SURFACE ELEV. 529± DROP 30 in. END DATE 7/9/09

DEPTH	GRAPH	SAMPLE	BLOWS PER FOOT	DRY DENSITY (PCF)	MOIST. CONT. (%)	DESCRIPTION
0						Silty SAND (SM) – Tannish brown, moist, dense. (Fill)
			44	104	22	Clayey SILT (MH) – Dark brown, moist, medium stiff, with plastic debris. (Fill)
			5	67	22	Firm at 4 feet.
5						
			37	85	39	Clayey SILT (MH) – Mottled brown, moist, medium stiff to stiff. (Completely Weathered Basalt)
10						
			15	76	44	
15						Seepage water encountered at 14.5 feet below grade at 2:00 pm on 7/09/09.
			23	88	31	
20						End boring at 19.5 feet.
25						
30						

Plate A4.7

APPENDIX H.

Preliminary Drainage Report and Calculations

Haiku Fire Station

Haiku, Island of Maui, Hawaii

TMK: (2^{nd} Div) 2-7-007: 008

Preliminary Drainage Report

November 2010

Prepared for:

Architects Hawaii, Ltd.
1001 Bishop Street
ASB Tower, Suite 200
Honolulu, Hawaii 96813

Prepared by:

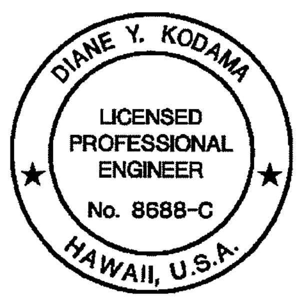
AECOM
1001 Bishop Street
ASB Tower, Suite 1600
Honolulu, Hawaii 96813

Haiku Fire Station

Preliminary Drainage Report

TMK: (2nd Div) 2-7-007:008

November 2010



(Expires April 30, 2012)

This work was prepared by me or under my direct supervision.

Signature (***Diane Y. Kodama***) Date
AECOM Pacific, Inc.

TABLE OF CONTENTS

FIGURES

APPENDICES

SECTION 1

INTRODUCTION

1.1 PURPOSE

The objective of this drainage report is to analyze and evaluate the effects of the proposed Haiku Fire Station project on existing drainage patterns and to form a basis of design for a drainage system to manage flow within the site and convey water off-site in accordance with County of Maui drainage requirements for the area. This report analyzes the conditions before and after the construction project during the SMA stage of the project. The drainage report will be refined when the construction documents are prepared and submitted to the Department of Public Works for approval.

1.2 GENERAL INFORMATION

A. The project location is in the Haiku district of Maui (see attached Figure 1, Vicinity and Location Maps). The Haiku Fire Station is being developed by the County of Maui, Department of Fire & Public Safety. The proposed improvements include installation of a new Fire Station Building with parking lot, helicopter landing zone, and utilities. The project will be located within a 27.90 acre development area.

B. Owner: County of Maui
Department of Fire and Public Safety
200 Dairy Road
Kahului, Maui, Hawaiʻi 96733
Contact: Lee Mainaga, Fire Services Officer
Phone: (808) 270-5542
Email: lee.mainaga@co.maui.hi.us

C. Vicinity & Location Maps (See Figure 1, Vicinity and Location Maps)

SECTION 2

PHYSICAL ENVIRONMENT

2.1 LOCATION

The Haiku Fire Station project site is located in Haiku, Maui, Hawaii 96708 at 3550 Hana Highway. Refer to Figure 1 for a location map of the project. The Tax Map Key (TMK) for the project lot is (2)2-7-007:008.

2.2 TOPOGRAPHY

The project site generally slopes from an elevation of approximately 590 feet above sea level at its highest point to approximately 500 feet at its lowest. The drainage generally flows in a north-westerly direction.

2.3 SOILS

According to the August 1972 publication *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Ref 4) by the United States Department of Agriculture, Soil Conservation Service, the soil at the project site is Haiku clay, with slopes of 7 to 15 percent (soil classification HbC). This series consists of somewhat excessively drained soils on low uplands on the island of Maui. Permeability is moderately rapid. Runoff is slow to medium, and the erosion hazard is slight to moderate.

2.4 DRAINAGE/FLOODING

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) of the project area (Map Number 150003 0225 B, Ref 1), the area is classified as Zone C – an area determined to have minimal flooding. Refer to Figure 2, Flood Insurance Rate Map (FIRM).

2.5 RAINFALL

According to the August 1972 publication *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (Ref 4) by the United States Department of Agriculture, Soil Conservation Service, the annual rainfall for the project area amounts to 50 to 80 inches.

SECTION 3

DRAINAGE

3.1 METHODOLOGY

Drainage characteristics for the project site are analyzed through the use of the Rational Method. Drainage guideline standards for the County of Maui – *Rules for the Design of Storm Drainage Facilities in the County of Maui* (11/12/95, Ref 3) – states that the Rational Method shall be used for drainage areas of 100 acres or less.

3.2 HYDROLOGIC CRITERIA

The hydrologic criteria used to obtain peak discharges are summarized as follows:

Criteria

Recurrence Interval: Tm = 10 years (for non-sump conditions)
Tm = 50 years (for sump conditions)
Tm = 50 years (for retention & detention basins)

(It is stated in the County of Maui - *Rules for the Design of Storm Drainage Facilities in the County of Maui* (11/12/95, Ref 3), that for drainage areas of 100 acres or less with sump, or tailwater effect and for the design of roadway culverts and bridges, Tm = 50 years)

Intensity and Rainfall Duration	Intensity of 1-hr Rainfall
Peak Discharges	Rational Method
Runoff Coefficient C	Determined from Table 1 or Table 2, (See Appendix A)

3.3 EXISTING DRAINAGE CONDITIONS

The "Existing Drainage Map" (Figure 3) shows the existing site conditions. There are four drainage areas in the existing condition. Two drainage areas, XDA-1 and XDA-2, are within the proposed project's property. The two remaining drainage areas, XDA-3 and XDA-4, are from areas outside the proposed project's property but both contribute to the onsite flow rates. The existing flow rate from Drainage Areas XDA-1 and XDA-4 is 14.13 cfs (10-yr) and 16.63 cfs (50-yr) and flows to the northwest property line. The existing flow rate from Drainage Areas XDA-2 and XDA-3 is 5.24 cfs (10-yr) and 6.13 cfs (50-yr) and flows to Hana Highway to the north. The total existing flow rate from the project's property is 19.37 cfs (10-yr) and 22.76 cfs (50-yr). Refer to Appendix B for existing drainage calculations.

3.4 PROPOSED DRAINAGE IMPROVEMENTS

The "Proposed Drainage Map" (Figure 4) shows the proposed site conditions. The proposed improvements for the site include construction of new facilities including a paved driveway off of Hana Highway, visitors parking area, employees parking area, fire station building, and helicopter landing area. The proposed drainage system will include drainage structures, drainlines, and detention basin. The increase in runoff as a result of the increase in impervious area from the proposed project will be discharged in the detention basin.

There are eight drainage areas in the proposed condition. Five are within the proposed project's property and three from areas outside the proposed project's property. New Drainage Areas NDA-1 thru NDA-5 are located onsite. Drainage Areas NDA-6 thru NDA-8 are located offsite, but contribute to the onsite flow rates.

Drainage Areas NDA-1 and NDA-8 with a flow rate of 10.85 cfs (10-yr) and 13.88 (50-yr) will sheet flow offsite towards the northwest property line. Drainage Areas NDA-2 thru NDA-4 and NDA-6 thru NDA-7 with a flow rate of 11.35 cfs (10-yr) and 13.69 cfs (50-yr) will flow into the proposed detention basin. Drainage Area NDA-5 (fire station building) with a flow rate of 1.08 cfs (10-yr) will be discharged into a rainwater catchment system.

The total discharge in the project site is anticipated to be 23.28 cfs (10-yr) and 29.01 (50-yr) in the proposed condition. Refer to Appendix C for proposed drainage calculations.

3.5 CONCLUSIONS

The proposed Haiku Fire Station project is anticipated to generate a 10-year flow rate of 23.28 cfs, an increase of 3.91 cfs from the existing condition and a 50-year flow rate of 29.01 cfs, an increase of 6.25 cfs from the existing conditions. The proposed drainage system will manage the increased flow rates with a detention basin. The flow rate onto Hana Highway will be reduced by 5.24 cfs (10-yr) and 6.13 cfs (50-yr). The flow rate to the northwest property line will be reduced by 3.28 cfs (10-yr) and 2.75 cfs (50-yr).

With this new development all existing offsite flows will either be reduced or detained, thus there will not be an adverse impact to the existing drainage system downstream, neighboring properties, or roadways.

3.6 DETENTION BASIN SIZING

In accordance with County of Maui drainage standards, 50-year storm flows were used to size the detention pond. The existing 50-year flow is 22.76 cfs and the proposed flow is 29.01 cfs. The detention pond size for a 50-year 1-hour flow is anticipated to be approximately 23,047 cubic feet. A comparison was made between the County pond size and the LEED required size for quantity control. LEED requires that a pond to be sized using a 1 year, 24-hour and 2-year, 24-hour storm for the area. The LEED pond size is approximately 5,400 cubic feet. The County method is more stringent and shall be used to size the detention pond.

REFERENCES

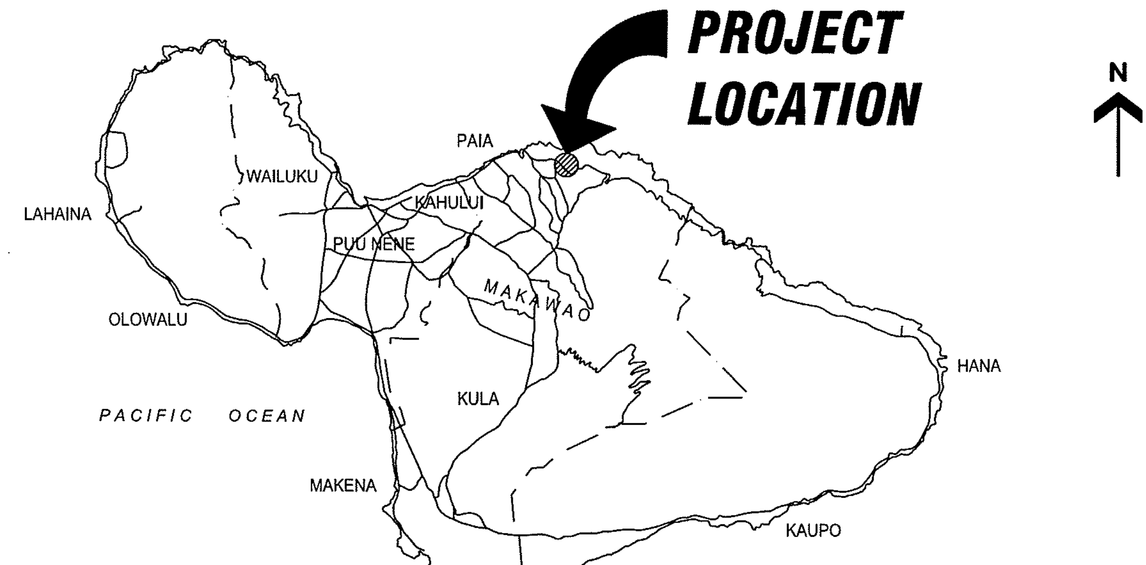
1. *Foundation Investigation, Science Flood Insurance Rate Map, Maui County, Hawaii,* Map Number 150003 0225 B, Ref Federal Emergency Management Agency, US Department of Homeland Security

2. *Building, Maui Community College, Kahului, Maui, Hawaii. W.O. 07-4536*, Hirata & Associates, Inc.., February 14, 2008.

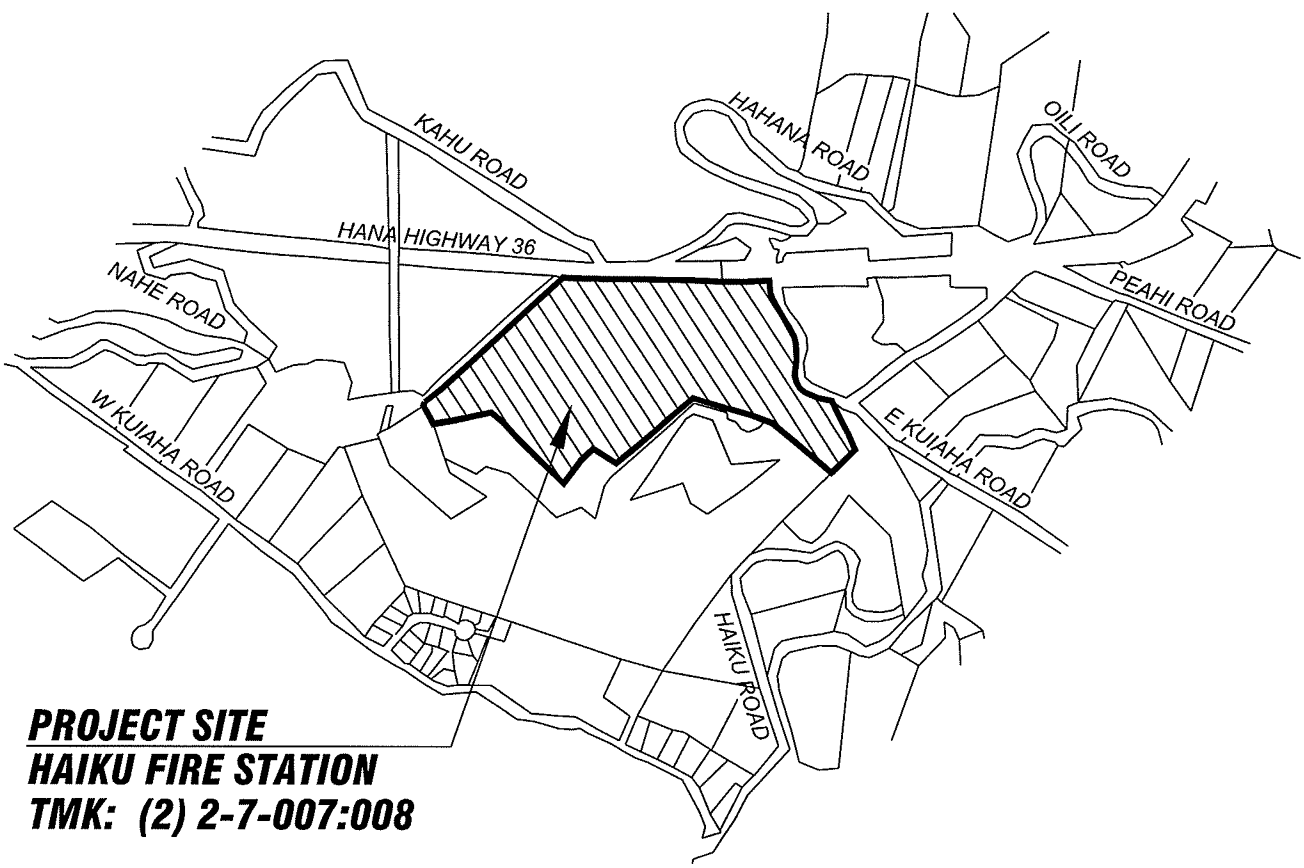
3. *Rules for the Design of Storm Drainage Facilities in the County of Maui,* Department of Public Works, County of Maui, Title MC-15, Chapter 4

4. United States Department of Agriculture, Soil Conservation Service, *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*, August 1972.

FIGURES



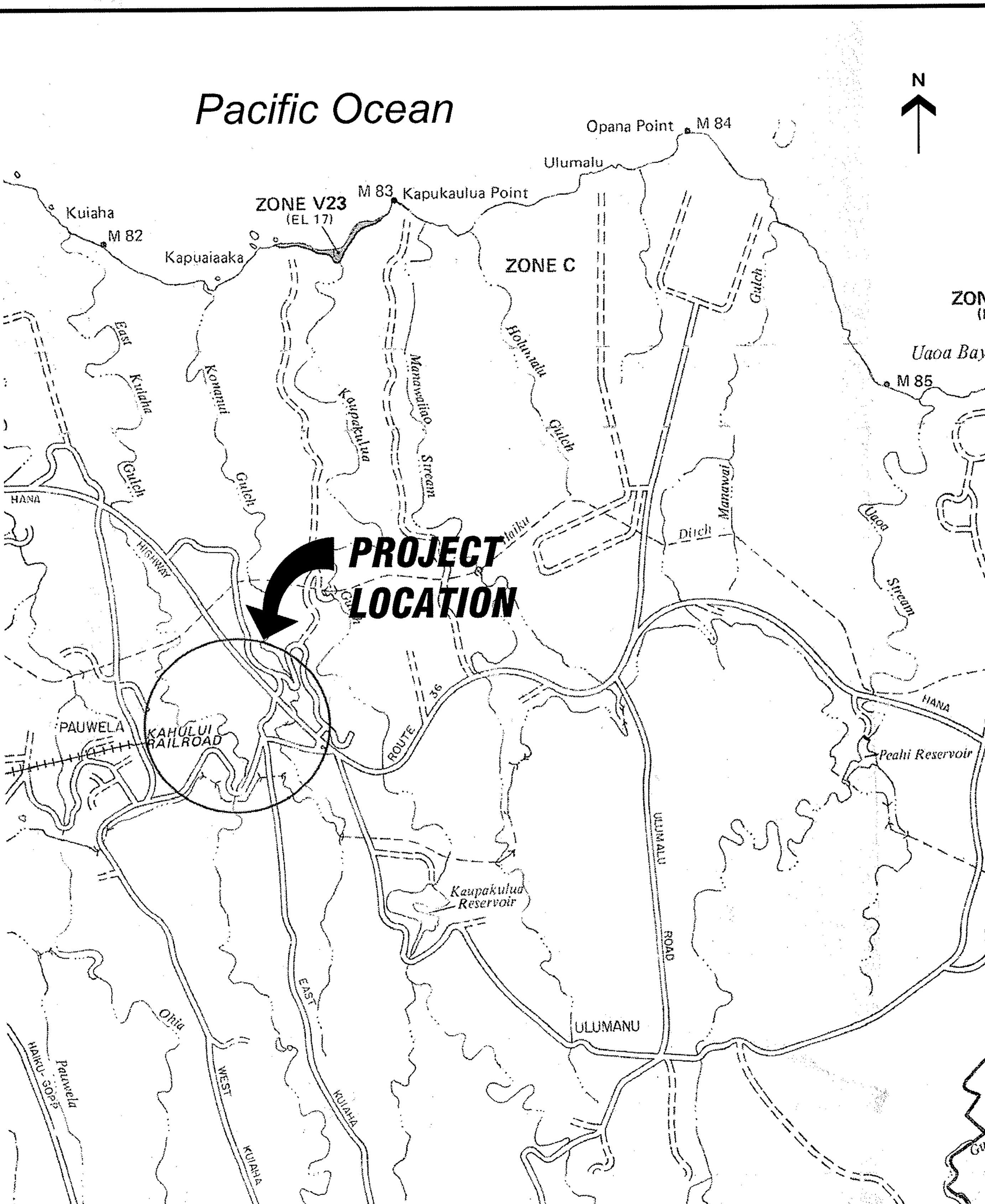
ISLAND OF MAUI
VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

NPDES PERMIT APPLICATION
FIGURE 1
Vicinity and Location Maps
HAIKU FIRE STATION
HAIKU, MAUI, HAWAII
November 2010

PATH/FILENAME: P:\Projects\Maui\60051010_AHL Haiku Fire Station\400 Reports\Drainage Report\Preliminary Drainage Report\... PLOT DATE: November 01, 2010 @ 09:54:06 am



FIRM MAP

NOT TO SCALE

NPDES PERMIT APPLICATION

FIGURE 2

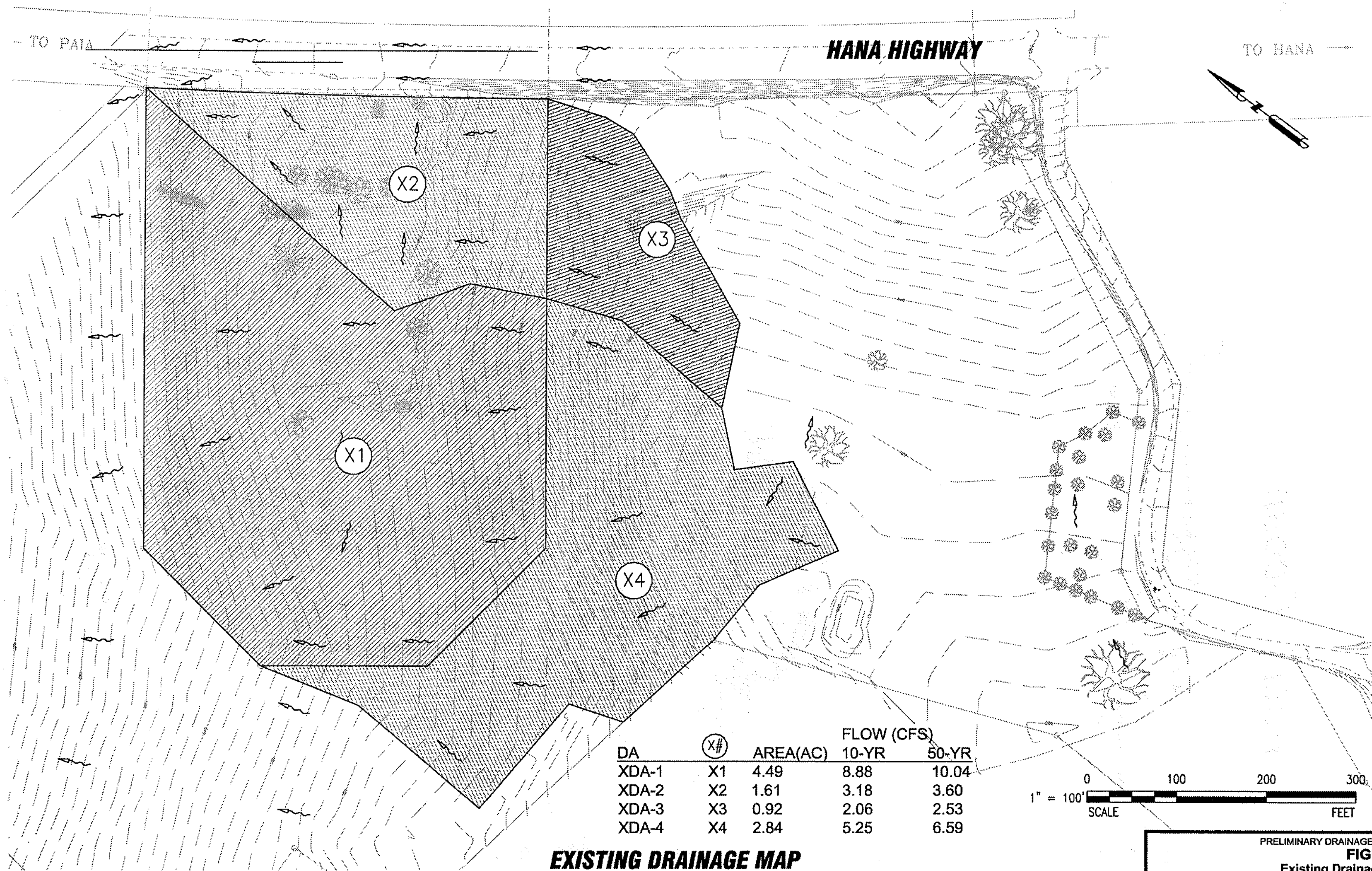
Flood Insurance Rate Map (FIRM)

HAIKU FIRE STATION

HAIKU, MAUI, HAWAII

November 2010

PLOT DATE: November 01, 2010 @ 10:01:04 am

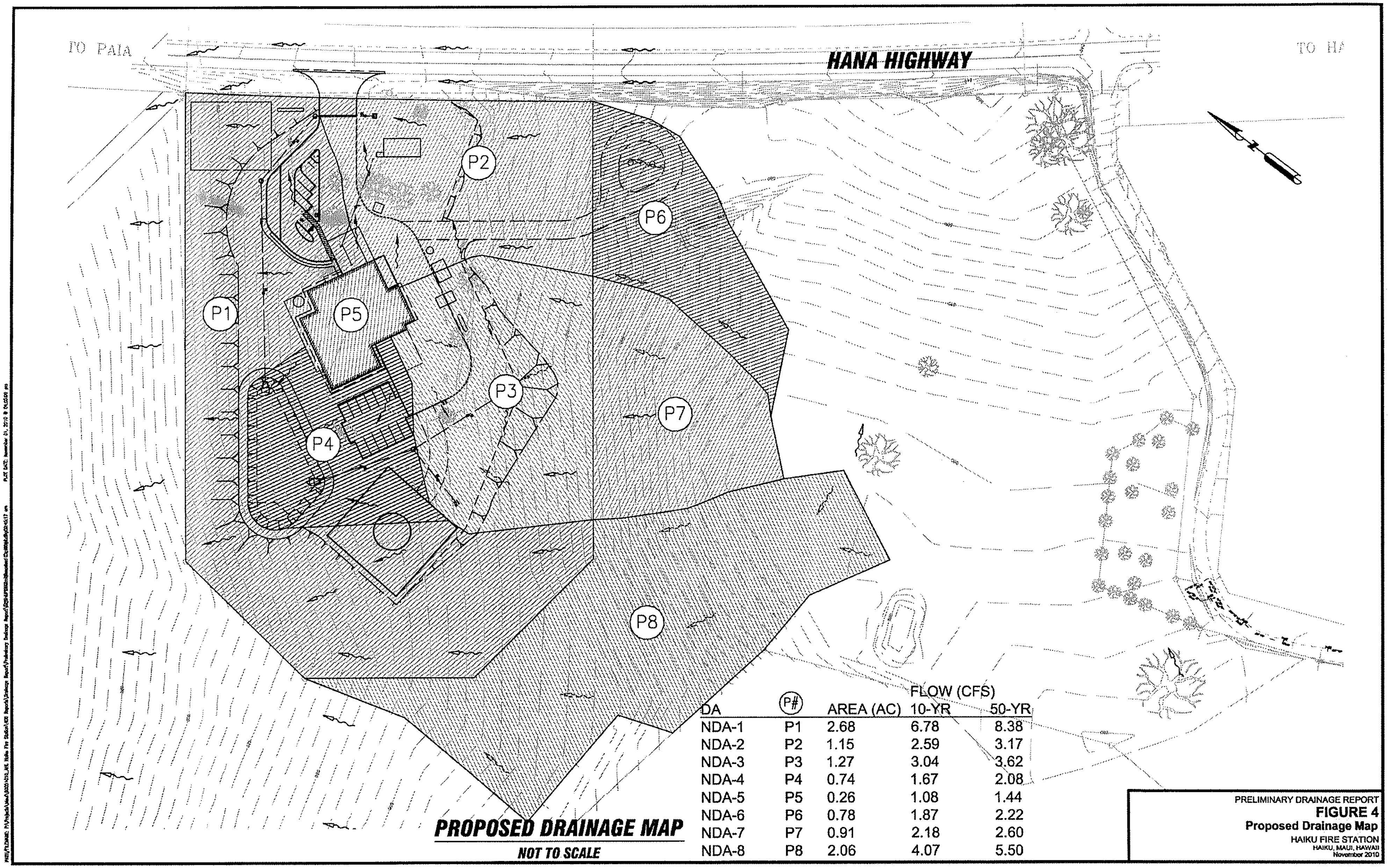


DA	X#	AREA(AC)	FLOW (CFS) 10-YR	FLOW (CFS) 50-YR
XDA-1	X1	4.49	8.88	10.04
XDA-2	X2	1.61	3.18	3.60
XDA-3	X3	0.92	2.06	2.53
XDA-4	X4	2.84	5.25	6.59

EXISTING DRAINAGE MAP

scale: 1"=100'

PRELIMINARY DRAINAGE REPORT
FIGURE 3
Existing Drainage Map
HAIKU FIRE STATION
HAIKU, MAUI, HAWAII
November 2010

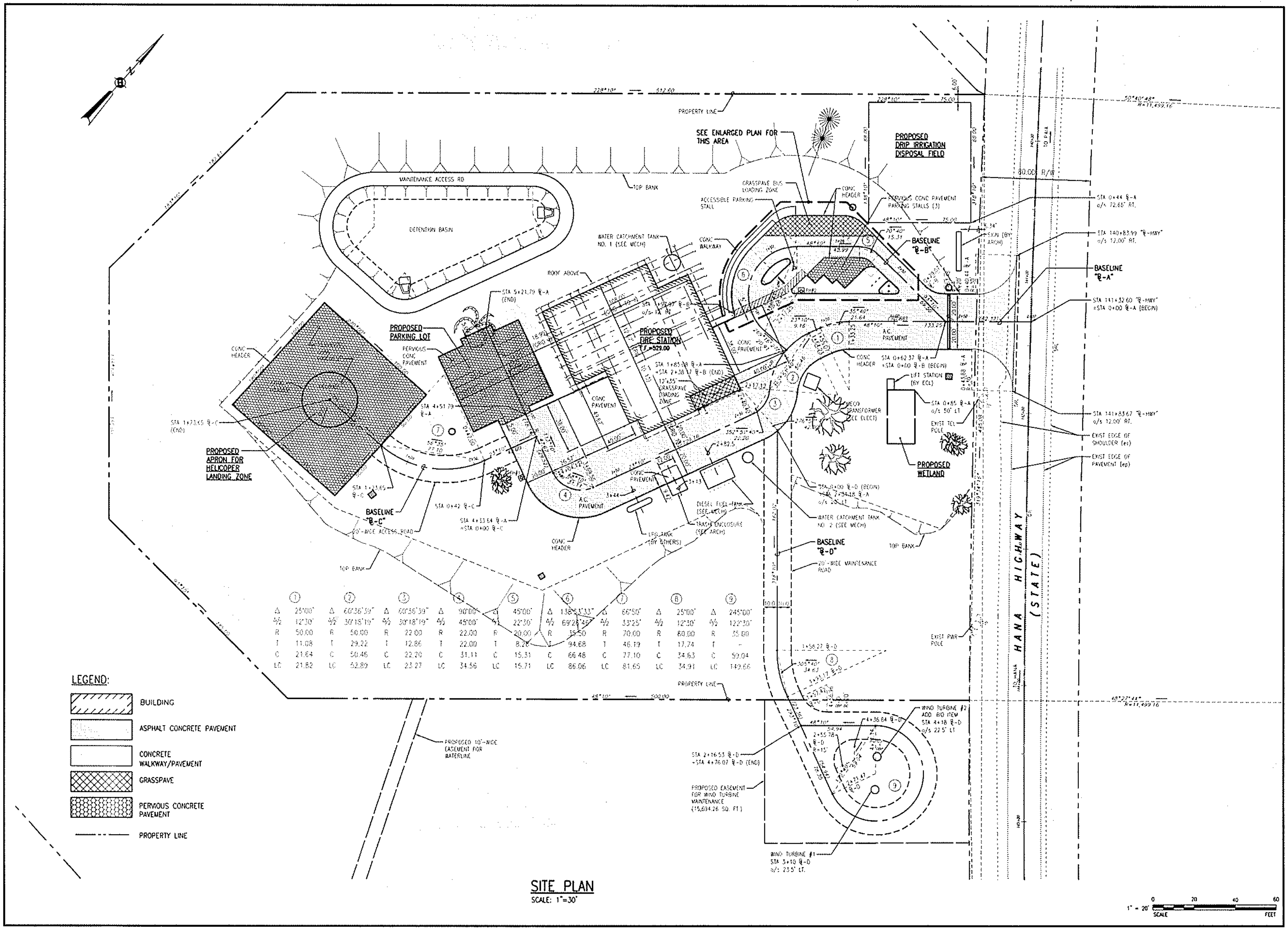


DA	P#	AREA (AC)	FLOW (CFS) 10-YR	FLOW (CFS) 50-YR
NDA-1	P1	2.68	6.78	8.38
NDA-2	P2	1.15	2.59	3.17
NDA-3	P3	1.27	3.04	3.62
NDA-4	P4	0.74	1.67	2.08
NDA-5	P5	0.26	1.08	1.44
NDA-6	P6	0.78	1.87	2.22
NDA-7	P7	0.91	2.18	2.60
NDA-8	P8	2.06	4.07	5.50

PROPOSED DRAINAGE MAP

NOT TO SCALE

PRELIMINARY DRAINAGE REPORT
FIGURE 4
Proposed Drainage Map
HAIKU FIRE STATION
HAIKU, MAUI, HAWAII
November 2010



ARCHITECTS • HAWAII LIMITED

1001 BISHOP STREET, SUITE 200
AMERICAN SAVINGS BANK TOWER
HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-9636
FAX: (808) 571-3280
www.ahldesign.com

HAIKU FIRE STATION

3550 HANA HWY
HAIKU, MAUI

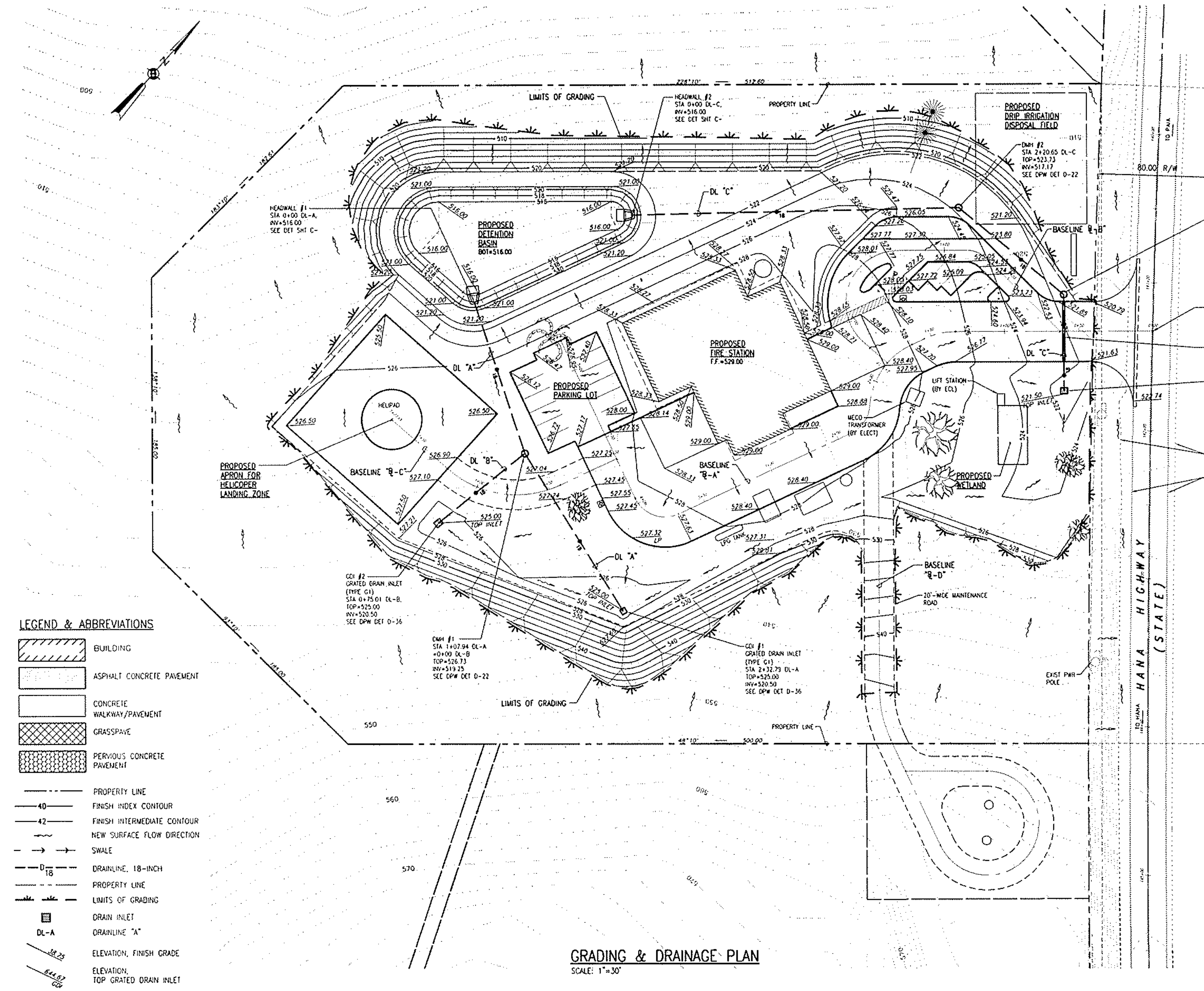
SITE PLAN

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

PROJECT NO: 5898.001
BIM FILE:
DRAWN BY:
DATE:
DRAWING NO

C-5

of Sheets



LEGEND & ABBREVIATIONS

(hatched)	BUILDING
(stippled)	ASPHALT CONCRETE PAVEMENT
(blank)	CONCRETE WALKWAY/PAVEMENT
(cross-hatched)	GRASSPAVE
(dotted)	PERVIOUS CONCRETE PAVEMENT
— · — · —	PROPERTY LINE
—40—	FINISH INDEX CONTOUR
—42—	FINISH INTERMEDIATE CONTOUR
~~	NEW SURFACE FLOW DIRECTION
- -→ -→-	SWALE
—D 18—	DRAINLINE, 18-INCH
— - —	PROPERTY LINE
	LIMITS OF GRADING
▦	DRAIN INLET
DL-A	DRAINLINE "A"
38.25	ELEVATION, FINISH GRADE
644.67 GDI	ELEVATION, TOP GRATED DRAIN INLET

NOTES:

1. FOR DRAINLINE PROFILE SEE SHEET C- .
2. FOR BENCHMARK SEE GENERAL SITE PLAN, SHEET C- .

EARTHWORK QUANTITIES
(FOR PERMIT PURPOSES ONLY)

EXCAVATION	....	C.Y.
EMBANKMENT	....	C.Y.
AREA	....	ACRES

GRADING & DRAINAGE PLAN
SCALE: 1"=30'

1" = 20' SCALE 0 20 40 60 FEET

ARCHITECTS · HAWAII LIMITED
1001 BISHOP STREET, SUITE 200
AMERICAN SAVINGS BANK TOWER
HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-9636
FAX: (808) 521-3280
www.ahldesign.com

HAIKU FIRE STATION
3550 HANA HWY
HAIKU, MAUI

GRADING & DRAINAGE PLAN

50% CONSTRUCTION DOCUMENTS
SEPTEMBER 27, 2010

PROJECT NO: 5893.001
BIM FILE:
DRAWN BY:
DATE:
DRAWING NO

C-7

of Sheets

APPENDIX A

Reference from *RULES FOR THE DESIGN OF STORM DRAINAGE FACILITIES IN THE COUNTY OF MAUI,*

Department of Public Works and Waste Management

County of Maui

Table 1

GUIDE FOR THE DETERMINATION OF RUNOFF COEFFICIENTS FOR BUILT-UP AREAS*

WATERSHED CHARACTERISTICS	EXTREME	HIGH	MODERATE	LOW
INFILTRATION	NEGLIGIBLE 0.20	SLOW 0.14	MEDIUM 0.07	HIGH 0.0
RELIEF	STEEP (> 25%) 0.08	HILLY (15 - 25%) 0.06	ROLLING (5 - 15%) 0.03	FLAT (0-5%) 0.0
VEGETAL COVER	NONE 0.07	POOR (< 10%) 0.05	GOOD (10 - 50%) 0.03	HIGH (50 - 90%) 0.0
DEVELOPMENT TYPE	INDUSTRIAL & BUSINESS 0.55	HOTEL-APARTMENT 0.45	RESIDENTIAL 0.40	AGRICULTURAL 0.15

**NOTE:* *The design coefficient "c" must result from a total of the values for all four watershed characteristics of the site.*

Table 2

RUNOFF COEFFICIENTS

Type of Drainage Area	Runoff Coefficient C
Parks, cemeteries	0.25
Playgrounds	0.35
Railroad yard areas	0.40
Unimproved areas	0.30
Streets:	
Asphaltic	0.95
Concrete	0.95
Brick	0.85
Driveway and walks	0.85
Roofs	0.95
Lawns:	
Sandy soil, flat, 2%	0.10
Sandy soil, avg., 2-7%	0.15
Sandy soil, steep, 7%	0.20
Heavy soil, flat, 2%	0.17
Heavy soil, avg., 2-7%	0.22
Heavy soil, steep, 7%	0.35

Table 3

MINIMUM RUNOFF COEFFICIENTS FOR BUILT-UP AREAS

Residential areas	C=0.55
Hotel, apartment areas	C=0.70
Business areas	C=0.80
Industrial areas	C=0.80

The type of soil, the type of open space and ground cover and the slope of the ground shall be considered in arriving at reasonable and acceptable runoff coefficients.

Table 4

APPROXIMATE AVERAGE VELOCITIES OF RUNOFF FOR CALCULATING TIME OF CONCENTRATION

TYPE OF FLOW	VELOCITY IN FPS FOR SLOPES (in percent) INDICATED			
OVERLAND FLOW:	0–3%	4–7%	8–11%	12–15%
Woodlands	1.0	2.0	3.0	3.5
Pastures	1.5	3.0	4.0	4.5
Cultivated	2.0	4.0	5.0	6.0
Pavements	5.0	12.0	15.0	18.0
OPEN CHANNEL FLOW:				
Improved Channels	Determine Velocity by Manning's Formula			
Natural Channel* (not well defined)	1.0	3.0	5.0	8.0

**These values vary with the channel size and other conditions so that the ones given are the averages of a wide range. Wherever possible, more accurate determinations should be made for particular conditions by Manning's formula.*

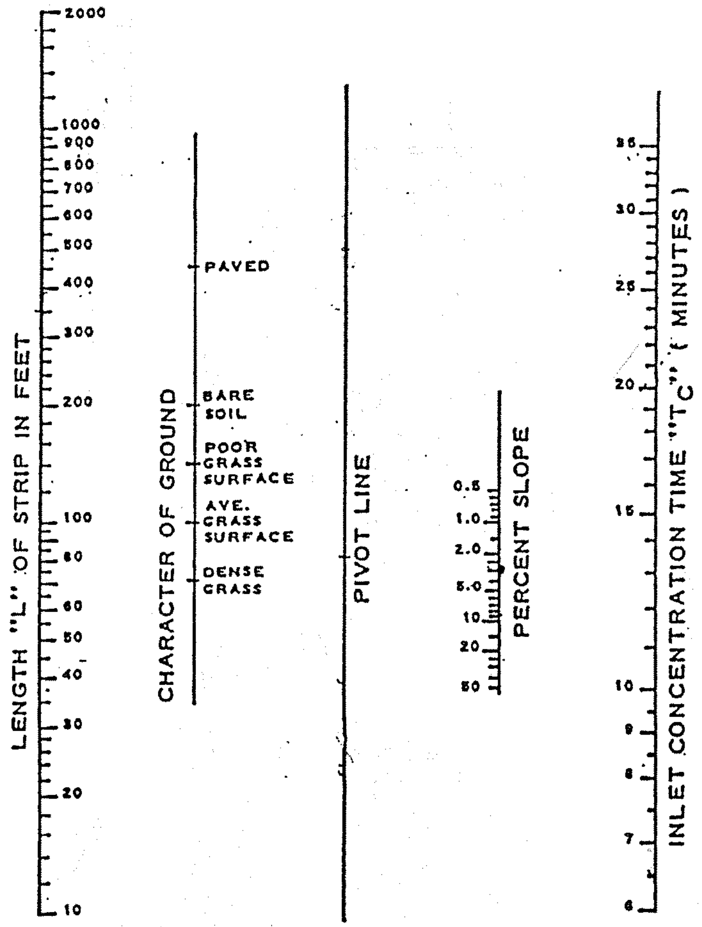
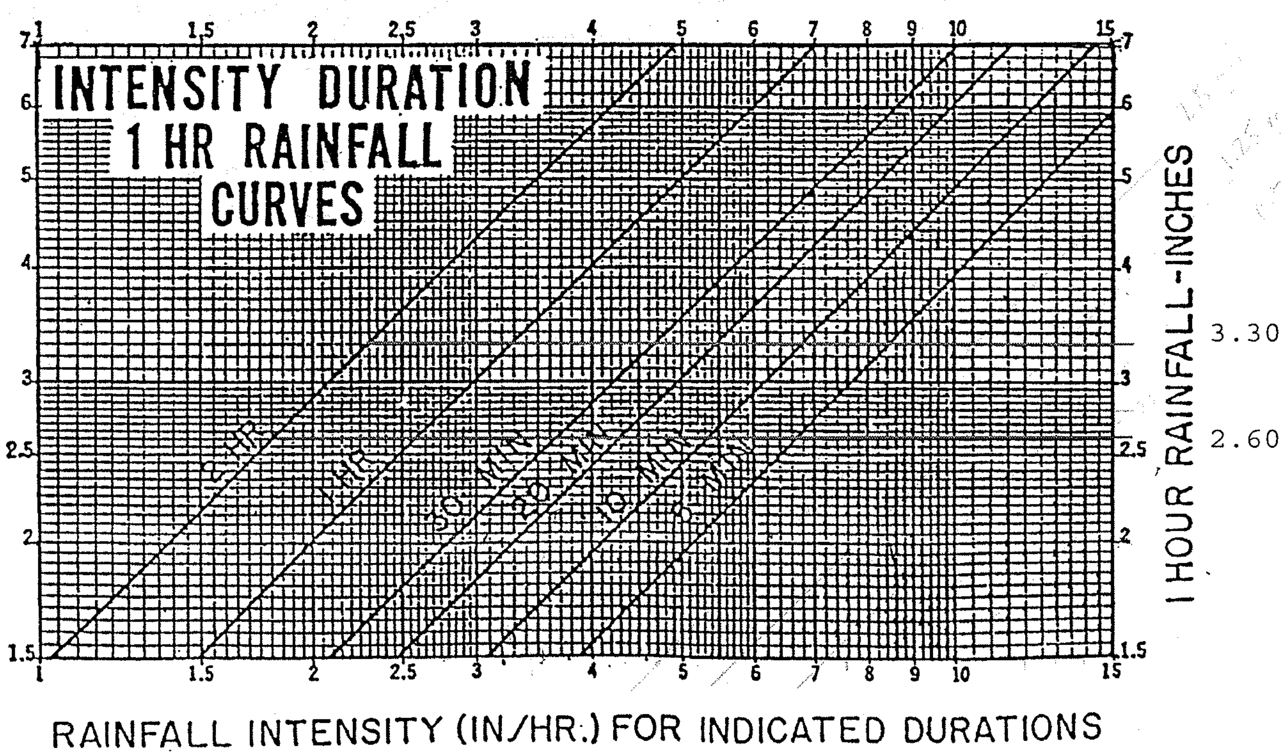
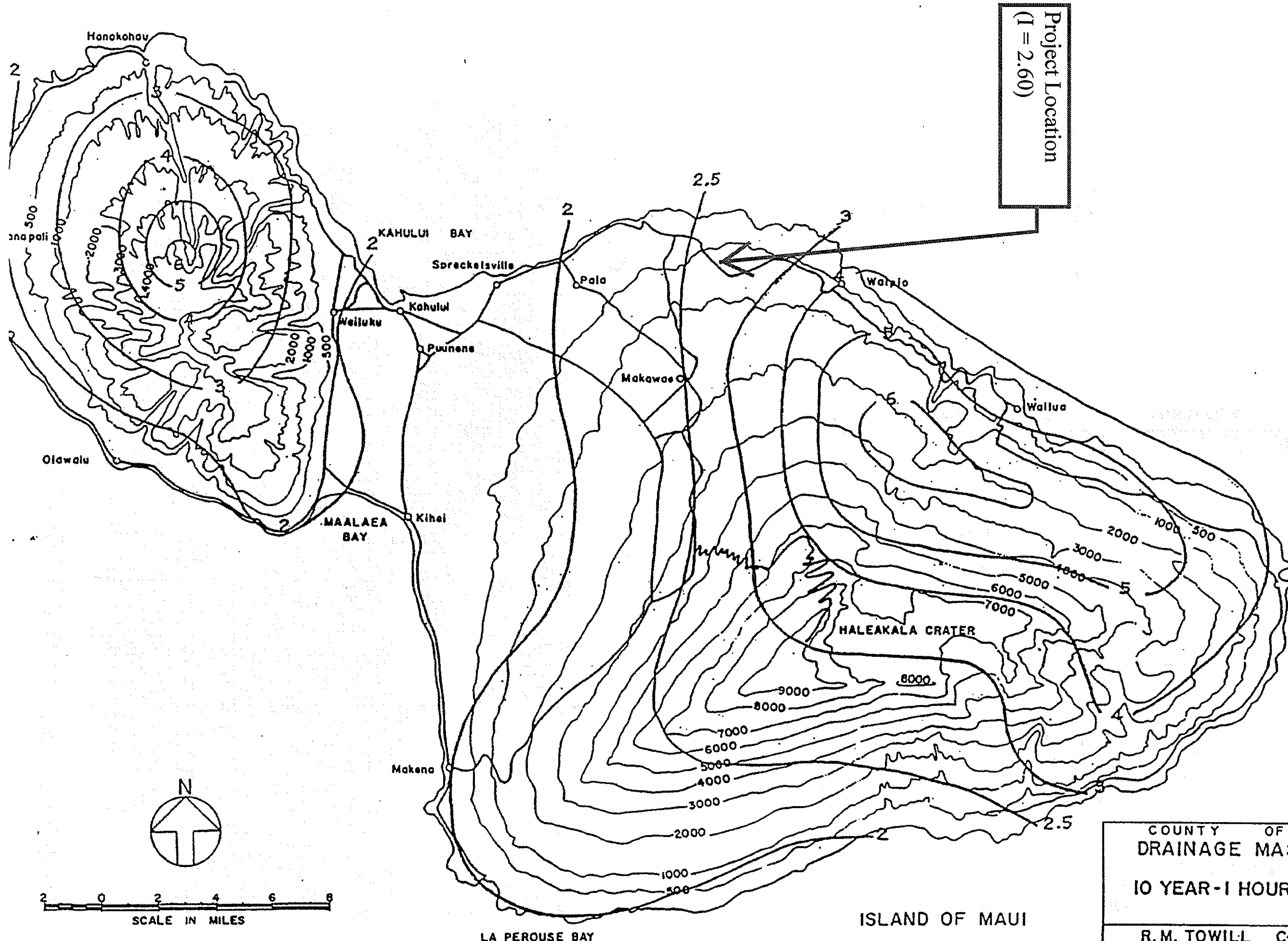


Plate 1

Overland Flow Chart

Plate 2



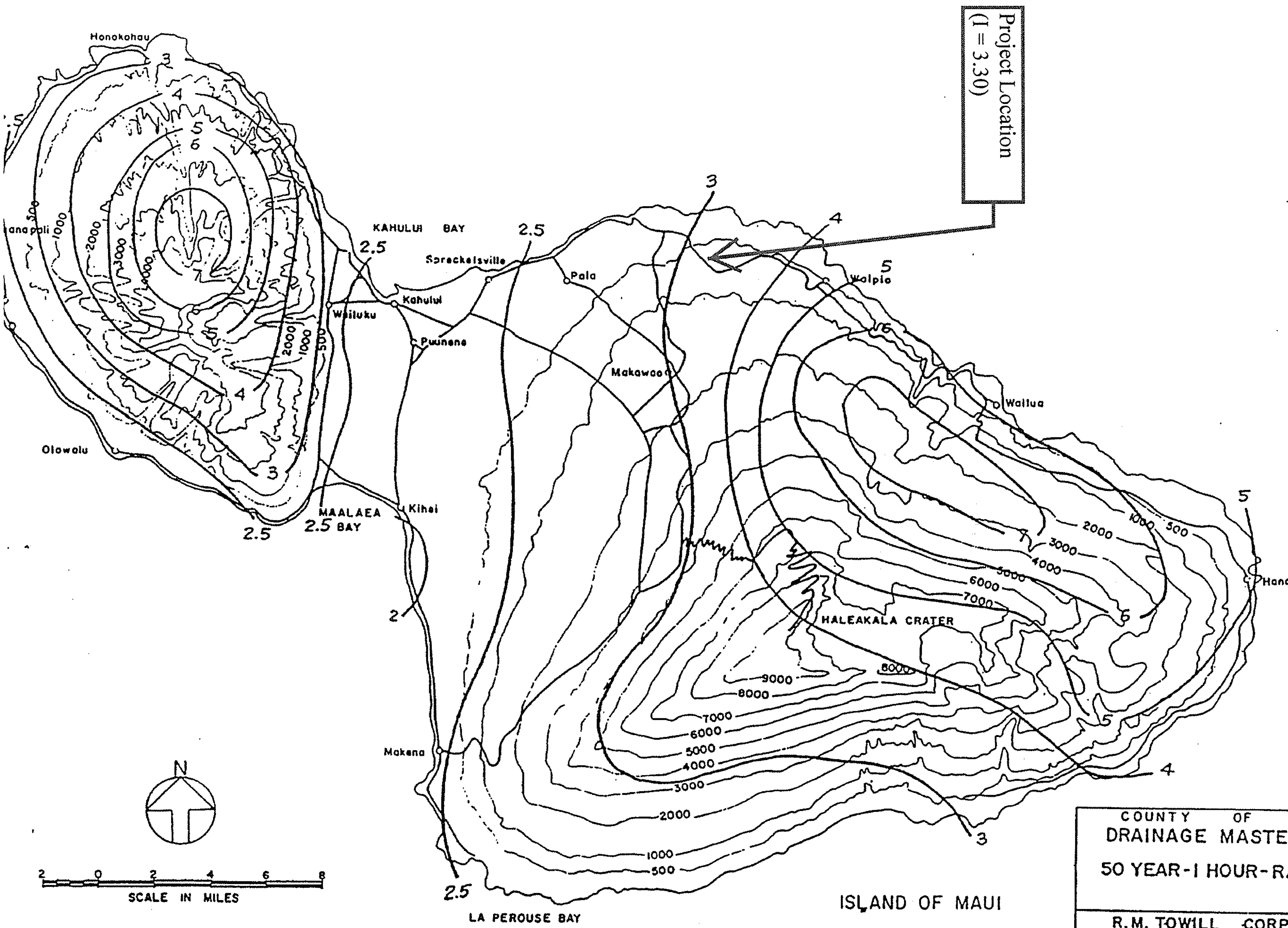


COUNTY OF MAUI
DRAINAGE MASTER PLAN

10 YEAR-1 HOUR-RAINFALL

R.M. TOWILL CORPORATION
CIVIL ENGINEERS - SURVEYORS

PLATE 4



COUNTY OF MAUI
DRAINAGE MASTER PLAN
50 YEAR-1 HOUR-RAINFALL

R.M. TOWILL CORPORATION
CIVIL ENGINEERS - SURVEYORS

PLATE 7

APPENDIX B

Drainage Design Calculations

EXISTING CONDITION, 10-YEAR

Drainage Design Calculations

Project Title: Haiku Fire Station **Prepared By:** SS **Date:** October 6, 2010
Location: Haiku, Island of Maui, HI **Checked By:** DYK **Date:**
Item: DRAINAGE FLOW CALCULATIONS (**EXISTING** CONDITION)

A. PURPOSE

Determine the quantity of surface runoff flow in cubic feet per second of the drainage area from the Haiku Fire Station project area. The 10-year, 1-hour storm was used to estimate the design flow for non-sump conditions. No sump conditions were found for this project.

B. CRITERIA

Peak discharges shall be found using the Rational Method: $Q = C \times I \times A$.

C. CALCULATIONS

Surface runoff for the area of interest:

$$Q = C \cdot I \cdot A,$$

where, Q = flow rate in cubic feet per second (cfs);

C = runoff coefficient;

I = rainfall intensity in inches per hour (in./hr) for a duration equal to the time of concentration (T_c); and

A = drainage area in acres (Ac).

Runoff Coefficient

Table 1 – *Guide for the Determination of Runoff Coefficients for Built-Up Area* – the runoff coefficient is estimated as being:

Infiltration (High)	0.00
Relief (Rolling)	0.03
Vegetal Cover (High)	0.00
Dev. Type (Residential)	0.40
C =	**0.43**

$(C_{XDA\text{-}1}) = 0.43$

$(C_{XDA\text{-}2}) = 0.43$

$(C_{XDA\text{-}3}) = 0.43$

$(C_{XDA\text{-}4}) = 0.43$

Rainfall Intensity

Drainage length (L)

$(L_{XDA\text{-}1}) \approx 498'$, Slope (S) = $(554.7' - 497.8') \div (498') \times 100\% \approx 11.4\%$

$(L_{XDA\text{-}2}) \approx 470'$, Slope (S) = $(551.5' - 508.8') \div (470') \times 100\% \approx 9.1\%$.

$(L_{XDA\text{-}3}) \approx 223'$, Slope (S) = $(576.5' - 551.5') \div (223') \times 100\% \approx 11.2\%$.

$(L_{XDA\text{-}4}) \approx 634'$, Slope (S) = $(581.4' - 35.5') \div (525.1') \times 100\% \approx 8.9\%$.

Plate 1 (Reference 1)—*Overland Flow Chart*—yields a time of concentration of:

$T_{c,XDA\text{-}1}$ = 18 minutes.

$T_{c,XDA\text{-}2}$ = 17.5 minutes.

$T_{c,XDA\text{-}3}$ = 13.2 minutes.

$T_{c,XDA\text{-}4}$ = 21.5 minutes.

Plate 4 (Reference 1)—*Drainage Master Plan, 10 Year 1 Hour Rainfall*—suggests a 10year, 1-hour recurrent rainfall intensity of:

$$I_{10\text{-yr, }1\text{-hr}} = 2.60 \text{ inches}$$

For all existing drainage areas.

Plate 2 (reference 1)—*Intensity Duration 1 Hr Rainfall Curves*—indicates a converted, actual, working rainfall intensity for the project site to be used in the Rational Method as being:

$I_{XDA-1} = 4.6$ in./hr.

$I_{XDA-2} = 4.6$ in./hr.

$I_{XDA-3} = 5.2$ in./hr.

$I_{XDA-4} = 4.3$ in./hr.

Area

As calculated through AutoCAD:

$A_{XDA-1} = 4.49$ Ac.

$A_{XDA-2} = 1.61$ Ac.

$A_{XDA-3} = 0.92$ Ac.

$A_{XDA-4} = 2.84$ Ac.

Surface Runoff

The product of the aforementioned, determined values yields the anticipated drainage flow that sheet flows into and from the project site:

$$Q = C \times I \times A$$

$Q_{XDA-1} = C \times I \times A = (0.43) \times (4.6 \text{ in./hr}) \times (4.49 \text{ Ac}) =$ **8.88 cfs.**

$Q_{XDA-2} = C \times I \times A = (0.43) \times (4.6 \text{ in./hr}) \times (1.61 \text{ Ac}) =$ **3.18 cfs.**

$Q_{XDA-3} = C \times I \times A = (0.43) \times (5.2 \text{ in./hr}) \times (0.92 \text{ Ac}) =$ **2.06 cfs.**

$Q_{XDA-4} = C \times I \times A = (0.43) \times (4.3 \text{ in./hr}) \times (2.84 \text{ Ac}) =$ **5.25 cfs.**

Summary

Area	Area (acres)	Flow (cfs)	Description
XDA-1	4.49	8.88	*Onsite flow to N-W property line*
XDA-2	1.61	3.18	*Onsite flow to Hana Highway (Mauka)*
XDA-3	0.92	2.06	*Offsite flow to Onsite XDA-2*
XDA-4	2.84	5.25	*Offsite flow to Onsite XDA-1*

Thus, the total amount of drainage in the project site is anticipated to be about **19.37 cfs** in the existing condition.

REFERENCES

1. *Rules for the Design of Storm Drainage Facilities in the County of Maui*, County of Maui, November 12, 1995.

APPENDIX C

Drainage Design Calculations

PROPOSED CONDITION, 10-YEAR

Drainage Design Calculations

Project Title:	Haiku Fire Station	**Prepared By:** RA		**Date:** November 1, 2010
Location:	Haiku, Island of Maui, HI	**Checked By:** DYK		**Date:**
Item:	DRAINAGE FLOW CALCULATIONS (**PROPOSED** CONDITION)			

A. PURPOSE

Determine the quantity of surface runoff flow in cubic feet per second of the drainage area from the Haiku Fire Station project area. The 10-year, 1-hour storm was used to estimate the design flow for non-sump conditions. No sump conditions were found for this project.

B. CRITERIA

Peak discharges shall be found using the Rational Method: $Q = C \times I \times A$.

C. CALCULATIONS

Surface runoff for the area of interest:

$$Q = C \cdot I \cdot A,$$

where, Q = flow rate in cubic feet per second (cfs);

C = runoff coefficient;

I = rainfall intensity in inches per hour (in./hr) for a duration equal to the time of concentration (T_c); and

A = drainage area in acres (Ac).

Runoff Coefficient

Table 1 – *Guide for the Determination of Runoff Coefficients for Built-Up Areas* (Reference 1) – the runoff coefficient is estimated as being:

Infiltration (High)	0.00
Relief (Rolling)	0.03
Vegetal Cover (Good)	0.03
Dev. Type (Residential)	0.40
C =	**0.46**

$(C_{NDA\text{-}1}) = 0.46$

$(C_{NDA\text{-}2}) = 0.46$

$(C_{NDA\text{-}3}) = 0.46$

$(C_{NDA\text{-}4}) = 0.46$

$(C_{NDA\text{-}5}) = 0.46$

$(C_{NDA\text{-}6}) = 0.46$

$(C_{NDA\text{-}7}) = 0.46$

$(C_{NDA\text{-}8}) = 0.46$

Rainfall Intensity

Drainage length (L)

$(L_{NDA\text{-}1}) \approx 152'$, Slope (S) = $(529.0' - 504.8') \div (152') \times 100\% \approx 15.9\%$.

$(L_{NDA\text{-}2}) \approx 367'$, Slope (S) = $(553.1' - 522.5') \div (367') \times 100\% \approx 8.3\%$.

$(L_{NDA\text{-}3}) \approx 227'$, Slope (S) = $(554.9' - 525.4') \div (227') \times 100\% \approx 13.0\%$.

$(L_{NDA\text{-}4}) \approx 156'$, Slope (S) = $(527.5' - 525.0') \div (156') \times 100\% \approx 1.6\%$.

$(L_{NDA\text{-}5}) \approx 50'$, Roof, Slope (S) $\approx 33\%$.

$(L_{NDA\text{-}6}) \approx 251'$, Slope (S) = $(579.5' - 551.3') \div (251') \times 100\% \approx 11.2\%$.

$(L_{NDA\text{-}7}) \approx 283'$, Slope (S) = $(581.5' - 554.9') \div (283') \times 100\% \approx 9.4\%$.

$(L_{NDA\text{-}8}) \approx 630'$, Slope (S) = $(581.5' - 525.1') \div (630') \times 100\% \approx 9.0\%$.

Plate 1 (Reference 1)—*Overland Flow Chart*—yields a time of concentration of:

$T_{c,NDA-1}$ = 10.0 minutes.

$T_{c,NDA-2}$ = 16.5 minutes.

$T_{c,NDA-3}$ = 12.8 minutes.

$T_{c,NDA-4}$ = 14.8 minutes.

$T_{c,NDA-5}$ = <3 minutes.

$T_{c,NDA-6}$ = 13.5 minutes.

$T_{c,NDA-7}$ = 14.0 minutes.

$T_{c,NDA-8}$ = 20.5 minutes.

Plate 4 (Reference 1)—*Drainage Master Plan, 10 Year 1 Hour Rainfall*—suggests a 10year, 1-hour recurrent rainfall intensity of:

$$I_{10\text{-yr, }1\text{-hr}} = 2.60 \text{ inches.}$$

For all existing drainage areas.

Plate 2 (reference 1)—*Intensity Duration 1 Hr Rainfall Curves*—indicates a converted, actual, working rainfall intensity for the project site to be used in the Rational Method as being:

I_{NDA-1} = 5.5 in./hr.

I_{NDA-2} = 4.9 in./hr.

I_{NDA-3} = 5.2 in./hr.

I_{NDA-4} = 4.9 in./hr.

I_{NDA-5} = 9.0 in./hr.

I_{NDA-6} = 5.2 in./hr.

I_{NDA-7} = 5.2 in./hr.

I_{NDA-8} = 4.3 in./hr.

Area

As calculated through AutoCAD:

$A_{NDA\text{-}1} = 2.68$ Ac.

$A_{NDA\text{-}2} = 1.15$ Ac.

$A_{NDA\text{-}3} = 1.27$ Ac.

$A_{NDA\text{-}4} = 0.74$ Ac.

$A_{NDA\text{-}5} = 0.26$ Ac.

$A_{NDA\text{-}6} = 0.78$ Ac.

$A_{NDA\text{-}7} = 0.91$ Ac.

$A_{NDA\text{-}8} = 2.06$ Ac.

Surface Runoff

The product of the aforementioned, determined values yields the anticipated drainage flow that sheet flows into and from the project site:

$$Q = C \times I \times A$$

$Q_{NDA\text{-}1} = C \times I \times A = (0.46) \times (5.5\text{ in./hr}) \times (2.68\text{ Ac}) =$ **6.78 cfs**.

$Q_{NDA\text{-}2} = C \times I \times A = (0.46) \times (4.9\text{ in./hr}) \times (1.15\text{ Ac}) =$ **2.59 cfs**.

$Q_{NDA\text{-}3} = C \times I \times A = (0.46) \times (5.2\text{ in./hr}) \times (1.27\text{ Ac}) =$ **3.04 cfs**.

$Q_{NDA\text{-}4} = C \times I \times A = (0.46) \times (4.9\text{ in./hr}) \times (0.74\text{ Ac}) =$ **1.67 cfs**.

$Q_{NDA\text{-}5} = C \times I \times A = (0.46) \times (9.0\text{ in./hr}) \times (0.26\text{ Ac}) =$ **1.08 cfs**.

$Q_{NDA\text{-}6} = C \times I \times A = (0.46) \times (5.2\text{ in./hr}) \times (0.78\text{ Ac}) =$ **1.87 cfs**.

$Q_{NDA\text{-}7} = C \times I \times A = (0.46) \times (5.2\text{ in./hr}) \times (0.91\text{ Ac}) =$ **2.18 cfs**.

$Q_{NDA\text{-}8} = C \times I \times A = (0.46) \times (4.3\text{ in./hr}) \times (2.06\text{ Ac}) =$ **4.07 cfs**.

Summary

Area	Area (acres)	Flow (cfs)	Description
NDA-1	2.68	6.78	*Onsite flow to N-W property line*
NDA-2	1.15	2.59	*Onsite flow piped to Detention Basin*
NDA-3	1.27	3.04	*Onsite flow piped to Detention Basin*
NDA-4	0.74	1.67	*Onsite sheet flow to Detention Basin*
NDA-5	0.26	1.08	*Roof to Catchment System*
NDA-6	0.78	1.87	*Offsite flow to Onsite NDA-2*
NDA-7	0.91	2.18	*Offsite flow to Onsite NDA-3*
NDA-8	2.06	4.07	*Offsite flow to NDA-1*

Thus, the total amount of drainage in the project site is anticipated to be about **23.28 cfs** in the proposed condition.

REFERENCES

1. *Rules for the Design of Storm Drainage Facilities in the County of Maui*, County of Maui, November 12, 1995.

APPENDIX D

Drainage Design Calculations

EXISTING CONDITION, 50-YEAR

Drainage Design Calculations

Project Title: Haiku Fire Station **Prepared By:** RA **Date:** November 1, 2010

Location: Haiku, Island of Maui, HI **Checked By:** DYK **Date:**

Item: DRAINAGE FLOW CALCULATIONS (**EXISTING** CONDITION)

A. PURPOSE

Determine the quantity of surface runoff flow in cubic feet per second of the drainage area from the Haiku Fire Station project area. The 50-year, 1-hour storm was used to estimate the design flow for detention pond sizing.

B. CRITERIA

Peak discharges shall be found using the Rational Method: $Q = C \times I \times A$.

C. CALCULATIONS

Surface runoff for the area of interest:

$$Q = C \cdot I \cdot A,$$

where, Q = flow rate in cubic feet per second (cfs);

C = runoff coefficient;

I = rainfall intensity in inches per hour (in./hr) for a duration equal to the time of concentration (T_c); and

A = drainage area in acres (Ac).

Runoff Coefficient

Table 1 – *Guide for the Determination of Runoff Coefficients for Built-Up Area* – the runoff coefficient is estimated as being:

Infiltration (High)	0.00
Relief (Rolling)	0.03
Vegetal Cover (High)	0.00
Dev. Type (Residential)	0.40
C =	**0.43**

$(C_{XDA\text{-}1}) = 0.43$

$(C_{XDA\text{-}2}) = 0.43$

$(C_{XDA\text{-}3}) = 0.43$

$(C_{XDA\text{-}4}) = 0.43$

Rainfall Intensity

Drainage length (L)

$(L_{XDA\text{-}1}) \approx 498'$, Slope (S) = $(554.7' - 497.8') \div (498') \times 100\% \approx 11.4\%$

$(L_{XDA\text{-}2}) \approx 470'$, Slope (S) = $(551.5' - 508.8') \div (470') \times 100\% \approx 9.1\%$.

$(L_{XDA\text{-}3}) \approx 223'$, Slope (S) = $(576.5' - 551.5') \div (223') \times 100\% \approx 11.2\%$.

$(L_{XDA\text{-}4}) \approx 634'$, Slope (S) = $(581.4' - 35.5') \div (525.1') \times 100\% \approx 8.9\%$.

Plate 1 (Reference 1)—*Overland Flow Chart*—yields a time of concentration of:

$T_{c,XDA\text{-}1}$ = 18 minutes.

$T_{c,XDA\text{-}2}$ = 17.5 minutes.

$T_{c,XDA\text{-}3}$ = 13.2 minutes.

$T_{c,XDA\text{-}4}$ = 21.5 minutes.

Plate 4 (Reference 1)—*Drainage Master Plan, 50 Year 1 Hour Rainfall*—suggests a 50year, 1-hour recurrent rainfall intensity of:

$$I_{50\text{-yr},\ 1\text{-hr}} = 3.30 \text{ inches.}$$

For all existing drainage areas.

Plate 2 (reference 1)—*Intensity Duration 1 Hr Rainfall Curves*—indicates a converted, actual, working rainfall intensity for the project site to be used in the Rational Method as being:

$I_{XDA\text{-}1} = 5.2$ in./hr.
$I_{XDA\text{-}2} = 5.2$ in./hr.
$I_{XDA\text{-}3} = 6.4$ in./hr.
$I_{XDA\text{-}4} = 5.4$ in./hr.

Area

As calculated through AutoCAD:

$A_{XDA\text{-}1} = 4.49$ Ac.
$A_{XDA\text{-}2} = 1.61$ Ac.
$A_{XDA\text{-}3} = 0.92$ Ac.
$A_{XDA\text{-}4} = 2.84$ Ac.

Surface Runoff

The product of the aforementioned, determined values yields the anticipated drainage flow that sheet flows into and from the project site:

$$Q = C \times I \times A$$

$Q_{XDA\text{-}1} = C \times I \times A = (0.43) \times (5.2 \text{ in./hr}) \times (4.49 \text{ Ac}) =$ **10.04 cfs**.
$Q_{XDA\text{-}2} = C \times I \times A = (0.43) \times (5.2 \text{ in./hr}) \times (1.61 \text{ Ac}) =$ **3.60 cfs**.
$Q_{XDA\text{-}3} = C \times I \times A = (0.43) \times (6.4 \text{ in./hr}) \times (0.92 \text{ Ac}) =$ **2.53 cfs**.
$Q_{XDA\text{-}4} = C \times I \times A = (0.43) \times (5.4 \text{ in./hr}) \times (2.84 \text{ Ac}) =$ **6.59 cfs**.

Summary

Area	Area (acres)	Flow (cfs)	Description
XDA-1	4.49	10.04	*Onsite flow to N-W property line*
XDA-2	1.61	3.60	*Onsite flow to Hana Highway (Mauka)*
XDA-3	0.92	2.53	*Offsite flow to Onsite XDA-2*
XDA-4	2.84	6.59	*Offsite flow to Onsite XDA-1*

Thus, the total amount of drainage in the project site is anticipated to be about **22.76 cfs** in the existing condition.

REFERENCES

1. *Rules for the Design of Storm Drainage Facilities in the County of Maui*, County of Maui, November 12, 1995.

APPENDIX E

Drainage Design Calculations

PROPOSED CONDITION, 50-YEAR

Drainage Design Calculations

Project Title:	Haiku Fire Station	**Prepared By:**	RA	**Date:**	November 1, 2010
Location:	Haiku, Island of Maui, HI	**Checked By:**	DYK	**Date:**	
Item:	DRAINAGE FLOW CALCULATIONS (**PROPOSED** CONDITION)				

A. PURPOSE

Determine the quantity of surface runoff flow in cubic feet per second of the drainage area from the Haiku Fire Station project area. The 50-year, 1-hour storm was used to estimate the design flow for detention pond sizing.

B. CRITERIA

Peak discharges shall be found using the Rational Method: $Q = C \times I \times A$.

C. CALCULATIONS

Surface runoff for the area of interest:

$$Q = C \cdot I \cdot A,$$

where, Q = flow rate in cubic feet per second (cfs);

C = runoff coefficient;

I = rainfall intensity in inches per hour (in./hr) for a duration equal to the time of concentration (T_c); and

A = drainage area in acres (Ac).

Runoff Coefficient

Table 1 – *Guide for the Determination of Runoff Coefficients for Built-Up Areas* (Reference 1) – the runoff coefficient is estimated as being:

Infiltration (High)	0.00
Relief (Rolling)	0.03
Vegetal Cover (Good)	0.03
Dev. Type (Residential)	0.40
C =	**0.46**

$(C_{NDA\text{-}1}) = 0.46$

$(C_{NDA\text{-}2}) = 0.46$

$(C_{NDA\text{-}3}) = 0.46$

$(C_{NDA\text{-}4}) = 0.46$

$(C_{NDA\text{-}5}) = 0.46$

$(C_{NDA\text{-}6}) = 0.46$

$(C_{NDA\text{-}7}) = 0.46$

$(C_{NDA\text{-}8}) = 0.46$

Rainfall Intensity

Drainage length (L)

$(L_{NDA\text{-}1}) \approx 152'$, Slope (S) = $(529.0' - 504.8') \div (152') \times 100\% \approx 15.9\%$.

$(L_{NDA\text{-}2}) \approx 367'$, Slope (S) = $(553.1' - 522.5') \div (367') \times 100\% \approx 8.3\%$.

$(L_{NDA\text{-}3}) \approx 227'$, Slope (S) = $(554.9' - 525.4') \div (227') \times 100\% \approx 13.0\%$.

$(L_{NDA\text{-}4}) \approx 156'$, Slope (S) = $(527.5' - 525.0') \div (156') \times 100\% \approx 1.6\%$.

$(L_{NDA\text{-}5}) \approx 50'$, Roof, Slope (S) $\approx 33\%$.

$(L_{NDA\text{-}6}) \approx 251'$, Slope (S) = $(579.5' - 551.3') \div (251') \times 100\% \approx 11.2\%$.

$(L_{NDA\text{-}7}) \approx 283'$, Slope (S) = $(581.5' - 554.9') \div (283') \times 100\% \approx 9.4\%$.

$(L_{NDA\text{-}8}) \approx 630'$, Slope (S) = $(581.5' - 525.1') \div (630') \times 100\% \approx 9.0\%$.

Plate 1 (Reference 1)—*Overland Flow Chart*—yields a time of concentration of:

$T_{c,NDA\text{-}1}$ = 10.0 minutes.

$T_{c,NDA\text{-}2}$ = 16.5 minutes.

$T_{c,NDA\text{-}3}$ = 12.8 minutes.

$T_{c,NDA\text{-}4}$ = 14.8 minutes.

$T_{c,NDA\text{-}5}$ = <3 minutes.

$T_{c,NDA\text{-}6}$ = 13.5 minutes.

$T_{c,NDA\text{-}7}$ = 14.0 minutes.

$T_{c,NDA\text{-}8}$ = 20.5 minutes.

Plate 7 (Reference 1)—*Drainage Master Plan, 50 Year 1 Hour Rainfall*—suggests a 50-year, 1-hour recurrent rainfall intensity of:

$$I_{50\text{-yr, 1-hr}} = 3.30 \text{ inches.}$$

For all existing drainage areas.

Plate 2 (reference 1)—*Intensity Duration 1 Hr Rainfall Curves*—indicates a converted, actual, working rainfall intensity for the project site to be used in the Rational Method as being:

$I_{NDA\text{-}1}$ = 6.8 in./hr.

$I_{NDA\text{-}2}$ = 6.0 in./hr.

$I_{NDA\text{-}3}$ = 6.2 in./hr.

$I_{NDA\text{-}4}$ = 6.1 in./hr.

$I_{NDA\text{-}5}$ = 12.0 in./hr.

$I_{NDA\text{-}6}$ = 6.2 in./hr.

$I_{NDA\text{-}7}$ = 6.2 in./hr.

$I_{NDA\text{-}8}$ = 5.8 in./hr.

Area

As calculated through AutoCAD:

$A_{NDA\text{-}1} = 2.68$ Ac.

$A_{NDA\text{-}2} = 1.15$ Ac.

$A_{NDA\text{-}3} = 1.27$ Ac.

$A_{NDA\text{-}4} = 0.74$ Ac.

$A_{NDA\text{-}5} = 0.26$ Ac.

$A_{NDA\text{-}6} = 0.78$ Ac.

$A_{NDA\text{-}7} = 0.91$ Ac.

$A_{NDA\text{-}8} = 2.06$ Ac.

Surface Runoff

The product of the aforementioned, determined values yields the anticipated drainage flow that sheet flows into and from the project site:

$$Q = C \times I \times A$$

$Q_{NDA\text{-}1} = C \times I \times A = (0.46) \times (6.8\text{ in./hr}) \times (2.68\text{ Ac}) =$ **8.38 cfs**.

$Q_{NDA\text{-}2} = C \times I \times A = (0.46) \times (6.0\text{ in./hr}) \times (1.15\text{ Ac}) =$ **3.17 cfs**.

$Q_{NDA\text{-}3} = C \times I \times A = (0.46) \times (6.2\text{ in./hr}) \times (1.27\text{ Ac}) =$ **3.62 cfs**.

$Q_{NDA\text{-}4} = C \times I \times A = (0.46) \times (6.1\text{ in./hr}) \times (0.74\text{ Ac}) =$ **2.08 cfs**.

$Q_{NDA\text{-}5} = C \times I \times A = (0.46) \times (12.0\text{ in./hr}) \times (0.26\text{ Ac}) =$ **1.44 cfs**.

$Q_{NDA\text{-}6} = C \times I \times A = (0.46) \times (6.2\text{ in./hr}) \times (0.78\text{ Ac}) =$ **2.22 cfs**.

$Q_{NDA\text{-}7} = C \times I \times A = (0.46) \times (6.2\text{ in./hr}) \times (0.91\text{ Ac}) =$ **2.60 cfs**.

$Q_{NDA\text{-}8} = C \times I \times A = (0.46) \times (5.8\text{ in./hr}) \times (2.06\text{ Ac}) =$ **5.50 cfs**.

Summary

Area	Area (acres)	Flow (cfs)	Description
NDA-1	2.68	8.38	*Onsite flow to N-W property line*
NDA-2	1.15	3.17	*Onsite flow piped to Detention Basin*
NDA-3	1.27	3.62	*Onsite flow piped to Detention Basin*
NDA-4	0.74	2.08	*Onsite sheet flow to Detention Basin*
NDA-5	0.26	1.44	*Roof to Catchment System*
NDA-6	0.78	2.22	*Offsite flow to Onsite NDA-2*
NDA-7	0.91	2.60	*Offsite flow to Onsite NDA-3*
NDA-8	2.06	5.50	*Offsite flow to NDA-1*

Thus, the total amount of drainage in the project site is anticipated to be about **29.01 cfs** in the proposed condition.

REFERENCES

1. *Rules for the Design of Storm Drainage Facilities in the County of Maui*, County of Maui, November 12, 1995.

APPENDIX F

Drainage Design Calculations

DETENTION POND SIZING

Required Storage Calculations for Storm Water Detention

Project Title: ai ire tation **Prepared By:** **Date:** o e er 20 0
Location: ai I an o a i I **Checked By:** **Date:**
Item: I L L I

A. PURPOSE

eter ine t e re ire tora e o e in c ic eet or t e tor ater etention te in t e ai ire tation roject. In accor ance it o nt o a i raina e tan ar t e 0 ear o r tor a e to e ti ate t e e i n raina e o .

B. CRITERIA

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C. REFERENCES

1. *Title MC-15, Rules for the Design of Storm Drainage Facilities in the County of Maui, Chapter 4* e art ent o P ic or an a te ater ana e ent o nt o a i
2. I L L L I (**EXISTING** I I) o e er 20 0
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D. CALCULATIONS

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E. LEED

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F. SUMMARY

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APPENDIX I.

Zoning Determination for Proposed Offsite Wind Turbines from County of Maui, Department of Planning, Zoning Administration and Enforcement Division

CHARMAINE TAVARES
Mayor

JEFFREY S. HUNT
Director

KATHLEEN ROSS AOKI
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

December 24, 2009

Mr. Glenn Yokotake
Architects Hawaii Limited
1001 Bishop Street, Suite 200
Honolulu, Hawaii 96813

Dear Mr. Yokotake:

SUBJECT: ZONING DETERMINATION FOR WIND GENERATION FACILITIES WITHIN THE AGRICULTURAL DISTRICT FOR THE PROPOSED HAIKU FIRE STATION LOCATED AT 3550 HANA HIGHWAY, HAIKU, MAUI, HAWAII; TMK: (2) 2-7-007:008 (RFS NO. 09-0003654)

This is in response to your letter dated October 23, 2009.

The proposed wind generation facilities are to be located within the State's and County's Agricultural District and therefore subject to Hawaii Revised Statutes (HRS), Chapter 205 and Maui County Code (MCC), Chapter 19.30A. Based on the representations provided, it is our determination that the subject facilities' use and impact are in accordance with HRS 205 and MCC, §§19.30A.050 and therefore shall be permitted as a "minor utility facility".

Should you have any questions or concerns, you may contact Trisha Kapua'ala, Staff Planner, at Trisha.Kapuaala@mauicounty.gov or 270-8008.

Sincerely,

AARON SHINMOTO
Planning Program Administrator

xc: Mark Roy, Munekiyo & Hiraga (via e-mail...mark@mhinconline.com)
Trisha Kapua'ala, Staff Planner
KIVA Related Document (TMK 2270070080000; RFS No. 09-0003654)
09/General File
JHS:FAC:TMLK;ckk
K:\WP_DOCS\PLANNING\RFS\2009\3654_WindGenFacHaikuFireStation\Response.doc