CHAPTER IV

Affected Natural Environment, Potential Impacts and Mitigation Measures

IV. AFFECTED NATURAL ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Climate

Existing Conditions. The climate of Central Maui is very much affected by its location on the isthmus, between the western side of Haleakalā and the West Maui Mountains, which gusty northwest trade winds funnel through. The project site experiences relatively strong trade winds that blow from north to south across the isthmus and out to sea. At 30-feet above ground level, wind speeds across the site range from about 5.5 meters per second to 7.5 meters per second, which is approximately 12 to 17 miles per hour. (vi)

A generally semi-arid climate pertains. The project site receives its highest rainfall during the winter and lowest rainfall during the summer. Throughout the year rainfall is relatively low, averaging approximately 20- to 30-inches per year, with the monthly average ranging from 0.25 inches in August to approximately 5-inches in January. (vii). Temperatures are generally moderate. The average high temperature in July averages 84 degrees in July and the average low in January is 64 degrees. It typically rains about 71 days per year and is sunny about 281 days per year.

Climate change over the next several decades is expected to produce a rise in sea levels around Hawai‘i and variations in its air and ocean temperatures, rainfall, and the frequency and intensity of storm events. These climatic changes could result in the Hawaiian Islands experiencing more frequent and severer droughts, tropical storms, coastal erosion events, flooding, and wildfires. Climatic change is also producing warmer and more acidic oceans, which

is causing damage to coral reefs and may degrade the State's fisheries. There are also concerns that rising sea levels could produce saltwater intrusion into some of the State's aquifers and that fresh water stream flows may decrease due to less rainfall and an increasing frequency of droughts. Climatic changes could produce negative impacts to Hawai'i's economy. Hawai'i's agricultural industry will suffer if climatic change reduces the availability of water for irrigation and if crops are exposed more frequently to storm events, outbreaks of disease and insects. The tourism industry could also be negatively impacted by an increase in coastal erosion, beach loss and severe storm events.

Potential Impacts and Mitigation Measures. The Project will not have a significant impact upon climatic conditions. However, the Project will implement a package of sustainability practices in the areas of energy conservation, water conservation, drainage mitigation, land planning and urban design that will make the Project more resilient to climatic change. Moreover, the Project's Agricultural Preserve may help to increase local food production, which will increase Hawai'i's food security (**See**: Section III.B.5).

2. Topography and Soils

Existing Conditions. Maui, like the rest of the Hawaiian Islands, was formed as the Pacific Plate moved over a "hot spot," where the release of magma over thousands of years formed large volcanic islands. The process created two distinct shield volcanoes, Mauna Kahalawai (West Maui Mountains) in the west, and Haleakalā to the east, which together create the island of Maui. The West Maui Mountains comprise 25% of Maui's land area. These mountains are steep and jagged, rising to 5,788 feet at Pu'u Kukui, with deep cut valleys formed by erosion from wind, rain and streams. Haleakalā, the larger eastern volcano, forms 75% of Maui's land area. It rises to 10,023 feet at Pu'u 'Ula'ula (Red Hill). As each volcano erupted they released lava and ash and, together with alluvium deposits, created the Central Maui isthmus, which joins the volcanoes together forming the island of Maui.

The project site lies within the fertile Central Maui isthmus, between the town of Wailuku to the north and Mā'alaea to the south. The elevation on the mauka development site ranges from approximately 350 feet above mean sea level at its southeasterly corner to approximately 710 feet above mean sea level at its northwesterly corner, with a slope averaging approximately 8%.

The elevation on the makai development site ranges from approximately 256 feet above mean sea level at a low point along the southerly border to approximately 408 feet above mean sea level at the northwesterly corner, with a slope averaging approximately 4%. The land within the agriculture preserve areas will remain undeveloped.

There are three soil series and seven soil types within the area proposed for development. The soil series are Pulehu Series, ʻĪao Series and the Wailuku Series. Each series consists of well-drained soils that are on alluvium fans formed from weathered basic igneous rock. The topography is gentle to moderately sloping, and the soil series are highly suited for both agriculture and urban development. The specific soil types are shown in Figure No.35 ~~30~~, "USDA Soils Map" and Table 26 ~~23~~, "Waikapū Country Town Soil Types".

Table 26 ~~23~~: Waikapū Country Town Soil Types

Waikapū Country Town Soil Types
ʻĪao clay, 3 to 7 percent slopes (IcB)
This soil occurs at elevations of 100 to 500 feet with slopes that range from 3 to 7 percent. It is a well-drained soil that is more than 80 inches in depth. The typical soil profile is 0 to 15 inches of clay, 15 to 48 inches of clay, and 48 to 60 inches of silty lay. The available water capacity is moderate at about 8.4 inches. Permeability is moderately slow. Runoff is medium and the erosion hazard is slight to moderate.
Pulehu silt loam, 0 to 3 percent slopes (PpA)
This soil occurs at elevations of 0 to 300 feet with slopes that range from 0 to 3 percent. It is a well-drained soil that is more than 80 inches in depth. The typical soil profile is 0 to 21 inches of silt loam and 21 to 60 inches of silty clay loam. The available water capacity is moderate at about 8.4 inches. Permeability is moderately moderate. Runoff is slow and the erosion hazard is no more than slight.
Pulehu cobbly clay loam, 3 to 7 percent slopes (PtB)
This soil occurs at elevations of 0 to 300 feet with slopes that range from 3 to 7 percent. It is a well-drained soil that is more than 80 inches in depth. The typical soil profile is 0 to 21 inches of cobbly clay loam and 21 to 60 inches of silty clay loam. The available water capacity is moderate at about 7.5 inches. Runoff is slow and the erosion hazard slight.

Water > 40 acres (W)
Water bodies greater than 40 acres.
Wailuku silty clay, 3 to 7 percent slopes (WvC and WvB)
This soil occurs at elevations of 50 to 1000 feet with slopes that range from 3 to 7 percent. It is a well-drained soil that is more than 80 inches in depth. The typical soil profile is 0 to 12 inches of silty clay and 12 to 60 inches of silty clay. The available water capacity is moderate at about 8.4 inches. Runoff is slow and the erosion hazard slight.
Wailuku silty clay, 7 to 15 percent slopes (WvC and WvB)
This soil occurs at elevations of 50 to 1000 feet with slopes that range from 7 to 15 percent. It is a well-drained soil that is more than 80 inches in depth. The typical soil profile is 0 to 12 inches of silty clay and 12 to 60 inches of silty clay. The available water capacity is moderate at about 8.4 inches. Runoff is slow and the erosion hazard slight.

Potential Impacts and Mitigation Measures. Implementation of the WCT Master Plan will require grading for roads, parks, and buildings upon development.

A grading permit will need approvals from State DLNR SHPD, Maui County Planning Department, and Department of Public Works (DPW) before construction begins. Grading plans for the site will be reviewed by DPW and SHPD.

The existing topography would be altered to the extent necessary for construction of the proposed project. Cut and fill quantities are anticipated to be similar, so little or no fill would be brought to or taken from the site. A National Pollutant Discharge Elimination System (NPDES) permit will be required from the State of Hawai‘i, Department of Health (DOH) prior to grading activities. During site preparation, storm runoff from the project area will be controlled in compliance with the County’s “Soil Erosion and Sediment Control Standards.” Typical mitigation measures include appropriately stockpiling materials on-site to prevent runoff and building over or establishing landscaping as early as possible on disturbed soils to minimize length of exposure.

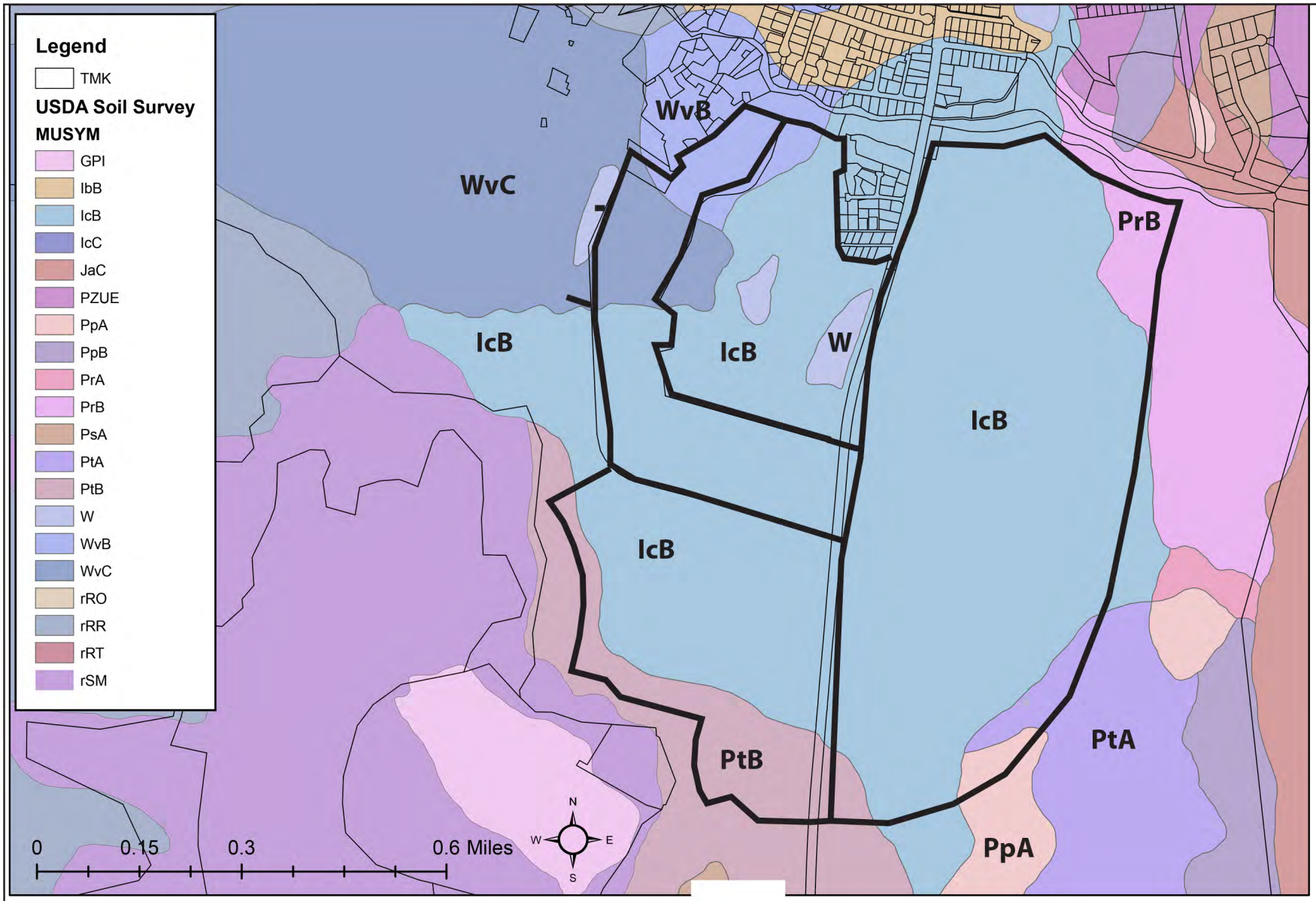


Figure 35

USDA Soils Map

WAIKAPŪ COUNTRY TOWN

PLANNING CONSULTANTS HAWAII, LLC

Impacts to the soils include the potential for soil erosion and the generation of dust during construction. Clearing and grubbing activities will temporarily disturb the soil retention values of the existing vegetation and expose soils to erosion forces. Some wind erosion of soils could occur without a proper watering and revegetation program. Heavy rainfall could also cause erosion of soils within disturbed areas of land.

To the extent possible, improvements will conform to the contours of the land, further limiting the need for extensive grading of the site. In addition, graded areas will be limited to specific areas for short periods of time. Measures taken to control erosion during the site development period may include:

- Minimizing the time of construction;
- Retaining existing ground cover as long as possible;
- Constructing drainage control features early;
- Using temporary area sprinklers in non-active construction areas when ground cover is removed;
- Providing a water truck on-site during the construction period to provide for immediate sprinkling as needed;
- Using temporary berms and cut-off ditches, where needed, for control of erosion;
- Watering graded areas when construction activity for each day has ceased;
- Grassing or planting all cut-and-fill slopes immediately after grading work has been completed; and
- Installing silt screens where appropriate.

Construction activities on the property will comply with all applicable Federal, State and County regulations and rules for erosion control. Before issuance of a grading permit by the County of Maui, the final erosion control plan and BMPs required for the NPDES permit will be completed. All construction activities will also comply with the provisions of Chapter 11-60.1, Hawai‘i Administrative Rules (HAR), Section 11-60.1-33, pertaining to Fugitive Dust. After construction, the establishment of permanent landscaping will provide long-term erosion control.

3. Natural Hazards

Existing Conditions. Natural hazards impacting the Hawaiian Islands include hurricanes, tsunamis, volcanic eruptions, earthquakes, stream flooding, and coastal flooding.

Seismic hazards are those related to ground shaking. Landslides, ground cracks, rock falls and tsunamis are all seismic hazards. Engineers and other professionals have created a system of classifying seismic hazards on the basis of the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time. The results are included in the Uniform Building Code (UBC) seismic provisions.

The UBC seismic provisions contain six seismic zones, ranging from 0 (no chance of severe ground shaking) to 4 (10% chance of severe shaking in a 50-year interval). Kauai County is located in Zone 1, County of Honolulu is Zone 2A, County of Maui is Zone 2B and County of Hawai‘i is Zone 4.

In addition to seismic hazards, devastating hurricanes do occur and have impacted Hawai‘i twice since 1980: Hurricane Iwa in 1982 and Hurricane Iniki in 1992. While it is difficult to predict these natural occurrences, it is reasonable to assume that future events could be likely, given the recent record.

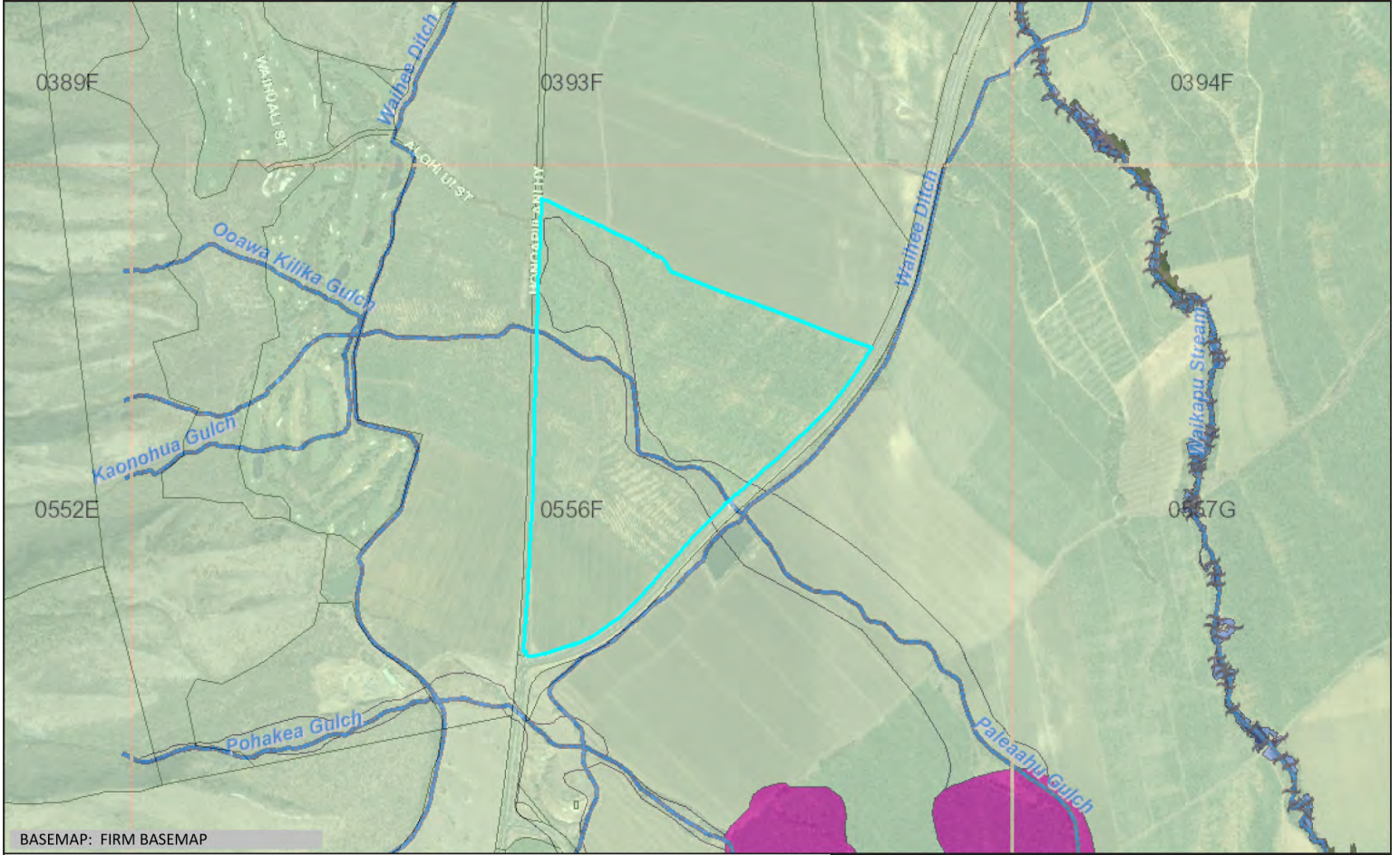
Tsunamis are large, rapidly moving ocean waves triggered by a major disturbance of the ocean floor, which is usually caused by an earthquake but sometimes can be produced by a submarine landslide or a volcanic eruption. About 50 tsunamis have been reported in the Hawaiian Islands since the early 1800s, including the most recent Tsunami as a result of the March 2011 earthquake in Japan. The Waikapū Country Town is outside of the Civil Defense Tsunami Evacuation Zone.

Volcanic hazards are not a concern in the Central Maui area due to the dormant status of Haleakalā. In Hawai‘i most earthquakes are linked to volcanic activity, unlike other areas where a shift in tectonic plates is the cause of an earthquake. Each year, thousands of earthquakes occur in Hawai‘i, the vast majority of them so small they are detectable only with highly sensitive instruments. However, moderate and disastrous earthquakes have also occurred.

The 1938 Maui Earthquake, with a magnitude of 6.7-6.9 on the Richter scale and an epicenter six (6) miles north of Maui, created landslides and forced the closure of the road to Hana. Damaged water pipes and ground fractures also were reported in Lāhainā. More recently, on October 16, 2006, a 6.7 magnitude earthquake struck on the underwater segment of the major rift zone of the Hualalai volcano on the northwest side of the Island of Hawai'i. The earthquake caused rockslides and some damage to roadways on Maui.

Flood hazards are primarily identified by the Flood Insurance Rate Map (FIRM) prepared by the United States Department of Homeland Security Federal Emergency Management Agency (FEMA), National Flood Insurance Program. Flood zone designations can also be identified by using the Hawai'i National Flood Insurance Program, Flood Hazard Assessment Tool. A portion of TMK Parcel Nos. 3-6-002:003 and 3-6-004:003, paralleling the Waikapū Stream, are located in Zones AEF and AE and XS. Zones AEF and AE are Special Flood Hazard Areas subject to inundation by the 1% annual chance flood. These areas have a 1% chance of being subjected to the 100-year flood each year. Mandatory Flood Insurance must be carried within Special Flood Hazard Areas. Zone AEF is defined as the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE. Zone AE is an area where the base flood elevation has been determined. Zone XS is an area of Non-Special Flood Hazard Area, which is an area considered to be of low to moderate risk. Mandatory flood insurance is not required in the Non-Special Flood Hazard Area. Zone XS is defined as an area of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood (**See**: Figure No. 36, A-E, "Flood Hazard Assessment Maps").

Potential Impacts and Mitigation Measures. Any structures built within the WCT site will be constructed for protection from earthquakes and the destructive winds and torrential rainfall of tropical hurricanes, in accordance with the Building Code adopted by the County of Maui. All work will comply with applicable flood zone standards, such as those set forth in Chapter 19.62, "Flood Hazard Areas",Maui County Code.



Flood Hazard Assessment Report

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Waikapu Country Town

Property Information

COUNTY:	MAUI
TMK NO:	(2) 3-6-002:001
WATERSHED:	POHAKEA; WAIKAPU
PARCEL ADDRESS:	0 HONOAPIILANI HWY WAILUKU, HI 96793

Notes:

Flood Hazard Information

FIRM INDEX DATE:	NOVEMBER 04, 2015
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	1500030556F
PANEL EFFECTIVE DATE:	SEPTEMBER 25, 2009

THIS PROPERTY IS WITHIN A TSUNAMI EVACUTION ZONE: NO
FOR MORE INFO, VISIT: http://www.scd.hawaii.gov/

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 0.30 0.60 mi

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If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and is not to be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.

FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND
(*Note: legend does not correspond with NFHL*)

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also know as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	Zone A: No BFE determined.
	Zone AE: BFE determined.
	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

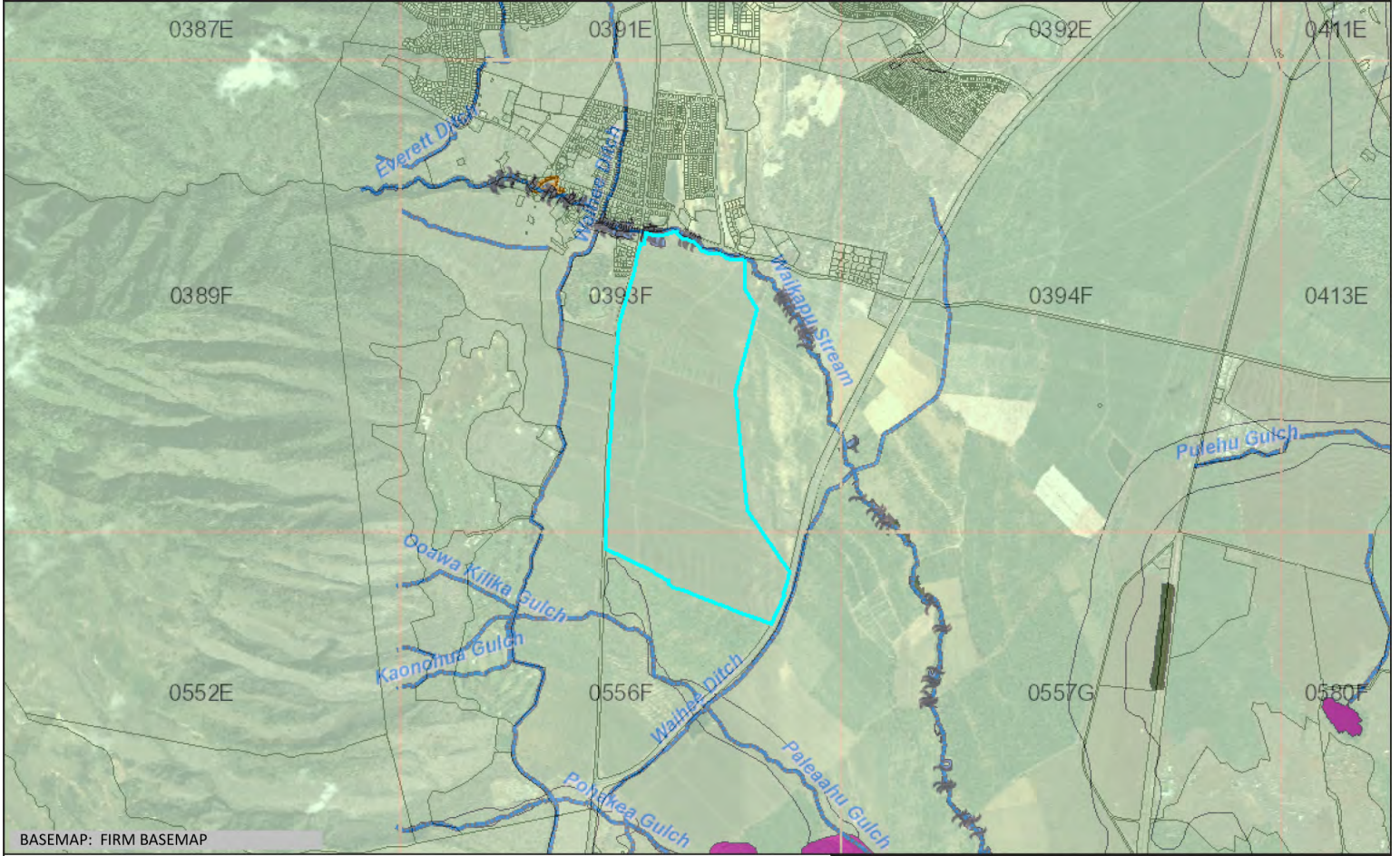
NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

Figure 36 A: Flood Hazard Assessment Map



Flood Hazard Assessment Report

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Waikapu Country Town

Property Information

COUNTY: MAUI

TMK NO: (2) 3-6-002:003

WATERSHED: IAO; WAIKAPU

PARCEL ADDRESS: 0 HONOAPIILANI HWY
WAILUKU, HI 96793

Notes:

Flood Hazard Information

FIRM INDEX DATE: NOVEMBER 04, 2015

LETTER OF MAP CHANGE(S): NONE

FEMA FIRM PANEL - EFFECTIVE DATE: 1500030393F - NOVEMBER 04, 2015
1500030556F - SEPTEMBER 25, 2009

THIS PROPERTY IS WITHIN A TSUNAMI EVACUTION ZONE: NO
FOR MORE INFO, VISIT: http://www.scd.hawaii.gov/

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 0.60 1.20 mi

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	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

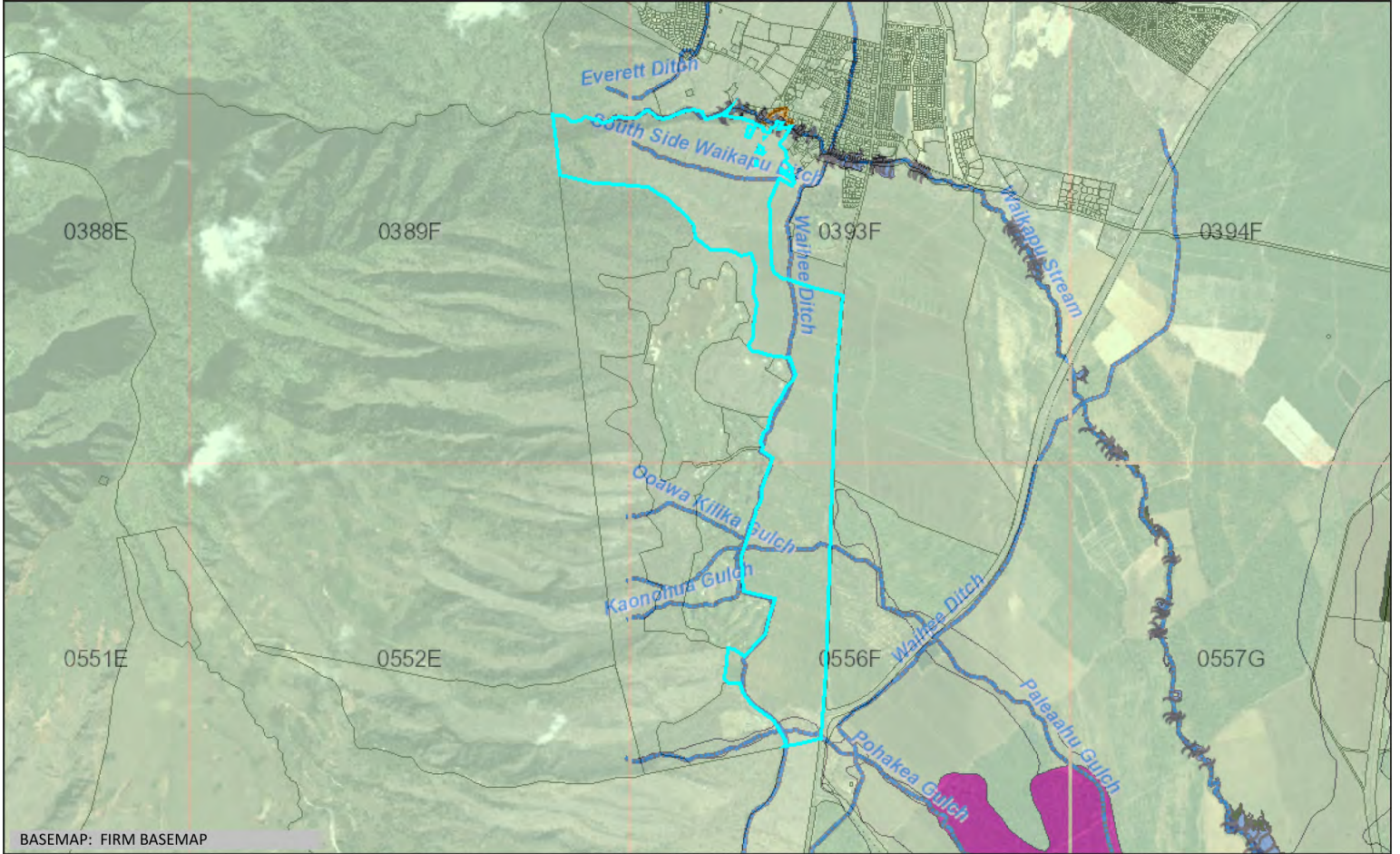
NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

Figure 36 B: Flood Hazard Assessment Maps



Flood Hazard Assessment Report

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WAIKAPU COUNTRY TOWN

Property Information

COUNTY:	MAUI
TMK NO:	(2) 3-6-004:003
WATERSHED:	POHAKEA; WAIKAPU
PARCEL ADDRESS:	0 HONOAPIILANI HWY WAILUKU, HI 96793

Notes:

Flood Hazard Information

FIRM INDEX DATE:	NOVEMBER 04, 2015
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL - EFFECTIVE DATE:	1500030389F - NOVEMBER 04, 2015 1500030393F - NOVEMBER 04, 2015 1500030556F - SEPTEMBER 25, 2009

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FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 0.60 1.20 mi

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FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND
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	Zone A: No BFE determined.
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	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

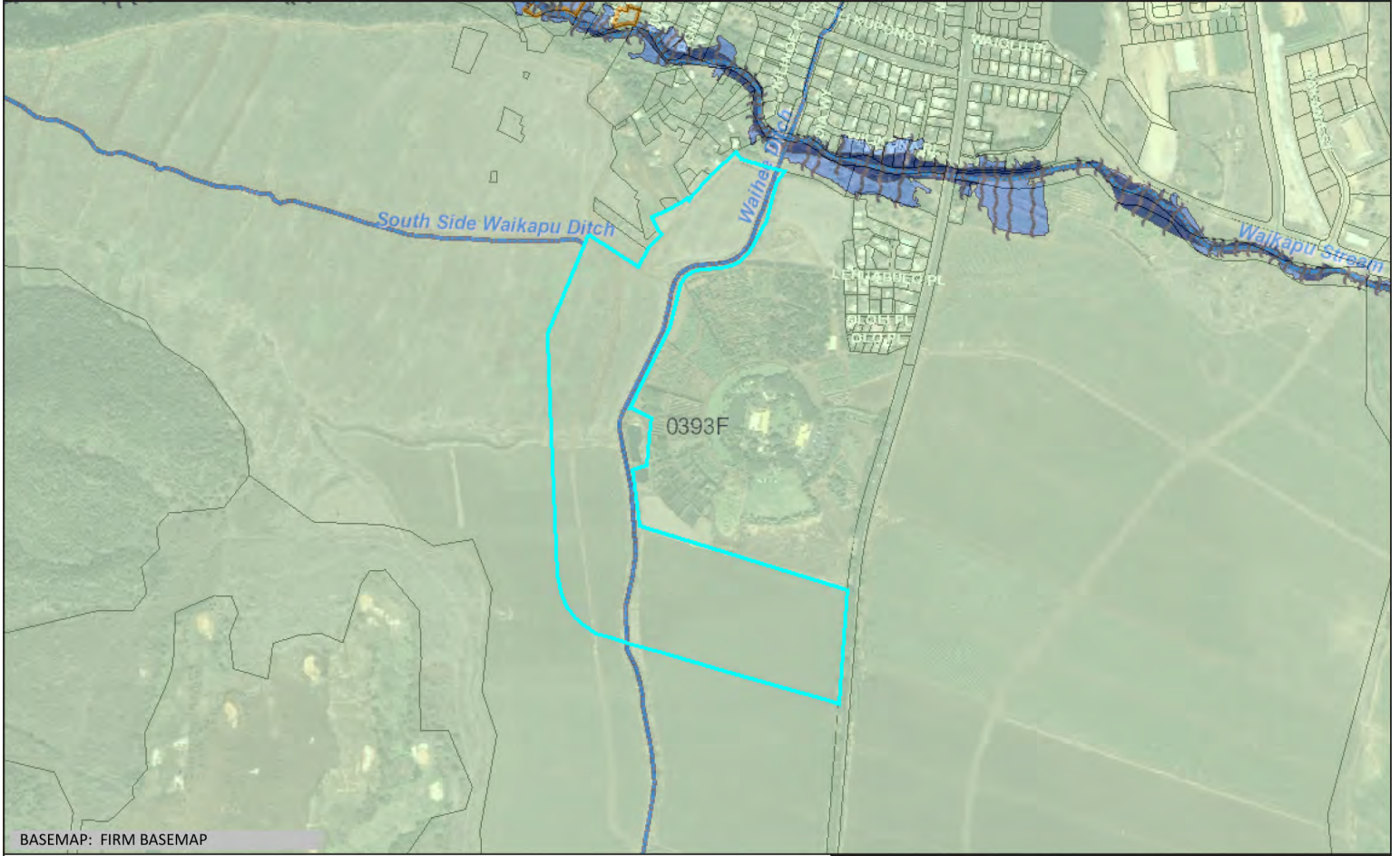
NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

Figure 36 C: Flood Hazard Assessment Maps



Flood Hazard Assessment Report

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WAIKAPU COUNTRY TOWN

Property Information

COUNTY: MAUI

TMK NO: (2) 3-6-004:006

WATERSHED: WAIKAPU

PARCEL ADDRESS: 2000 HONOAPIILANI HWY
WAILUKU, HI 96793

Notes:

Flood Hazard Information

FIRM INDEX DATE:	NOVEMBER 04, 2015
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	1500030393F
PANEL EFFECTIVE DATE:	NOVEMBER 04, 2015

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THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 600 1,200 ft

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FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND

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	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

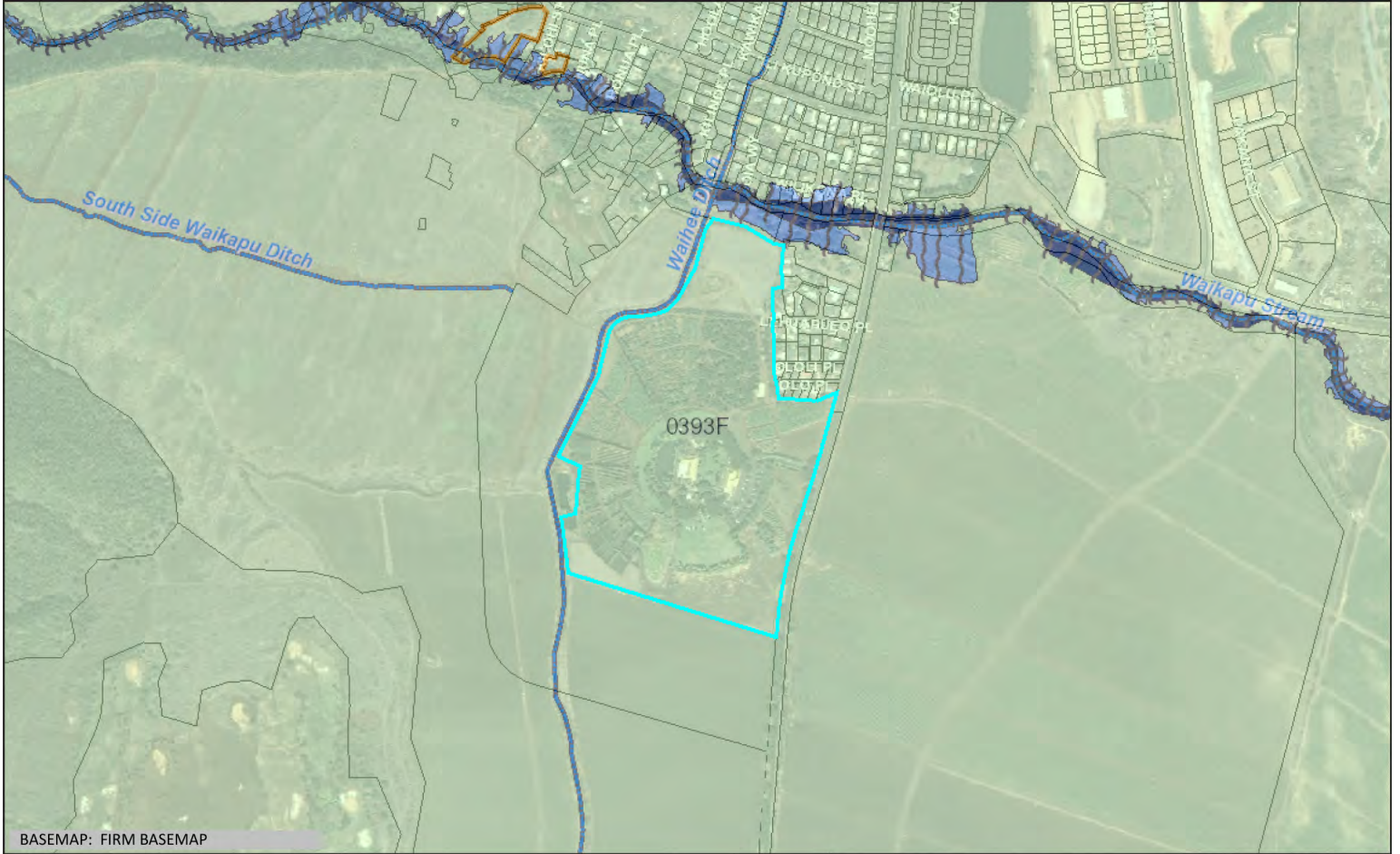
NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

Figure 36 D: Flood Hazard Assessment Maps



Flood Hazard Assessment Report

www.hawaiinfip.org

WAIKAPU COUNTRY TOWN

Property Information

COUNTY:	MAUI
TMK NO:	(2) 3-6-005:007
WATERSHED:	WAIKAPU
PARCEL ADDRESS:	1670 HONOAPIILANI HWY WAILUKU, HI 96793

Notes:

Flood Hazard Information

FIRM INDEX DATE:	NOVEMBER 04, 2015
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	1500030393F
PANEL EFFECTIVE DATE:	NOVEMBER 04, 2015

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FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 600 1,200 ft

Disclaimer: The Hawaii Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use, accuracy, completeness, and timeliness of any information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR, its officers, and employees from any liability which may arise from its use of its data or information.

If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and is not to be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.

FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND
(*Note: legend does not correspond with NFHL*)

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also know as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	Zone A: No BFE determined.
	Zone AE: BFE determined.
	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

Figure 36 E: Flood Hazard Assessment Maps

Flood Hazard Assessment Report

www.hawaiinfip.org

WAIKAPU COUNTRY TOWN

Property Information

COUNTY:	MAUI
TMK NO:	(2) 3-6-006:036
WATERSHED:	WAIKAPU
PARCEL ADDRESS:	0 WAIKAPU WAILUKU, HI 96793

Notes:

Flood Hazard Information

FIRM INDEX DATE:	NOVEMBER 04, 2015
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	1500030393F
PANEL EFFECTIVE DATE:	NOVEMBER 04, 2015

THIS PROPERTY IS WITHIN A TSUNAMI EVACUTION ZONE: NO
FOR MORE INFO, VISIT: http://www.scd.hawaii.gov/

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 100 200 ft

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FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND
(*Note: legend does not correspond with NFHL)*

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also know as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	Zone A: No BFE determined.
	Zone AE: BFE determined.
	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

Figure 36 F: Flood Hazard Assessment Maps

The project area located adjacent to the Waikapū Stream, within the Special Flood Hazard Area, is proposed to be set aside for parks, open space and agriculture. No structures will be will be located within Zone AEF.

The WCT project site is located approximately 3.5 miles inland of Kahului Harbor and about 4 miles inland of Mā‘alaea Harbor and should therefore not be impacted by tsunami or coastal flooding. In addition, the proposed development will be designed with a drainage system, including detention basins, to mitigate any increase in runoff that could negatively impact neighboring properties.

4. Flora and Fauna

Existing Conditions. Botanical and Faunal Surveys were conducted by Robert W. Hobdy, Environmental Consultant, in February 2013 for the 494 acres proposed for development (**See**: Appendix B, “Botanical and Faunal Surveys”).

A total of 130 plant species were recorded during the survey. Seven species were found to be common within the project area: buffelgrass (Cenchrus ciliaris), Guinea grass (Megathyrsus maximus), sugar cane (Saccharum officinarum), smooth rattlepod (Crotalaria pallida), cheeseweed (Malva parviflora), ’uhaloa (Waltheria indica) and Java plum (Syzygium cumini). These species are found naturally in Hawai‘i as well as throughout the tropics nearly worldwide and are common.

Just 3 native species were found within the project area: ’uhaloa, koali awahia (Ipomoea indica) and popolo (Solanum americanum). These species are found naturally in Hawai‘i as well as throughout the tropics nearly worldwide and are common. Four plant species found during the survey were introduced over a thousand years ago by Polynesian voyagers: kukui (Aleurites moluccana), niu (Cocos nucifera), hau (Talipariti tileaceum) and ’ihi’ai (Oxalis corniculata). The remaining 123 species were non-native plants, including some useful forage grasses, but many are considered to be agricultural or roadside weeds.

All of the mammals recorded are common non-native species of no particular concern. None of the endangered Hawaiian hoary bats were detected during the survey. Birdlife is dominated by

widespread introduced species. While no protected seabirds were found on the property, the ‘ua’u and ‘a’o are known to overfly the area between the months of March and November.

Three native insects were recorded during the survey. The indigenous dragonflies, the globe skimmer and the green darner are both widespread and common, both in Hawai‘i and elsewhere, and are of no particular conservation concern. The Blackburn’s sphinx moth, however, is an endangered species and is of special concern. Just two individuals of its preferred host plants, the tree tobacco, were found on the northern end of the sugar cane fields at the base of a stockpiled sand pile. These two plants were carefully examined for eggs, larvae or signs of feeding. One plant was found to have two mature eggs on separate leaves. The eggs had turned brown, indicating they were ready to hatch out young larvae. Tree tobacco plants are not native to Hawai‘i, but fall under the protection of the Endangered Species Act (1973) during the period of their association with the Endangered Blackburn’s sphinx moth. The occurrences of the non-native amphibians, reptiles and mollusks are of no particular interest or concern.

Potential Impacts and Mitigation Measures. As a result of the above findings it is determined that there is little of botanical concern and that the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui. No recommendations with regard to plants are deemed appropriate or necessary.

With respect to the ‘ua’u and ‘a’o which are known to overfly the property, it is recommended that any significant outdoor lighting be shielded to direct the light downward so that it is not visible from above. This is because the ‘ua’u and ‘a’o are easily confused and distracted by bright lights and often crash to the ground, where they are particularly vulnerable to being run over by vehicles or killed by predators.

As for the presence of the two tree tobacco plants that were found on the northern end of the sugar cane fields at the base of a stockpile, one of which was host to two mature Blackburn’s sphinx moth eggs, Hobdy recommended that this occurrence be reported to the U.S. Fish and Wildlife Service so that the required protections and management actions could be clarified.

In a December 15, 2015 e-mail to Planning Consultants Hawai'i LLC, the U.S. Fish and Wildlife Service provided the following guidance to mitigate impacts to the Blackburn's sphinx moth that might exist on the WCT property (See Appendix Q ~~L~~):

1. Survey protocol

Surveys for Blackburn's sphinx moth and its potential host plants will be conducted by a qualified individual during the wettest portion of the year (Hawai'i Island: January to April; Maui North shore: November to April; rest of Maui: October to April – early surveys can be done if there have been Kona storms), approximately four to eight weeks following a significant rainfall event. In some cases, multiple surveys may be recommended.

If *Nothocestrum sp*. or *N. glauca* are detected during surveys, the plants will be visibly marked with flagging and the following documented: 1) general larval plant density; 2) proximity of larval plants to project sites; 3) average height of the larval plants; 4) signs of larval feeding damage on leaves; and 5) presence of Blackburn's sphinx moth larvae on leaves.

2. Avoidance and minimization

N. glauca frequently occurs in disturbed areas. Blackburn's sphinx moth adults lay eggs on *N. glauca* and moth larvae feed on the leaves of the plant before they crawl from the plant and burrow into the soil or crevices in rock where they pupate for up to a year or longer. They are most likely to pupate within 33 ft. (10 m) of the larval host plant, although they may transit farther over paved and hardened surfaces to find a suitable site to enter the ground. The minimization measures below are conservative because our understanding of the species' resource limitations and behavior is limited. Clearing of the *N. glauca* would be completed using the following safeguards to ensure the potential for direct effects to Blackburn's sphinx moth eggs, larvae, and pupae are minimized:

- If *N. glauca* is less than three feet in height and no Blackburn's sphinx moth eggs, larvae, or signs indicating the possibility of pupating larvae (such as frass, chewed stems or other browsing characteristics) are detected, the entire plant(s) may be removed and the soil within 33 ft. (10 m) may be disturbed.

- If *N. glauca* is more than three feet in height, it is possible that the signs of Blackburn's sphinx moth foraging have been shed and pupating larvae may be in the ground in the area beneath the plant(s). Therefore, if there are no signs of Blackburn's sphinx moth on *N. glauca* more than three feet in height, the above-ground portion of the plant(s) may be cut off and removed and the following measures implemented to minimize the potential for future use of the plant by Blackburn's sphinx moth and potential impact to a pupae that may already be in the soil near the plant:
    - Stems will be treated with herbicide or re-trimmed to prevent leaf growth and potential use by the Blackburn's sphinx moth.
    - A 33-ft (10-m) disturbance-free buffer will be established around the plant's location for one year. After one year, the plant roots may be removed and the soil disturbed if necessary. The one-year waiting period will ensure any larvae pupating in the soil will have pupated and emerged from the soil prior to disturbance of the plant(s) or soil.

In accordance with the U.S. Fish and Wildlife's guidance, a qualified biologist will be retained to resurvey the previously identified Tree Tobacco (*N. glauca*) plants, and immediate area, for the presence of Blackburn's sphinx moth larvae. Depending upon the height of the tree, and the presence or absence of the Blackburn's sphinx moth, the prescribed mitigation measures documented above will be adhered to. Based upon the guidance provided, the Applicant understands that by implementing the necessary mitigation measures, the presence of the host Tree Tobacco plant and Blackburn's sphinx moth should not constrain development of the project site.